REPORT
ON THE
INJURIOUS INSECTS
AND OTHER ANIMALS
OBSERVED IN THE MIDLAND COUNTIES
DURING 1905,

BY

WALTER E. COLLINGE, M.Sc.,
Foreign Member of the Association of Economic Entomologists, Washington, U.S.A.; Honorary Secretary of the Association of Economic Biologists; Editor of the "Journal of Economic Biology"; Honorary Consulting Zoologist to the Midland Reafforesting Association; and Lecturer in Zoology and Comparative Anatomy in the University of Birmingham.

THIRD REPORT.
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THIRD REPORT.

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Preface.

The publication of a Third Report on the Injurious Insects and other Animals which have been forwarded to me by various correspondents in the Midland Counties of England during 1905, has only been possible by the financial assistance I have received from the County Councils of Staffordshire and Warwickshire, who have both granted the sum of £10 towards the cost of this publication, and my hearty thanks are here tendered to both of these bodies; also to the Council of the Birmingham Natural History and Philosophical Society for their continued assistance with my experimental work in Economic Zoology.

I have pleasure in acknowledging the kind assistance given me as regards the figures illustrating this work: To the Controller of His Majesty's Stationery Office and the Secretary of the Board of Agriculture I am indebted for their courtesy in supplying me with electros of Figures XVII, XVIII, XIX, XXIV—XXXII, all of which are from illustrations which have appeared in the Board's leaflets; and to Messrs. J. F. Blakey, F. H. Brownhill, G. F. Strawson, and Herbert Thompson for photographs from which some of the other figures have been made.

As in past years, I have been greatly aided in my work by the farmers, fruit-growers, and horticulturists of the Midlands, who have always been most ready to afford me all assistance in their power, and I take this opportunity of thanking them for their ready and willing aid.

WALTER E. COLLINGE.

The University,
Birmingham,
March, 1906.
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REPORT

ON THE

INJURIOUS INSECTS AND OTHER ANIMALS

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DURING 1905.

"If men can be shown that their health, wealth, or happiness depends upon a knowledge of insect life, there would be no trouble to interest people in the study of Entomology. Show the farmer, the gardener, and the horticulturist the importance of knowing the habits of insects in order to successfully combat the pests that destroy their crops . . . . and the science of Entomology will quickly take the rank it deserves among its sister sciences."

C. P. Gillette.


INTRODUCTION.

During the year January 31st, 1905, to January 31st, 1906, four hundred and seventy-nine inquiries were dealt with. Of these, four hundred and five were connected with agricultural and garden pests, eleven referred to household or commercial pests, forty-nine specimens were sent in for identification, whilst the remaining fourteen were of a miscellaneous nature.

Applications for information were dealt with from the Intelligence Department of the Board of Agriculture; the Imperial Department of Agriculture for the West Indies; and the Imperial Department of Agriculture for the Fiji Islands.

In all, three hundred and ninety-three written replies have been sent out.

For kindly examining and identifying specimens unknown to me, or for other information, I am much indebted to the following workers:—R. A. Burdon, B.A., H. Willoughby Ellis, F.E.S., A. H. Martineau, F.E.S., A. E. Shipley, F.R.S., and F. V. Theobald, M.A.

During the year the following publication has been issued: Reports on Economic Zoology, No. 2.—The Life History of the Pear Midge, *Diplosis pyrivora*, Riley.
Addresses and lectures have been given to agriculturists, fruit growers, gardeners, etc., at Solihull, Birmingham, Walsall, Bromsgrove, Four Oaks, etc.

Amongst the more noticeable features of the year may be mentioned the continued increase andspread of the Apple Sucker and Plum Aphis (especially in Herefordshire and Worcestershire); the Cabbage Aphis, Cabbage Moth, the White Woolly Currant Scale, and Mussel Scale are also abundant.

Wireworms are still in most of the Midland Counties a very serious pest. The experiments made during the past season with various suggested remedies seem likely to ultimately prove of service.

In Staffordshire, Shropshire, Hereford, Worcester, Warwick, and Leicester, horticulturists have suffered severely from the losses caused by Eelworms.

There is a decrease in the number of cases where the Pear Midge and Apple Blossom Weevil have been the source of trouble, but the Turnip Flea-Beetle and Cabbage-Gall Weevil are still doing great damage.

The year 1905 proved exceptionally favourable for Crane and other flies; next to the Wireworm, the larvae of the former, or "Leather Jackets," are the most serious pest we have to contend with.

Chief Lines of Research.

Two important pieces of work have been undertaken during the past season on a piece of ground set apart for the purpose by the Council of the University of Birmingham, viz., the continued experiments on the Black Currant Gall-Mite, and a series on the Plum Aphis, a full report of which will be found on pages 5 and 18. The life history of Aleyrodas vaporarium has also been studied, and preventive and remedial measures considered, particulars of which will be found on page 22, and a number of experiments have been made as to a remedy for the Clay-coloured Weevil (p. 26), Wireworms (p. 28), the Lilac Leaf-Miner (p. 36).

Insects Sent for Identification.

Many specimens of insects or insect larvae have been received for identification from farmers, fruit-growers, florists, and others. While there is no difficulty in identifying the common pests, replying to such inquiries takes up considerable time; but this work is very necessary, as it familiarises the senders with the common farm, field, and garden pests, so that any new or rare insect would not be likely to pass unnoticed.

Voluntary Observers.

In my last Report, the following appeal was made for voluntary observers:—

"The agricultural interests of the Midland Counties are of a
THE STEM EELWORM.

varied nature, and each year great losses are suffered by the depredations of insects and other animals. The large area under observation makes it quite impossible for one individual to keep in touch with the various outbreaks, or to learn of such in time to warn agriculturists and others of threatened attacks.

"In order to make my work on Economic Zoology of greater practical value, and to bring the same into closer relations with those whom it primarily concerns, I desire to enlist the sympathies and services of a few more voluntary observers in different parts of the Midlands, who would be willing to send in short weekly reports from March to June, and later less frequently. Such reports would be of great value collectively, as indicating the abundance of any particular insect or insects, the extent of their depredations, the plants affected, means of distribution, and causes facilitating the spread of insect and other pests.

"It is specially desired to obtain the services, observations, and experiences of those practically acquainted with insects and other agricultural pests.

"Each worker will receive due credit for all observations, etc., and a copy of all future Reports; further, all inquiries for information will be willingly answered. Appropriate stationery and stamped and addressed envelopes will be supplied to those selected."

Although somewhat late in the year when this reached the notice of those likely to be of service, two or three workers responded, and their reports, though few, have been most helpful. I would particularly mention the excellent work that is being done by Mr. J. G. Blakey, of Redditch, Mr. F. H. Brownhill, of Sparkbrook, and Mr. Herbert Thompson, of Sparkhill.

THE STEM EELWORM.

*Tylenchus devastatrix*, Kuhn.

During the past year this pest has been particularly prevalent. The following plants have been attacked and forwarded by different correspondents:—Hyacinth, narcissus, begonia, pelargonium, dahlia, pansy, various primulas, etc.

**Life-history.**

The adult worm varies in length (1 to 1.5 millim.) but roughly may be stated as about the twenty-fifth of an inch. Viewed under the microscope, it is seen that the tail end is slightly more pointed than the mouth end. Within the narrow gullet is a sharply pointed dart, by means of which it pierces the plant tissues.

The eggs, which are deposited in the tissues of the infected plant, are an oblong or oval shape, and the young worms or larvae which hatch out from these resemble the parent, externally differing only in size. Before attaining the size of the parent, the larva passes through a series of moults.
REPORT ON INJURIOUS INSECTS FOR 1905.

It is very important to remember that the larvae can remain in dry soil or in dried vegetable matter for a considerable length of time in a state of suspended animation, having the power to resume active life after even two or three years.

PREVENTIVE AND REMEDIAL MEASURES.

This is an exceedingly difficult pest to deal with. In gardens or on small areas all refuse of diseased plants should be burnt, and the soil liberally treated with gas lime, or saturated three times at intervals of a fortnight with one part of carbolic acid in twenty parts of water. Where either of these methods of treatment have been employed, the soil so treated should be allowed to remain for six or seven weeks before being used again.

On larger areas, as for instance on red clover or onion crops, as long an interval as possible should be allowed before the same crop is grown again. Land known to be infested should also receive a liberal dressing of gas lime.

Good results have frequently been obtained by grazing sheep on the land.

WHITE WORMS.


A correspondent forwarded Narcissus bulbs injured by the stem eelworm (*Tylenchus devastatrix*). A number of larger worms were noticed and forwarded to Mr. A. E. Shipley, F.R.S., who very kindly reported that, in the opinion of Dr. Vejdovsky, they were almost certainly *Fridericia leydigi*, Vej., but he could not be absolutely certain, as they were immature.

WOODLICE.

Several correspondents have sent in specimens of different species of woodlice from greenhouses and conservatories, as well as from the open garden.

By far the two commonest species are *Oniscus asellus*, Linn., and *Porcellio scaber*, Latreille. In addition to these, the following species have been received:—

*Trichoniscus pusillus*, Brandt.
*Trichoniscus roseus*, Koch.
*Platyarthrus hoffmannseggi*, Brandt.
*Porcellio pictus*, Brandt and Ratzeburg.
*Porcellio rathkei*, Brandt.
*Metoponorthus pruinosus*, Brandt.
*Cylisticus convexus*, De Geer.

I shall be very pleased to receive further specimens.

PREVENTIVE AND REMEDIAL MEASURES.

In conservatories and greenhouses, trapping is one of the most successful measures I know of, and for this purpose little heaps of
wet grass or leaves, wet wooden boards 12 by 6 inches, or plant pots filled with wet grass, should be left on the floor of the conservatory or potting house over night and examined next morning.

Where they occur in large numbers in the open garden they are a much more difficult pest to deal with, but even here continued trapping has considerably reduced their numbers.

THE BLACK-CURRANT GALL-MITE.

*Eriophyes ribes* (Nalepa).

The previous experiments* on the destruction of this pest, although very successful, were not of the nature that a fruit-grower could apply at a cost which would repay him for the extra labour involved, although certain growers have given the sprayfluid mentioned in my earlier Report a trial with very satisfactory results.

The two main objections to the soap and sulphur sprayfluid were, firstly, the large number of applications which were given in my experiments, and, secondly, the large quantity of soap used. But once having proved that the mite could be destroyed by the use of sulphur, it remained to be demonstrated in what form it was best applied, and whether or not it could be shown that any benefit resulted from a smaller number of applications.

With these two objects in view, a series of experiments was commenced early in 1905 on a piece of land set apart and prepared for the purpose by the Council of the University of Birmingham.

On this plot seven rows of bushes were planted, consisting of Black Naples, Baldwins, and Boskoop Giant. All were as badly infected with "big bud" as it was possible to obtain; indeed, I have never seen worse. The plot of land was far from an ideal one, and the last that a fruit-grower would have chosen, so that the bushes had no natural advantages in their favour.

The experiments carried out were as follows:—Rows 1, 2, and 3 were dusted with equal parts of unslaked lime and flowers of sulphur. Rows 4, 5, and 6 were sprayed with a mixture consisting of 1 lb. lime, 1 lb. sulphur, and 20 galls. water; whilst Row 7 was sprayed with a mixture consisting of 1 lb. sulphur, 1 lb. soft soap, and 20 galls. water.

DUSTING WITH LIME AND SULPHUR.—As it was desirable to find, if possible, the minimum number of applications that would give successful results, Row 1 was dusted three times, Row 2 twice, and Row 3 once. The dustings were applied when the bushes were wet on March 31st, April 14th, and May 5th. A small pair of bellows were used for the purpose, but better results have since been obtained by the use of the "Coronette" Knapsack Sprayer.

* Rept. on Econ. Zool., No. 1, 1904.
At the end of June all the bushes were in full leaf, and excepting here and there, where the growing points had been burnt by the lime, they all looked remarkably healthy.

The remains of the old diseased buds were microscopically examined, but no mites were found, nor could any trace of big buds be discovered on any of the bushes.

In September, buds were taken from the different bushes, particularly those buds which appeared big or at all irregular in shape. These were carefully treated by what is known as the Nalepa and other methods; numerous slides were made and examined under the microscope, with the following results:

Row 1.—Out of a large number of buds examined, only two were found containing mites; in one there was a single immature specimen, and in the other there were five examples, also immature.

Row 2.—Very few mites were found, but there were more infected buds; the largest number of mites found in a single bud was seven. In all cases the mites were immature.

Row 3.—Here the buds differed very little from those taken from Row 2, only the percentage of infected buds was slightly greater.

Summary.—It is very evident that all the bushes benefited by the application of the lime and sulphur. It would have been better, however, had a little less lime been used (1 pt. of lime to 2 pts. of sulphur would probably have acted as well). In the case of those bushes that received a single dusting, the big buds were considerably reduced in number, not more than one-quarter of the
number being present in October of those present in February. Where two dustings were given, a distinctly marked diminution over those receiving one dusting was shown; whilst where three dustings were applied the mite was almost exterminated. It must be borne in mind that neither a sprayfluid nor dry application will reach the eggs in the buds, and it seems clear that the number of adult mites which successfully migrated from the old buds into the new ones was very small indeed. In all cases the mites found were immature specimens.

Spraying with Lime and Sulphur.—The results obtained by spraying were not so good as those by dusting. A larger number of buds were affected, and in many of them there were adult and immature mites and eggs. The differences between the one, two, or three applications of the sprayfluid were quite in keeping with those found to obtain where dusting had been done. The fewer the applications, the more buds affected, and the greater the number of mites.

Spraying with Soft Soap and Sulphur.—Row 7 was sprayed twice with the sprayfluid above-mentioned. When the bushes were examined in October, a fairly large number of big buds were noticed; there were, however, nothing like so many as in the previous February: roughly estimated, I should think about onethird the number. In many of these buds, twelve to twenty adult mites were present, many immature specimens, and a few eggs. The result of an examination of eighty-six suspected buds gave an average of four adults, nine immature mites, and three eggs per bud.

Summary and Conclusion.

After the experiments which have been made, I feel convinced that the application of lime and sulphur will keep this mite in check, and, if the dusting or spraying is continued, will, eventually entirely eradicate the pest.

Various statements have appeared in a section of the horticultural and agricultural press, stating that there is no likelihood of a cure, or even of means whereby the mite can be kept in check, and further that its life-history is very imperfectly understood. * I would warn all fruit-growers against such misleading statements. The life-history is now practically fully known, and the experiments which I have conducted, and which have now extended over seven years, have yielded results, checked by many large fruit-growers, which clearly point to the fact that the application of lime and sulphur offers an effective remedy.

It is interesting to note in this particular that the destructive rust or silver mite of the orange and lemon has been combated in a similar manner. In 1889, according to Mr. Marlatt,† large quantities of citrus trees were obtained from Florida, and a species

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* I am sorry to have to include the Journ. Roy. Agric. Soc., 1905, vol. 66, pp. 178-181, amongst these.
of *Eriophyes* (*E. oleivorus*, Ashmead) was undoubtedly introduced in the Rivera and San Diego Bay districts of California, U.S.A., where it did considerable harm in the orange and lemon groves. Mr. Marlatt states that "an estimate, made from actual count, indicates that the mites and eggs on a single leaf in midwinter may reach the enormous number of 75,000," indicating some billions of mites for each tree in the active breeding season. He further states that it "is readily destroyed by various insecticides. The eggs, however, are much more difficult to kill, and practically no wash can be relied upon to reach and destroy all the eggs of this mite. . . . The sovereign remedy for the rust mite is sulphur. . . . The advantage of the sulphur treatment arises from the fact that the sulphur adheres to the leaves, and the young mites are killed as soon as they come in contact with it."

A further example of treating another species of the same genus of mites is offered in the case of the cotton leaf blister-mite (*E. gossypii*, Banks.), which made its appearance in the West Indian cotton fields in 1903, and quickly spread throughout the islands. Here the lime and sulphur treatment has proved most effective.

**THE WALNUT GALL-MITE.**

*Eriophyes tristriatus v erinea* (Nal.).

This species sometimes proves very troublesome on walnut trees. As yet I cannot give any account of its life-history, and the only remedial measures I know of are dusting or spraying with lime and sulphur, and burning the fallen leaves from infected trees.

The specimens from which the illustrations were taken were very kindly sent me by Miss S. E. Stow, of Grantham, to whom I am indebted for many other galls formed by mites of this genus.

**THE HAZEL-BUD MITE.**

*Eriophyes avellaena* (Nalepa).

The remedial measures mentioned in my last Report have been carried out in a number of instances, with the result that during 1905 there has been a considerable diminution in the number of abortive buds.

A few new cases have been reported, and the lime and sulphur dusting has been tried with excellent results.

**THE LIME LEAF GALL-MITE.**

*Eriophyes tiliae* (Pgst.), Nalepa.

The well-known nail-galls on the upper side of the leaves of the lime have been frequently met with during the past season. Unfortunately, time has not permitted the working out of the life-history of this species, although a few important facts have been added to work done in previous years. There is little doubt but that, when the migration period is known, dusting with lime and sulphur will prove an effective remedy.

FIG. II.—Leaves Attacked by the Walnut Gall-Mite. Upper Surface.

FIG. III.—Leaves Attacked by the Walnut Gall Mite. Under Surface.
INSECTA.

SPRINGTAILS.

Collembola.

Looked at from the point of view of the economic zoologist, the Springtails have until quite recently been regarded as of little or no importance. During the past year, however, large numbers have been sent in by different correspondents, and I have examined numerous cases where, if they were not the primary cause of injury, they played the part of seconders in a very able manner.

All the species of this order are small, wingless insects presenting numerous points of zoological interest. I must here, however, confine my remarks strictly to their economic importance as destroyers of various plants.

Curtis* mentions a species of *Sminthurus* (S. solani) as feeding upon the parenchyma of the green leaves of the potato, and states: "In Nova Scotia the crops of turnips and cabbages are principally destroyed, whilst in the seed leaf, by some *Sminthurus*, the size of a pin's head, and nearly globular. It hops with great facility by means of its forked tail, and may be found on every square inch of all cultivated ground, but it is not plentiful on new land." He also alludes to a *Podura* (P. plumbea, Linn.) being abundant in February, 1846, skipping about the rottning potatoes.

Miss Ormerod† records injury to the leaves of turnips by *Sminthurus luteus*.

Guthrie§ states that he learned from Professor H. E. Summers, State Entomologist of Iowa, that a species, probably belonging to *Achorutes*, was so abundant in the soil containing seeds, and kept it so thoroughly worked up, as to give the little plants no chance to root, and that many died.

Theobald** records certain Collembola damaging orchids; and again a species of *Orchesella††; also a species of *Lipura* damaging the roots of cauliflowers and celery.§§

Carpenter‡‡ has also recorded *Achorutes Armatus*, A. longispinus, and *Lipura ambulans* damaging bean seeds.

In March last a correspondent forwarded from Solihull, roots of cauliflowers covered with specimens of *Lipura ambulans*, Linn. The plants were badly attacked with "Finger and Toe" disease, caused by a fungus (*Plasmodiophora brassicae*). This species is extremely common in decaying vegetable matter, but I have not met with a case where they have attacked healthy plants.

The same species of *Lipura* was later sent in from some nursery gardens near Birmingham on Narcissus bulbs, which had been

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* Farm Insects, p. 435.
§ The Collembola of Minnesota, 1903, p. 4.
‖ Ibid., p. 158.
injured by the stem eelworm (see p. 3), also examples of Achorutes armatus (Nicolet).

Specimens of various species of Sminthurus have been received, amongst which must be mentioned S. malmgreenii, Tub., forwarded by Mr. R. G. Sims, from Knowle, Warwickshire, which is the first record for this country, Mr. A. D. Imms informs me.

PREVENTIVE AND REMEDIAL MEASURES.

Curtis* recommends sprinkling salt over the land after the seed is sown, and then roll it well down, as these insects will not remain in damp ground. Professor Carpenter† advocates soaking the ground with a half per cent. solution of formalin. Theobald§ has found that a dressing of soot and lime proved effective.

All of these have been experimented with, and I have found lime or soot and lime answer in all cases I have yet had to deal with.

THE EARWIG.

Forficula auricularia, Linn.

Reports from gardeners throughout the Midlands testify to the unusual abundance of this insect. Many state that they have never seen it so numerous before, nor have they known it commit so much damage. In a few nursery gardens it has been a veritable plague, and very drastic measures have had to be adopted to stay its depredations.

The old-fashioned plan of placing inverted flower pots stuffed with hay on sticks is now very often neglected, and I cannot help thinking that the great increase in the numbers of this insect is largely due to the neglect of this simple remedy.

THE BOOK LOUSE.

Atropos divinatoria, Fabr.

This is one of those insects which from time to time appear in sufficiently large numbers to constitute a pest. Two such cases have been reported upon during the past year. In one instance large numbers were found beneath the wall-paper of a room in a dwelling-house, and in another amongst a series of curio-cabinets.

From the fact that they are very often found in undisturbed books, and their pale, wingless, louse-like appearance, many species of the genus are known as the book louse. They are not all frequenters of dwelling-houses; a number of species live out of doors, some of which are winged.

A. divinatoria is a wingless form, almost one millimeter in length; it has well-developed mouth organs for biting, and is an omnivorous feeder. It is particularly fond of the starchy paste used in binding books, or that used by paperhangers.

* Tom. cit., p. 433.
Other species are often very abundant in the straw coverings of wine bottles and straw mattresses.

Marlatt records a case* in the United States, where "in a new house, kept by very neat occupants, a mattress of hair and corn husks, which had been purchased some six months before, was found in September, after the house had been closed about six weeks, to be so covered with these insects that a pin point could not have been put down without touching one or more of the bugs. The side of the lower sheet next the mattress was likewise covered, and further search showed the walls, and, in fact, the entire house, to be swarming with them. A sweep of the hand over the walls would gather them by thousands; bureau drawers were swarming with them, and they were under every object and in everything. The mattress was found to contain millions of them, and seemed to be the source of supply.

The measures taken were most thorough. The mattress was promptly removed; walls and floors were washed with borax and corrosive sublimate solution; carpets were steam-cleaned; pyrethrum was freely used; furniture was beaten, cleaned, and varnished, the struggle being kept up for a year with all the persistence of an extraordinarily neat housekeeper. The insect continued to have the best of it, however, and persisted, though in diminished numbers.

The family then removed to a hotel, and for days the house was fumigated with burning sulphur, and the scrubbing was repeated. The insect was still not entirely exterminated, and the house was vacated again and subjected to the vapour of benzine. The insects, two years after the removal of the mattress, were reported to be still in the house, greatly reduced, but to be found in dark corners."

**Remedial Measures.**

If on shelves, amongst books, in cabinets, etc., constant dusting and exposure to fresh air and sunlight are the best measures to take. If on wallpapers, the same will usually prove effective. Where these fail, which is seldom the case in this country, dusting book-shelves, etc., with pyrethrum powder will generally eradicate the pest.

**The Pea and Bean Thrips.**

*Thrips pisiivora.*

Complaints have been received of the damage done to peas and scarlet-runner beans by the larvae of this tiny insect.

In nearly all cases the insect attacks the blossom, with the result that the pods are destroyed, or only stunted and distorted ones develop.

If a blossom is opened early in the spring, it will be found to contain various stages of the insect. The female lays her eggs

in the folds of the leaves of the unopened blossom, and the larvae hatch out in about ten days. They are a deep-yellow or yellowish-brown in colour, and for about twenty-eight days they may be noticed in great activity in the flowers. At the end of that time wings commence to develop, and the insect reaches its nymph stage, which lasts for about a week. Excepting for the developing wings and the rather lighter colour, there is little difference in the appearance of the nymph from that of the larva.

The adult insect is about one-twelfth of an inch in length, almost black or brownish-black, with a paler head, and the abdomen is marked by six more or less pale bands. There are two pairs of wings, which are fringed with numerous fine hairs. During the winter the adults hybernate in crevices and beneath the rough bark on pea or bean sticks, in crevices in palings, or under the rough bark of trees, etc.

**PREVENTIVE AND REMEDIAL MEASURES.**

Wherever an attack of these insects has been experienced, the haulm and the old sticks should be burnt. Neither peas nor beans should be grown on or near the same ground the following year.

Liming and deep ploughing have also been recommended, and the removal of all rough herbage which affords a winter shelter.

**THE FROTH FLY.**

*Tettigonia spumaria,* Linn.

As in 1904, the larvae of this insect have proved very troublesome.

The different accounts of the life-history are not altogether satisfactory. At the beginning of September, 1904, several perfect females were examined and found to be full of eggs; they had almost ceased to leap, and being on sunflowers, which were cut down in November, particular attention was paid to them with a view to finding out when and where the eggs were deposited.

In December some of the old cut ends of the stems of the sunflowers were pulled off from the roots, and inside these hollow tubes many hibernating females were found, still carrying the eggs. In April, 1905, what were thought to be the eggs of this insect were noticed in groups of three, four, or five on the new sunflower leaves; certainly in five or six days after the observation was made, there were tiny masses of froth present, with the newly-hatched larvae within.

In addition to the remedial methods suggested in my last Report, I would mention the two following:—

The cut ends of stalks of sunflowers, hollyhocks, etc., should be gathered early in the year and burnt.

Good results have been obtained by spraying with the following sprayfluid:—
REPORT ON INJURIOUS INSECTS FOR 1905.

Soft soap 5 lbs., tobacco ¼ lb., water 5 gallons, the whole to be well boiled together, and when applied add three gallons of water to every gallon of the mixture.

**THE APPLE SUCKER.**

*Psylla mali,* Förster.

From Hereford, Worcester, and Warwick many inquiries have been received respecting this pest. There can be little doubt that it is spreading and infecting new orchards.

A number of experiments have been made to test the action of the soda and potash sprayfluid upon the eggs, and, whilst it sometimes happens that the eggs are not all killed, all the experiments I have made go to prove that if the sprayfluid is properly made and applied, and does not contain too much soft soap, comparatively very few of the eggs hatch out. Mr. Fred V. Theobald,† in his valuable report for 1904, states that "If the ova are just ready to hatch, the embryos are killed," but unless in that condition it has no effect. Whilst all the experiments I have made point to the fact that the later the application is made the better are the results, they also support my contention that there is a marked diminution in the number of larvae on trees which have been sprayed in January or February, over those which have not.

Mr. Theobald also draws attention to a feature I have not noticed in the Midlands, viz., that this *Psylla* frequents hawthorn hedges around orchards, so that unless they are also sprayed but little good will be done.

**THE LARCH AND SPRUCE CHERMES**

*Chermes abietis,* Linn.

The insect which gives rise to the only too well-known pine-apple galls of the spruce has a most complicated life-history, which has formed the subject of numerous biological memoirs, not the least valuable of which is one by Mr. E. R. Burdon, issued during the past year.‡

Early in 1905 Mr. Burdon published a summary of a most valuable paper dealing with the early stages of the development of the galls formed by this species. As the complete paper will not be published for some time, he has very kindly permitted me to read through his MS., and to make an abstract of the damage done to the host plant, and the results of his experiments on prevention and cure, and his results will, I feel sure, be greatly appreciated by foresters and others.

The following is an abstract taken from Mr. Burdon's MS.:—

Of the various generations, only one, that on the spruce, induces the formation of a gall, though all more or less damage the plants by sucking

* It is very important that a sprymarker should be mixed with the sprayfluid.
In the autumn a larva of the *Chermes* pierces by means of its proboscis the stem of the spruce either below a bud, or the bud itself, and, thus anchored, hibernates. At this stage the insects are exceedingly minute (0.5 millim.), but the proboscis is about three times the length of the body, and pierces the cortex, its apex reaching the neighbourhood of the cambium. Once established, the insect remains in this position until her death in the following June.

In the following spring, about the middle of April, the insect awakens and commences to suck, at the same time secreting, by a series of glandular plates on the dorsal side of her body, a tuft of wool-like wax. The sucking action causes changes to take place in the cells of the plant, and a gall-growth commences to make its appearance.

During these changes the larva has increased in size and undergone three moults, the cast skins being found beside her in the wool-like wax.

**Damage to the Host Plants.**

The injury done by these insects is considerable. In this country the spruce and larch are the chief sufferers, for not only do the pines appear to be less attacked, but they seem better able to resist the pest. Further, the diseased trees are less able to
withstand the attacks of other insects which then take possession, laying their eggs thereon, or burrowing into the decaying wood, and thus hastening the death of the tree. Fungi also make their appearance, and it has been pointed out by Professor Marshall Ward that diseases such as the Larch Canker no doubt often gain an entrance into the trees through the wounds made by *Chermes* and other insects. The Larch Leaf Rust and Spruce-Shoot Disease are also probably so introduced. Mr. Burdon points out that the hyphae of the fungi are always found in the old galls on the spruce, while the black, bead-like fruit bodies may be seen projecting from the stomata of the leaves, viz., the apices of the needles of the dead gall.

**Preventive and Remedial Measures.**

The methods recommended by Miss Ormerod, Mr. Blandford, and others—the snipping off of the galls in the summer—is both troublesome and unsatisfactory, for it not only damages the trees, but does not lessen the pest. This is, of course, intelligible when the facts of the life-history are considered, since the supplies on the spruce are kept up by the return of adult winged forms from the larch. Experiments go to show that this drastic treatment is often more serious than that caused by the insects.

Miss Ormerod also recommended "drenchings with any of the *Aphis* washes in July or when the *Chermes* are seen to be hatching," but Mr. Burdon points out that the majority of the galls are closed in July, in consequence of which the fluid would not reach the occupiers, and would therefore be of no effect.

Mr. Blandford has suggested washing in April, which would certainly destroy numbers of the mothers and eggs, but would still prove ineffective if the season was early and the larvae had commenced to enter the galls.

It is quite evident from Mr. Burdon's researches that the winter mothers or foundresses must be removed whilst still in the hibernating condition: it is therefore all-important that any washing should be done in the winter. The results from Mr. Burdon's experiments were most satisfactory. He used a sprayfluid consisting of 1 lb. of paraffin, ¼ lb. of soft soap, and 8 gallons of water. Taking a shoot on which the buds were badly infected, it was dipped into this fluid, all parts being thoroughly wetted.

In the first experiment, six shoots bearing a total of twenty-four infected buds, with thirty-nine *Chermes* on, were so treated. All the insects except one died, and twenty-three of the buds developed into strong, healthy shoots, showing no sign of gall formation. A single foundress that survived never appeared quite healthy, and caused only a small insignificant gall.

The second experiment was made at the beginning of April, when the insects were awakening from hibernation, and had not affected the buds to any extent. On six shoots bearing twenty infected buds there were twenty-four winter mothers, all of which
were killed by the same treatment as in the previous experiment, and all the shoots developed normally. Thus, out of a total of sixty-three winter mothers on forty-four buds, only one insect survived the treatment.

Other experiments were made with 12 ounces of caustic soda, 12 ounces of carbonate of potash, 4 ounces of treacle, and 8 gallons of water, but every infected bud on ten out of the twelve shoots treated developed into a gall.

From a knowledge of the life-history, it is evident that for the treatment to be completely successful, the larch, and Pinus abies, if they show any signs of blight in summer, must be sprayed at the same time as the spruce. Apart from other advantages, winter spraying removes two generations of the same insect at one and the same time.

THE WOOLLY APHIS (AMERICAN BLIGHT).

Schizoneura lanigera, Hausz.

The complaints of the damage sustained by the attacks of this pest are as numerous as ever.

I have found nothing to improve upon the sprayfluid mentioned in my Report for 1903, viz., a $\frac{1}{4}$ lb. of soft soap to $1\frac{1}{4}$ gallons of hot water for the branch form, and hot water alone for the root form.

Mr. J. G. Blakey, of Redditch, to whom I am indebted for the photographs of Figures V and VI, writes me that he finds some varieties of apples much more susceptible to the attacks of this insect than others. He has also been experimenting with treating
diseased trees with hydrocyanic acid gas, and has obtained very satisfactory results.

So long as there is no law to compel certain owners of infected trees to attend to the same, fruit-growers must suffer, for, however careful and thorough the measures taken in one orchard may be, they will prove of little avail if nothing is done in adjoining orchards, or others in the immediate district.

PLUM APHIDS.

*Aphis pruni*, Réaumur.

*Hyalopterus pruni* (Fabr.).

Hitherto in both Warwickshire and Worcestershire the common aphid of the plum has been *Hyalopterus pruni* (Fabricius), but so far as I can learn, during 1905 *Aphis pruni*, Réaumur, has been much the commoner species, and also more destructive.

This latter species has been forwarded by correspondents from Sutton Coldfield, Solihull, Bromsgrove, Stafford, Leamington, etc. Early in the spring some trees planted on the experimental plot at Bournbrook were found to be affected with the small green
Figs. VII & VIII.—Spraying Plum Trees Attacked by Plum Aphids.
larvae, which had hatched out from eggs that had remained on
the trees during the winter. The trees were at once sprayed with
paraffin emulsion, which was repeated in seven days' time, and no
further specimens were seen. Previous, however, to spraying, some
of the larvae were removed and transferred to pot specimens under
glass, and the life-history noted.

Growth was very rapid, and examples examined on May 12th
had developed into apterous viviparous females, and under the
microscope large numbers of the developing young could be seen
in their bodies. The colour is somewhat variable; most were a
deep green, but a few showed traces of brown. The antennae were
light brown, and the cornicles deep brown, and three faint-green
stripes on the abdomen. These gave rise to young, which again
developed into apterous viviparous females, and this continued
until nearly the end of May. On May 24th the rudiments of wings
appeared, and the pupal stage commenced. The pupae differ in
being of a shining green, with the wing cases edged with brown;
the cornicles were almost wholly black; in a few, slight traces of
green were present. By June 8th all were in the pupal condition.
From these, viviparous winged females appeared, and soon pro-
duced living young, which developed into apterous viviparous
females. These gave rise to further young, which rapidly assumed
the form of the parent, and these gave rise to other generations.
This continued until the end of September, when the pupal condi-
tion was again assumed, and from the pupae a generation of
winged males and wingless oviparous females appeared, the number
of females being in excess of the males. After fertilisation, the
females commenced to deposit their eggs on the stems, twigs, at the
base of the buds, etc., so that in the second week in October
numerous little shiny masses of bright blackish eggs were to be
found.

The trees from which the progenitors of these specimens had
been removed were examined during the first week in October, and
on one or two a few wingless oviparous females were found (in
all probability they had come from escaped viviparous winged
females from the colonies under glass). The trees were sprayed
with paraffin emulsion, and carefully looked over in November,
but no eggs could be found. Many twigs were cut off and more
leisurely examined, but with the same result. It may, therefore,
be fairly concluded that the paraffin sprayfluid killed the
oviparous females before they had deposited their eggs.

The life-history may be diagrammatically summarised as
follows:—
I. LIFE-HISTORY OF *Aphis pruni*, Réaumur.

- **Eggs.**
  - Larvae.
    - Wingless viviparous females.
      - Young which develop into further apterous viviparous females, which again produce young and so on for a series of generations
    - Pupae.
  - After fertilisation.
    - Winged males.
      - Apterous oviparous females.
        - Pupae.
        - Successive generations of apterous viviparous females.
      - Young.

THE CABBAGE APHIS.

*Aphis brassicae*, Linn.

During the past season this Aphid has proved a very serious pest, and frequent applications have been received for information.

LIFE-HISTORY, ETC.

The eggs are deposited on the under surface of the leaves of cabbage, Brussels sprouts, and other cruciferous plants at the end of October or early in November, and hatch out early in May. It is not until the year has well advanced that they do any considerable damage, although plants received from Cheshire in July were blistered all over, most of the leaves having many yellow patches on them.

In the early part of the year the larvae are covered with a mealy-like substance, and seem to spread very slowly.

In Staffordshire and Warwickshire there was an active migration late in the summer from such plants as the shepherd's purse (*Capsella bursa-pastoris*), the charlock or wild mustard (*Brassica sinapis*), etc. Indeed, it would seem as if they prefer the cultivated plants in the autumn. Here they excrete large quantities of a sticky honey-dew, which covers the leaves and stems, making most plants unmarketable, and, if largely infested, killing them.
In spite of the beneficial work of the larvae of certain Hovering Flies (Catabomba pyrastri, Linn., and Syrphus grossulariae, Meig.), and Ladybird beetles, once they attack a plant, they seem to flourish.

None of the remedies I know of are of any value except where employed on a small scale. For gardens or where grown on small areas, three or four weekly applications of $\frac{1}{4}$ lb. of soft soap to 1 gallon of water will usually keep the plants clear.

All cruciferous weeds should, of course, be destroyed.

THE SNOW OR GHOST FLY.

\textit{Aleyrodes vaporarium}, Westw.

The Snow or Ghost Fly, known also as the White Fly and Mealy Wing, belongs to a family of the Hemiptera known as the \textit{Aleyrodidae}, which are related on the one hand to the \textit{Coccidae}, or scale insects, and the \textit{Aphididae}, or plant-lice, on the other.

Generally speaking, this insect has not been sufficiently plentiful in the Midland Counties to constitute a pest of any seriousness for many years past, but early in 1905 it made its appearance in large numbers, and has caused much loss to horticulturists and others. One species, \textit{A. citri}, Riley and Howard, has proved a serious pest in the orange and lemon groves of the Southern States of America, whilst in our own country \textit{A. brassicae} has often proved very troublesome.

The present species was described by Westwood in 1856, but he stated that the antennae were six-jointed. Britton\textsuperscript{*} in 1903 gave a much fuller account, together with the habits and life-history of the insect.

PLANTS ATTACKED.

I have taken this species on, or it has been reported to me as attacking, the following plants:—Tomatoes, chrysanthemums, asters, cucumbers, vegetable marrows, lettuce, roses, and numerous plants under glass.

LIFE-HISTORY AND HABITS.

Throughout life, in all stages, the Snow Fly frequents the under surface of the leaves of different plants. The eggs are laid first on the lower leaves, later on those above, and so on until the top of the plant is reached. As Dr. Britton remarks: "Thus the lower leaves of large and badly-infested plants are usually completely covered on their under surfaces with the empty skins from which the adults have emerged. These leaves are the first to wither and drop. Those next higher up on the plant will show nymphy and pupae; still higher we shall find younger and newly-hatched nymphy, while on the upper leaves the adults will be mating and the females laying eggs."

Réaumur was the first to record the curious process of oviposition, or egg-laying, in an allied species, *A. chelidonii*. The female fly first inserts her beak into the tissue of the leaf, and upon this she swings round, depositing her eggs in a circle. This, however, does not always take place, for I have more often noticed the eggs in irregular groups of from seven to nine, or scattered singly over the surface of the leaf.

The eggs are tiny, smooth, shiny, elongate ovate bodies, almost white when laid, with just a faint tinge of green, but in three or four days they darken, changing to a bluish-black. They are attached to the under side of the leaf by a short stalk from the broad end of the egg. Specimens under observation indoors hatched out on the ninth day after deposition, but out of doors twelve to fifteen days is the usual period.

The newly-hatched insect or pupa is about a quarter of a millimeter in length, oval in outline, and when looked at from the dorsal side as it lies upon the under surface of the leaf is seen to have two caudal setae posteriorly and a pair of antennae anteriorly. Looked at from the ventral side, three pairs of short, ill-defined legs can be made out, a pair of large eyes, and between them and ventrally a long, sucking mouth-tube, while posteriorly seven or eight segments are fairly well marked.

After a short time these pupae become attached to the leaf, forming a peculiar skin which much resembles a scale insect. Within the nymph changes to the fly. Later the dorsal wall splits along the median line and transversely along a caret-shaped line, and the perfect insect escapes. The old pupal skin remains attached to the leaves for some length of time.

**Remedial Measures.**

The most satisfactory results have been obtained by fumigating with hydrocyanic acid gas.

For spraying, almost any of the *Aphis* washes are suitable, but, owing to the difficulty in reaching the under side of all the leaves, sprayfluids have not proved very effective.

Very good results have been obtained by placing tarred and newly-varnished boards and sticks amongst infected plants.

**The Mussel Scale.**

*Mytilaspis pomorum*, Bouché.

This insect is still far too common in our fruit orchards. Considerable headway has been made in inducing owners of two or three or single infected trees to spray the same with the soda and potash sprayfluid.

As pointed out in my last Report (p. 19), wherever the scale is noticed the trunks and main branches should be well washed with soda and potash (caustic alkali), and early in June sprayed
with paraffin emulsion; this should be done three or four times, at intervals of two or three days.

All young stock should be fumigated with hydrocyanic acid gas before being planted.

**FIG. IX. — THE MUSSLE SCALE (Mytilaspis tomorum).**

1. — Upper surface of female scale. 2. — Lower surface of same. 3. — Eggs.
All greatly enlarged.

**THE OYSTER-SHELL BARK LOUSE**

*Aspidiotus ostreaformis*, Curtis.

Several correspondents in Worcestershire and Gloucestershire have sent in twigs cut from plum trees, also twigs from willows, infected with this scale.

The measures recommended for the Mussel Scale apply with equal force to this species.

**THE WHITE WOOLLY CURRANT SCALE.**

*Pulvinaria ribesii*, Sign.

From Walsall, Wednesbury, and the neighbouring district, cuttings of currant and gooseberry bushes have been received during the past season very badly infested with this scale. Much good has been done by cutting down the worst and burning the cuttings, also by the application of the soda and potash spray fluid in the winter.

**THE COCKCHAFER.**

*Melolontha vulgaris*, Fabr.

In the Midland Counties 1905 has been what is popularly termed a "chafer year," and in all the counties the larvae have proved most destructive.
THE COCKCHAFFER.

LIFE-HISTORY.

The female beetle deposits her eggs in May or June in the soil some six or seven inches below the surface. The number varies from twenty-five to fifty, and in a month or six weeks the thick, fleshy, white or yellowish-white larvae hatch out. During the first year they are not particularly harmful, and as the winter approaches they make their way into the deeper layers of the soil; in the following year, with the return of spring, they make their way up close to the surface, and there commence to be exceedingly destructive, feeding upon the roots of various plants. In August or September of the third summer they become full-fed, and

A Photograph of *Chionaspis salicis* (*L*.), on the Willow, has inadvertently been used to illustrate *Aspidiotus ostreaeformis* (The Oyster-Shell Bark Louse).

**Fig. X.—The Oyster-Shell Bark Louse.**

making their way to some two or more feet below the surface, they change into pupae. The pupal stage extends over some eight or nine weeks, the perfect beetles appearing towards the end of October or at the commencement of November, and at once hibernate. Early in the following spring they come out again, and often do considerable damage to oak and elm trees, on whose leaves they feed.

Much good can be effected by gathering the beetles and destroying them. The efficiency of such a method of suppressing this pest is well illustrated by some figures given by M. J. Bernard
before a meeting of the Société Nationale d'Agriculture of France. In the district of Meaux (Seine et Marne), a system of collecting the beetles was commenced, and the data are given in periods of three years, and show a steady decrease. The numbers for 1889 are 314,943 lbs.; for 1892, 268,490 lbs.; for 1895, 77,506 lbs.; for 1898, 229,515 lbs.; for 1901, 73,590 lbs.; and for 1904, 53,919 lbs. This gives us a total of nearly 1,018,000 lbs., or, say, 454 tons, and the number of beetles may be put down at 500,000,000, or an annual average of 28,000,000. One may perhaps form some better idea of the quantity when it is stated that it would fill two good trains of twenty-three trucks each, each truck carrying ten tons.

In this case these were collected by women and children, and the cost for the eighteen years amounted to £4,800, which, distributed over 315,000 acres, works out at about 4d. for every two and a half acres per annum.

Rooks undoubtedly destroy large numbers of the larvae, although they frequently damage the crops in so doing.

Moles also feed upon the larvae, and are most effective enemies, the little harm they do being hardly worthy of mention when compared with the number of larvae they destroy.

THE CLAY-COLOURED WEEVIL.

Otiorrhynchus picipes, Fabr.

This well-known beetle has proved itself a very troublesome pest in gardens and greenhouses. On wall fruits and raspberries it has been unusually plentiful, and, as is well known, in such positions it is most difficult to get rid of. Jarring the raspberry canes, as recommended in last year’s Report, considerably reduced the number of beetles, but in the case of the wall fruit such measures are not possible.

As this beetle is so widely distributed and the source of constant mischief, a number of experiments were tried, which may be briefly summarised.

Outdoor Experiments.—Washing the trees with a strong force of water was practically useless, for, although many of the beetles were washed off, they remained uninjured, and soon made their way back again to the trees.

Spraying with Paris green, 1 oz. to 10 gallons of water, also proved of little value.

The most effective remedy was found in placing overnight amongst the branches, bundles of loosely-twisted hay made up into rope-like pieces. When removed in the morning, these were found to each contain two to three dozen beetles. The bundles should be immediately burned on being removed. In addition, tarred bands were placed round the trees early in the year.

Indoor Experiments.—Jarring or tapping the stem of a plant over a tarred board is the most effective way of clearing these beetles off plants in pots in greenhouses or conservatories.
For the larvae, Mr. Theobald* has recommended watering the roots of 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. The whole to be mixed by means of a force pump into an emulsion. If bottled off and kept airtight, it will keep some time. When required for use, take one part of the emulsion and add to thirty parts of water.

This sometimes proved effective; at other times it proved injurious to the plants, or only destroyed the larvae near to the surface.

Boiling water alone often proved successful; in some cases, however, the plant was injured by such treatment.

For the destruction of the larvae, "Vaporite" was certainly the most satisfactory. In all the trials it had the same effect, and there was no injury to the plants.

In all conservatories and greenhouses, a few toads will prove very valuable in destroying this and other pests.

**THE RASPBERRY BEETLE.**

*Byturus tomentosus*, Fabr.

Early in June specimens of this beetle were forwarded by various correspondents in Staffordshire. It is a well-known species, common throughout the country, and, in addition to attacking raspberries, it is often found on wild and cultivated blackberries.

**LIFE-HISTORY.**

As soon as the raspberry blossom buds open, the female beetle deposits therein her eggs; these hatch out in due course, and the larvae, which are of a yellowish-grey colour, marked by a brownish transverse stripe in the middle of the segments, and provided with two pointed curved spines posteriorly, at once commence to eat their way into the receptacle of the fruit, later eating into the fruit and completely destroying it. In some cases only one side of the fruit is damaged, whilst in others it assumes a stunted or deformed shape. The larvae become full-fed about the time the fruit is ripe. They now leave the fruit and make their way into holes and crevices in the poles, or shelter at the base of the stock in the earth, where they form a cocoon, pupate, and remain throughout the winter, hatching out about the middle of May.

**PREVENTIVE AND REMEDIAL MEASURES.**

Jarring the poles over tarred boards or sacks on dull days, when the beetles are inactive, will rid the canes of large numbers.

Deeply burying the surface soil will bury the pupae also.

Prunings, old canes, poles, etc., should be burnt in the winter.

WIREWORMS.

During the past year a series of experiments have been made in connection with the larvae of the Click Beetles, commonly known as wireworms.

On three different plots of land, all equally badly infested, three different experiments were carried out.

On plot 1 the substance used was a proprietary article offered for sale by Messrs. Strawsons. This firm very kindly placed at my disposal a supply of their “Vaporite,” which they asked I would report upon exactly as I found it.

On plot 2 a second proprietary article, termed “Betol,” sold by the Boundary Chemical Co., of Liverpool, was put down.

Plot 3 received ½ lb. carbolised naphthalene, mixed with 7 lbs. of sand, to every seven square yards of soil.

In all cases the material was scattered on the land and then hoed in.

The results of these experiments so far are as follows:—

PLOT I.—The “Vaporite” was put down early in the year, and peas and beans were sown as in the previous year. Owing to the enormous number of wireworms, all the plants were completely ruined in 1904; many only just came through the soil, and then died; others grew about a foot high, and a very few flowered and produced poor, shrunken pods.

In 1905, as soon as the peas were above the surface, some of the soil was turned over, and large numbers of dead wireworms were collected, and there was no difficulty in making out the remains of others that had been dead for a longer period. A good healthy crop was produced in 1905.

At the present time (March, 1906) it is only by long and continuous searching that a wireworm can be found, whereas last year at this season there was no difficulty in gathering ten to twenty from every spadeful of soil.

In addition to using this substance for wireworms, I have plots infected with millipedes, etc., to which it has been applied, and upon which I hope to report at a later date.

So far experiments would seem to show that we have here an effective remedy for one of the farmer’s worst pests.

PLOT II.—Unfortunately, this experiment was not commenced until late in the season, and with only a small quantity of material. It is proposed to repeat it later.

PLOT III.—The experiment on this plot was very similar to that on plot 1, although the results were scarcely as satisfactory.

I have frequently pointed out, when advocating the value of poultry to the farmer, what a large amount of good they do if put on to the land with portable houses, and moved from day to day. We should hear much less of wireworms if this system became more general. Recently Mr. W. Tudge, of Kington, has given a very striking illustration of the effectiveness of fowls in this
connection.* He states that he had a field of oats which last year was very badly infested with this pest, and very nearly destroyed the crop. A fowl-house, with between forty and fifty fowls in it, was put on to the field, and about half an acre was ploughed per day, the house being daily moved on. This year the field had swedes on it, and there was not a sign of wireworm. He measured an acre and a half, which had been the worst place, and had fifty large cart-loads of Webb's Imperial off it, grown with a light dressing of farmyard manure and 5 cwt. per acre of Webb's turnip manure.

THE CLEARWING MOTHS.

The larvae of all the Clearwing Moths belonging to the genus *Sesia* do great damage to fruit and other trees. During 1905 specimens of the following species have been received:—

The Red-belted Clearwing (*Sesia myopiformis*, Bork.)
The Currant Clearwing (*Sesia tipuliformis*, Linn.)
The Osier Clearwing (*Sesia bembiciformis*, Hub.)
The Hornet Clearwing (*Sesia aptiformis*, Linn.)

I have no further remedial measures to recommend apart from those contained in my last Report

THE SCALLOPED HAZEL Moth

*Odontopera bidentata*, Clerck.

The larvae of this moth have been unusually common during the past season. Not unfrequently the variable colouring of the larvae gives rise to the idea that a tree is attacked by two or three different species.

It has been reported in large numbers on laburnum, jasmine, hazel, cherry, lilac, and pear trees. In the case of the laburnums and jasmines the trees were almost stripped.

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FIGS. XII. AND XIII.—ALDER INJURED BY THE LARVAE OF THE HORNET CLEARWING MOTH.
Figs. XIV and XV.—Sallow injured by the larvae of the Osier Clearwing Moth.
Spraying with Paris green (Blundell's), 1 oz. to 10 gallons of water, is the only remedy I have tried, and it has invariably proved successful.

In the Midland Counties this moth is rapidly increasing in numbers.

**THE COMMON PUG.**

*Eupithecia vulgata*, Haw.

A Worcester correspondent forwarded the larvae of this moth from hops, on which it was unusually plentiful and doing serious damage. I have not previously heard of it being an enemy of hops, and it is to be hoped that this is an exceptional case.

Specimens of the plant were obtained with the eggs on, and these were hatched out and the moths bred out.

My correspondent informed me that the Blue Tit (*Parus caeruleus*) fed largely upon them; indeed, he thought that, had it not been for these birds, the damage would have been much more serious.

**THE FIGURE-OF-8 MOTH.**

*Diloba caeruleocephala*, Linn.

In many parts of Worcestershire and Warwickshire the larvae of this well-known moth have proved very troublesome on apple and plum trees. Fortunately, it is a species which is not difficult to get rid of. A heavy fall of rain will wash great numbers off the trees, or simply shaking the trees will cause large numbers to fall to the ground. An appreciable difference can be made in their numbers in an afternoon by this means, and especially so if a few fowls are allowed the run of the orchard during the shaking.

The cocoons are often attached to the branches of the trees, so that any measures which favour keeping the bark clean are serviceable. In the case of bad attacks, spraying with Paris green is perhaps the best method of clearing them off the trees.

**THE BURDOCK MOTH.**

*Gortyna flavago*, W. V.

A correspondent forwarded in May examples of the larvae of this moth damaging tomatoes. Whilst common on the Burdock (*Arctium lappa*), Agrimony, Dock, Ragwort, Yellow Flag, Water Betony, various thistles, and I believe it has been recorded attacking potatoes, it has only once been recorded as damaging tomatoes.*

It is a common species, however, and tomato-growers should keep a watchful eye for what at any time might become a serious pest.

In the case examined the larvae had not only tunnelled into the stem, but into the fruit also.

THE CABBAGE MOTH.

During 1904 and 1905 the larvae of this moth have caused considerable loss. In some districts they were present in such numbers as to constitute a plague. Where they settled in market and kitchen gardens, they very quickly attacked cabbages, lettuce, etc., later feeding generally, even on rhubarb leaves.

The life-history was given in my last Report (p. 35). The preventive and remedial measures it will be well, perhaps, to repeat.

**FIG. XVI.—THE CABBAGE MOTH (Mamestra brassicae).**

**PREVENTIVE AND REMEDIAL MEASURES.**

On small areas much good may be done by hand picking early in the year.

Wherever an attack has been observed, the ground should be well turned over in the winter, and poultry turned on to the land.

**FIG. XVII.—CATERPILLAR OF THE CABBAGE MOTH.**

Dusting with gas lime, which has been exposed to the air for three or four months, is often recommended, but is far from satisfactory, often spoiling such plants as cabbages for culinary purposes. Watering with liquid farmyard manure, one part to three parts of water, has proved very beneficial.
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THE CLOUDED DRAB MOTH.

*Taeniocampa instabilis*, W. V.

In my Report for 1904 (p. 59) I mentioned that the larvae of this moth had been found damaging the flower-buds of roses. This occurred again in 1905, and so plentiful were the caterpillars in another case that they attacked dahlias. Whilst well known on poplar, elm, laburnum, ash, willow, sallow, and currant, these seem to be new food plants. In both cases, I should state, the plants were growing close to poplar trees, but there was a decided preference shown for either the roses or dahlias.

Spraying with Paris green (*Blundell’s*) proved an effective remedy.

THE CURRANT-SHOOT MOTH.

*Incurvaria (Tinea) capitella*, Clerck.

This tiny moth is a difficult pest to attack, and I am sorry to have to record its presence in the Midland Counties.

![Image of the Currant-Shoot Moth]

**Fig. XVIII.—The Currant-Shoot Moth.**
1.—The Moth. 2.—The Caterpillar (both magnified).

The life-history has been worked out in detail by Dr. A. T. Chapman, and the following is a brief summary taken from his excellent paper:**

![Image of Currant Shoots Attacked by Caterpillar]

**Fig. XIX.—Currant Shoots Attacked by Caterpillar.**
1.—Caterpillar in bored shoot. 2.—Shoot tunnelled by Caterpillar.

The moths may be seen on the wing early in May. The female sits upon the currant, and inserts her long ovipositor, or

egg-laying tube, in the lateral region into the pulp. At each penetration, Dr. Chapman believes that two eggs are deposited. The whole process on one occasion occupied three or four minutes, on another only about thirty seconds.

The eggs are whitish, or nearly colourless, and lemon-shaped. The larva, on hatching, commences to feed on the interior of a seed, where it remains until the actual date of its leaving the currant. In June or July it commences to bore its way out, and spins a small, firm, white cocoon, which it attaches to the old persistent bud scales or to the bark, and herein it passes the winter. In the following spring it leaves the cocoon and bores its way into the currant buds, and also into the young shoots. Here it again commences to feed, and about the end of April becomes full-fed, and enters upon the chrysalis stage, the moth appearing early in May.

**Preventive and Remedial Measures.**

Spraying in the winter with soda and potash destroys many of the caterpillars sheltering in their cocoons.

All cuttings containing the larvae should be burnt.

I am informed that the Blue Tit does much good in clearing the larvae during their hibernating period.

**The Raspberry Moth.**

*Lampronia rubiella*, Bjerk.

The caterpillars of this small moth were received from a correspondent in May last, and later infested canes were received.

**Life-history.**

The eggs are laid on the raspberry flowers towards the end of May or early in June, and hatch out in five or six days. The small, pinkish-red larva remains within the raised receptacle upon which the fruits are formed for a short time, but does not appear to feed at all. It then either crawls off the plant or lowers itself down by silken threads to the ground, on reaching which it makes its way into the soil, and forms a small, flat, white cocoon, wherein it passes the winter. The following spring, from March to April, it leaves this cocoon, crawls up the cane, and makes its way into the base of a bud, upon which it feeds. Later it eats its way into the pith of the cane, just below the base of a bud, where it pupates, remaining in this chrysalis stage for about three weeks.

The pupa is about a quarter of an inch long, and on the dorsal side of the last segment has a somewhat peculiar spine. In colour it is orange-red, with the abdominal region almost pink.

**Preventive and Remedial Measures.**

Early in March paint the lower parts of the canes with a mixture of soft soap and paraffin so as to prevent the caterpillars from creeping on to the canes.
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All cuttings should be burnt. Infested canes should be cut down between April and June.

By far the best remedy, however, is to bury the surface soil around the stocks any time between July and the following March.

THE INDIAN-MEAL MoTH.

*Plodia interpunctella*, Hübner.

Two cases of serious attacks of this moth have been reported upon during the year. It is an exceedingly common pest in stores, feeding upon almost anything that is edible.

The female deposits her eggs in groups, usually varying in number from three to a dozen, to the number of about three hundred and fifty. Specimens kept in the laboratory hatched out in four days, and commenced to feed upon semolina. The larvae are a dull yellow or yellowish-white, later changing to a light rose-red. As they feed, they spin long silken threads, which become entangled with particles of food and excrement, joining the same together, and thus injuring for food far more material than they eat. When mature, the larvae surround themselves with a loose, silken cocoon, in which they change to light-brown pupae.

If the temperature is favourable the life-cycle occupies about five weeks, so that four, five, or more generations may appear in a year.

**Remedial Measures.**

The only treatment of any value is fumigating with bisulphide of carbon or hydrocyanic acid gas (see p. 53).

THE STRAWBERRY PLUME MoTH.

*Ptero-phorus pentadactylus*, Linn.

The tiny, white, hairy larvae of this moth have been forwarded by different correspondents, doing damage to strawberry plants and many garden plants.

Wet weather seems fatal to the larvae, and wherever spraying with soap and water was resorted to it quickly disappeared. In the early part of the summer the moths were unusually numerous in Worcestershire, Warwickshire, and Staffordshire.

THE LILAC LEAF-MINER.

*Gracilaria syringella*, Fabr.

As mentioned in my last Report (p. 42), the attacks of the larvae of this moth have been unusually severe. In view of the fact that the number of trees attacked was far in excess of that of any previous year, the life-history has been carefully worked through again, and various remedial measures taken.
The observations and experiments were made on nine trees about five feet in height and growing five or six feet apart.

The moths of the first brood were noted on May 24th, rather later than in 1904. The eggs were noticed on both the upper and under surfaces of the leaves a few days later, 27th and 28th, and the caterpillars hatched out on June 4th. They at once made their way into the leaves, and commenced to feed upon the soft parenchymatous tissue between the upper and lower epidermis. The largest numbers found in any one leaf was thirteen. Sometimes the whole

![Fig. XX - Leaves of Lilac Attacked by Leaf-Miner.](image)

of one side of the leaf was tunnelled; in other cases the basal half was blistered before the apical; whilst in others the blisters were irregular and scattered over the leaf.

The young larvae are almost transparent and glossy; a little later they have a faint yellowish tinge, with a narrow median green line caused by the green chlorophyll in the intestine. After feeding in the leaf for about three weeks, they creep out on to the surface and commence to feed on the epidermis, the leaves rolling up laterally or from the apex. About ten days later they become full-fed, and are slightly over a quarter of an inch in length, with a prominent brown head. Here they remain for about ten days, then leaving the rolled leaves and pupating in the axils of the leaves or branches,
or even leaving the trees and crawling to fences, etc. After fourteen or sixteen days the moths of the second brood make their appearance, and the life-cycle is again repeated, the pupal condition continuing through the winter.

**Preventive and Remedial Measures.**

Picking off the leaves had but very little effect. Spraying with paraffin emulsion in May proved beneficial. There were very few blistered leaves on the two sprayed trees, whilst the remaining seven showed little else but blistered ones.

Spraying with soda and potash in January killed or injured many of the pupae, but as these trees were near a fence, many of the larvae had left the trees and were pupating in crevices and cracks in the fence.

**The Larch Leaf-miner.**

*Coleophora laricella*, Hübner.

The larvae of this moth, and also numerous branches of larch, have been received from Sutton Park; here they have been unusually abundant, and many of the trees had the appearance of having been scorched by a fire. Some trees seemed to be more badly affected than others, but in all cases the injury was considerable.

**Life-history.**

The female moth deposits her eggs in July, a single egg only on each needle. The eggs are of a dull yellow colour, and hatch
out in from fourteen to twenty days with small reddish-brown larvae. Like other species of the genus, the young larvae at once commence to tunnel the needles, the ends of which soon become whitish and shrivelled up. Out of this mined portion the larva next forms a case, separating it completely from the needle; this it lines with a silky coat, and, after creeping in, it drags in with it a fresh leaf or needle, to which it attaches it. Here it leaves the case and again commences to mine the tissues, returning from time to time to the case. After numerous needles have been treated in this manner, the case is attached to the branches or stem of the tree, or in cracks or crevices in the bark, which are favourite places for hibernating in. In such spots as these the larva remains for the winter. A large number undoubtedly die, whilst others are eaten by other insects, birds, etc.

In the following spring the larva returns to the needles, commences feeding, and the ends of the needles again become whitish and shrivelled. By now the larva has almost attained its full size, so that the original case is no longer capable of containing it, in consequence of which it commences to cut along one side and work in a further portion of leaf, thus increasing the dimensions of the case. Towards the end of May or early in June the cases are firmly attached to the needles, and pupation takes place, the moth appearing about the middle of June.

**Preventive and Remedial Measures.**

From observations made by myself and others, it seems clear that the conditions which most favour the attacks of this moth are the close planting of larch trees and where they are grown in large numbers. Some good may be done by thinning and burning the infected trees. Open growth is another important factor.

Wherever possible, mixed plantations should be put down, and on the first appearance of attack the lower branches should be cut away and burnt.

Experiments have been made in gardens with various spray-fluids, and an application of paraffin emulsion or soft soap and water (⅓ lb. soft soap and 1 gallon water) was found effective in preventing the female moths depositing their eggs on the needles. The applications were made during the first week in July.

**The Oak Leaf Roller Moth.**

*Tortrix viridana*, Linn.

Not for many years past has this insect been so plentiful as during 1905. In certain districts it has swarmed over the trees in myriads, stripping almost every leaf. In one case recorded, the larvae had attacked apple trees adjoining a small plantation of oak trees. Numerous cuttings were sent me from time to time, and the moths were bred. So far as I could discover, the larvae behaved precisely in the same manner as those on the oak trees.
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Some five years ago there was a very similar prevalence of this moth in the Midlands.

As soon as the larvae appear, fruit trees which are attacked should be sprayed with Paris green.

THE NARCISSUS FLY.
Merodon equestris, Fabr.

Two cases have been sent me during the past year of narcissus bulbs badly damaged by the larvae of this fly.

The first specimens were received in February, and attached to the sides of the bulbs were earthy cocoons containing pupae. These were bred out, and the following observations made:—

The first two flies appeared on April 26th, another on May 2nd, and five or six on May 4th. They are handsome little flies, the body being a deep bluish-black, marked transversely with golden-yellow bands; the wings are a slaty-grey, with the tips slightly yellowish.

On the 12th of May little groups of eggs, four or five in number, were found deposited on the bulbs quite close to the soil, the date of hatching was not observed, but it occurred early in June, and the larvae then crept down the side of the bulb and commenced to attack it. In no case were any of the bulbs attacked from the upper part. If a number of larvae enter one bulb (and it frequently happens that seven or eight do), it soon becomes destroyed, and they then pass through the soil and enter another bulb (two or three to each bulb), and so on to other bulbs until they become full-fed towards the end of October or beginning of November. Even as late as the middle of December a few still remained in the larval condition. They now leave the bulbs and form in close proximity an earthen cell which is lined with silk, and so complete the cocoon.

REMEDIAL MEASURES.

Wherever an attack is noticed the bulbs should be taken up and burnt, and the top soil deeply buried. This should be done in September or early in October.

THE MARGUERITE FLY.
Napomyza lateralis, Fall.

The larvae of this fly have proved very troublesome to nurserymen and others.

Spraying the young plants with paraffin emulsion is the most effective measure I know of, but this pest can only be kept down by constant and careful attention; thus plants which are badly attacked should be burnt, and others that are less so should be carefully gone over and the diseased leaves picked off.
THE HOLLY LEAF-MINER.

Chromatomyia ilicis, Curtis.

In Sutton Park, and generally throughout the Midlands, the Holly Leaf-Miner abounds, and so numerous has it become that it is now quite the exception to find certain varieties of holly free from this pest.

FIG. XXII.—LEAVES OF MARGUERITE ATTACKED BY FLY.

LIFE-HISTORY.

The life-history of this fly was first worked through in 1902-3, and again in 1903-4, when it was present in my own garden in small numbers.

Early in June the female fly deposits her eggs on the underside of the leaves; so far as my observations go, only a single egg is placed on each leaf, and on the mid-rib close to the leaf-stalk. In seven or eight days the larva hatches out and makes its way into the vessels of the mid-rib, and then commences to slowly travel forwards. In September, October, or November it leaves the vessels, and tunnels its way into the soft, green tissue of the leaf, forming galleries which give the leaf a blistered appearance.

By the following April the larva is mature, and it now bites through the epidermis in order to provide an exit for the fly. Like many other flies, it retains its last larval skin as a protection for the thin, white pupal case. The pupa is of a flattened oval form and marked by a number of regular transverse segments, the original segments of the larval skin; within this is a second skin, which is the true puparium.
The fly makes its way out of the pupal case towards the end of May or early in June; the first to emerge in 1904 appeared on May 17th, and in 1903 on June 3rd.

**Preventive and Remedial Measures.**

Towards the end of May, and again early in June, holly bushes or trees should be sprayed with paraffin emulsion or dusted with equal parts of soot and lime; both are equally disagreeable to the female fly. Very few leaves were attacked where one of these materials had been used.

**The Ribes Gall-Midge.**

Various correspondents have forwarded branches of *Ribes alpinum* covered with galls formed, I think, by a Cecid or Gall-Midge.

![Figure XXIII: Galls on Ribes alpinum.](image)

In some of the specimens the larvae were found, and an attempt to breed out the midges was made, but proved unsuccessful.
GENERAL NOTES ON OTHER INJURIOUS INSECTS, ETC.

GALLS ON OAK TREES.—Galls formed by small Hymenopterous insects (Cynips kollari, Htg., Andricus fecundatrix, Htg., A. gemmatus form corticis, Htg., and A. ramuli, Schenck) have been unusually common in the Midland Counties during the past year.

THE LARGE BLACK SLUG.—A correspondent forwarded early in September specimens of the large black slug (*Arion empiricorum*, Fér), which species was present in large numbers amongst cabbages, where they were doing considerable damage. He was recommended to apply white hydro-oxide of calcium in a 1 to 2 per cent. solution in water.

THE YEW GALL-MIDGE.—Many complaints have been received of damage done by the larvae of the Yew Gall-midge (*Cecidomyia taxii*, Inch.). It is largely on the increase, and more prevalent now than ever remembered. I know of no effective method of treatment.

LARVAE OF THE GOAT MOTH.—A series of oak trees very badly attacked by the larvae of the Goat Moth were reported from near Warwick. One tree was past remedy, so was cut down; the remaining ones were treated with stick cyanide, and no further damage has been observed.

BEETLES DAMAGING MUSHROOMS.—A Staffordshire correspondent sent in early in October specimens of mushrooms badly damaged by beetles. On opening the specimens, they were found to be infested with two species of small beetles (*Mycetophagus quadripustulatus* and *Dacre humeralis*). Later, from Shropshire, mushrooms were received containing the larvae of the former species.

THE PINE SAWFLY.—Specimens of *Lophyrus pini*, Linn., were received from Shifnal, Staffordshire, in July, where they were present in large numbers on pines. An account of the life-history and preventive and remedial measures was forwarded to the correspondent.
PARASITIC DISEASES OF ANIMALS.

THE PIG LOUSE.

_Haematopinus suis_ (Linn.).

Under the name of _H. urius_, Nitzsch, I recorded this louse in my last Report (p. 61) from Knowle. Since, various correspondents have reported the same, with requests for further information.

The species is the largest of its family, full-grown female specimens measuring over a quarter of an inch in length. The male is rather smaller.

The eggs are elongated oval in shape and have an operculum or lid at one end, which admits of the exit of the young louse. At the opposite end the egg is attached by a gluey substance to the base of a hair. When laid, they are bluish-white in colour and covered with small hexagonal punctations. The eggs hatch out in from five to sixteen days, varying according to the temperature.

If badly affected with lice, the skin of swine becomes covered with sores and swellings, and considerable inflammation develops; the result is that their growth is seriously interfered with, and at the same time their general physical condition is weakened, thus rendering the animals liable to various contagious diseases. It is held by many writers on swine diseases that these lice may carry the infection of swine cholera from sick to healthy animals.

Fortunately, it is not a difficult matter to free swine attacked by this pest; two or three dressings of creolin, 10 to 15 per cent. in water, will soon effect a cure. Paraffin emulsion, made as follows, is also effective:—Paraffin, 1 gallon; hard soap, ¼ lb.; water, ½ gall. Boil the soap and water until the former is dissolved; then remove from the fire, and whilst still hot add the paraffin; then churn well until an emulsion is formed. If well mixed, this forms a gelatinous mass on cooling, and will keep indefinitely. When required for use, heat again (exercising great care on account of the inflammable paraffin present), and mix with 20 gallons of warm water. Apply with an ordinary force pump with a spray nozzle.
ON THE PRESERVATION OF WILD BIRDS,

Injurious and Beneficial to the Agriculturist, etc.

Owing to the ruthless destruction during recent years of certain wild birds, and the unnecessary and mischievous preservation of others, agriculturists, fruit-growers, horticulturists, and gardeners have suffered to a considerable extent.

At the present time many wild birds exceedingly beneficial to the farmer are annually destroyed in large numbers, whilst others, which are undoubtedly injurious to crops, etc., are protected.

During the past year there has been much discussion upon this subject amongst agriculturists in all parts of the country, and various resolutions have been passed. There appears, however, to be much misunderstanding respecting the food habits of the different species condemned, and room for some information upon this all-important point.

At the outset let me state a fact that is far too often overlooked by many who advocate the indiscriminate protection of wild birds—that there are certain species which are distinctly beneficial to the farmer, fruit-grower, and gardener, if not allowed to become too numerous, but as soon as their numbers exceed a certain limit they become equally injurious, and cannot be regarded as other than enemies.

As yet neither the farmer nor bird-lover have paid sufficient attention to sifting the facts and separating the same from prejudice and hearsay. We want much more detailed information as to the food of different birds, and the collection of this information must extend over the whole twelve months of the year and for successive years. It is only by carefully considering and judicially weighing the information thus obtained that we shall ever arrive at sound conclusions.

No one I think, will deny that birds as a class are much more beneficial than they are injurious to the agriculturist. This is openly granted by farmers and others, but it is with reference to, comparatively speaking, a few species only that so much diversity of opinion exists.

We have about two hundred and eighty species of British birds, a fair percentage of which are so rare or small in numbers that they do not affect the subject under consideration. In the same manner, all those species aquatic and littoral in their habits may be left out of consideration. Thus we reduce the list down to about eighty-five species, of which fifty may be said to feed exclusively upon insect life—such, for instance, as the swift, swallow, martin, flycatchers, wagtails.
FIG. XXIV.—Male Swallow, and Tail of Female (\(\frac{3}{4}\)ths natural size.)

FIG. XXV.—The Martin. (\(\frac{3}{4}\)ths natural size.)
This leaves us about thirty-five species, of which the commonest are:

- Kestrel.
- Barn Owl.
- Brown Owl.
- Great Titmouse.
- Blue Tit.
- Skylark.
- Yellow Bunting.
- Chaffinch.
- House Sparrow.
- Greenfinch.
- Bullfinch.

- Starling.
- Blackbird.
- Fieldfare.
- Thrush.
- Magpie.
- Jay.
- Rook.
- Jackdaw.
- Woodpigeon.
- Stockdove.
- Green Plover or Peewit.
With regard to many of these there can be no question of their value to the farmer, such, for instance, as the Kestrel (Fig. XXVII), the Barn Owl (Fig. XXVIII), the Brown Owl, the Great Titmouse (Fig. XXIX), the Blue Tit (Fig. XXX), the Jay, and the Green Plover (Fig. XXXI); while as to the House Sparrow, Woodpigeon, and Stockdove, I think there can be no question as to their being distinctly injurious.

As to the remaining species, I propose to offer a few remarks largely based upon the examination of the food contents of their stomachs.
ON THE PRESERVATION OF WILD BIRDS.

Fig. XXVIII.—The Barn Owl and Egg. (Owl 1/4th, Egg 1/3rd natural size.)
FIG. XXIX.—THE GREAT TITMOUSE.

FIG. XXX.—THE BLUE TIT.
The Skylark.—Except where present in large numbers, or during severe weather, I have never heard of this bird doing any serious damage.

The Yellow Bunting.—Where allowed to increase unduly, it undoubtedly does a certain amount of harm, but the cases where it really can be regarded as injurious are few.

Food contents of stomach: Insect larvae, beetles, various seeds; in the autumn, grain.

The Chaffinch.—In my opinion, the Chaffinch for at least two months in the year does considerably more harm than good. The depredations a flock will commit on newly-sown seeds are astonish-

![The Green Plover or Piewit](image)

Fig XXXI.—The Green Plover or Piewit.

ing, and, whilst not favouring any ruthless destruction, it should not be protected at all.

Food contents of stomach: Mostly seeds, occasionally a few insects.

The Greenfinch.—The remarks on the Chaffinch apply with equal force to this species also; if anything, it is the more destructive, and for a longer period.

The Bullfinch.—In spite of all that has been said and written to the contrary, this species during the earlier part of the year does serious damage to plum, damson, gooseberry, and other fruit trees.

The Starling, Blackbird, Fieldfare, Thrush, and Rook.—Distinctly the farmer's friends, but when allowed to unduly increase, particularly so in the case of the Starling and Rook, they become equally injurious.
REPORT ON INJURIOUS INSECTS FOR 1905.

The Jackdaw. I think the worst charge that can be brought against this bird is that of an egg thief. Looked at from the farmer's point of view, it is distinctly beneficial. A large number of stomachs have been examined of this bird during the past four or five years, and the contents have invariably consisted of insect larvae, beetles, earthworms, sheep ticks, and millipedes.

The Magpie and Jay. Both egg thieves, but, fortunately, they are fond of the eggs of the woodpigeon, stockdove, and blackbird, and do much to check the increase of these birds.

The food contents of their stomachs include slugs, beetles, insect larvae, worms, etc.

In view of the above expressed opinions, I would strongly advocate the most stringent measures for exterminating sparrows, woodpigeons and stockdoves. In the interests of farmers and fruit-growers, no effort should be spared to keep down their numbers. Landowners are often to blame for the large increase of woodpigeons by not permitting tenants to use firearms. In his own interests, no man should have anything to do with farms or orchards where such conditions obtain, but leave those who are foolish enough to farm or cultivate the same.

I am strongly in favour of permitting (indeed, encouraging) the taking of the eggs of the Chaffinch, Greenfinch, and Bullfinch. The remaining species are, in my opinion, beneficial, provided they are not permitted to unduly increase.

In the case of the Owls, Swallows, Flycatchers, Wagtails, and all such birds, no effort should be spared to protect and encourage them, and every inducement offered to them to increase in number.
APPENDIX.

APPENDIX A.

INSTRUCTIONS FOR USING HYDROCYANIC ACID GAS.

This, the most powerful and dangerous poison used in combating insect pests, should no no account be used by uninstructed or careless people.

The materials required are a 2 lb. pot jam-jar, in which place 7 ozs. of water, to which add 4 ozs. of sulphuric acid and, as directed below, 2 ozs. of 98 per cent. cyanide of potassium for every 1,000 cubic feet of space.

First make the room to be fumigated as air-tight as possible, leaving one window to open from the outside. Then wrap up the pieces of cyanide in blotting-paper. Having placed in the jam-jar the water and acid, place the jar just within the room to be fumigated, draw the door nearly to, and with the arm reach in and drop the wrapped-up cyanide into the jar, and close the door immediately. Strips of paper well sized should then at once be placed over the crevices.

The room should remain closed for from two to three hours; then open the window from the outside, and leave until thoroughly well ventilated. Remember the fumes and the cyanide are deadly poison. Care should be taken that no one remains outside the door of the room as in a passage, as some of the fumes might escape.

In conservatories, greenhouses, &c., proceed as follows:—Add the 4ozs. of sulphuric acid to the 7ozs. of water in a jar; then take the cyanide, which should be wrapped up in blotting paper, and by means of a stick or piece of string drop it into the water from the outside of the greenhouse. The window or door should then be shut, and the house should remain closed for three-quarters of an hour at least, after which time they can be opened to ventilate, but it should be remembered that it is unsafe to enter the house until an hour or more after the windows and doors have been opened. The best results have been obtained at a temperature of 50° F., about one hour after sunset, when the foliage is dry.*

INSTRUCTIONS FOR USING BISULPHIDE OF CARBON.

The fumes of this chemical, in addition to being deadly poison to all animal life, are also highly inflammable. No light—such, for instance, as a lighted cigar or pipe—should be brought near it, nor should it be used where there are electric wires.

For fumigating stores it is best used in a large air-tight tin, into which the goods are placed, and then pour the bisulphide into a saucer placed upon the goods in the proportion of one pound (1lb.) to every thousand (1,000) cubic feet of space. The liquid

* Mr. G. F. Strawson informs me that he has obtained better results by pouring the diluted acid upon the cyanide of potassium, using no blotting paper. He has also devised and successfully used in conservatories, &c., a series of fans, con-3-ting of boards suspended by two cords with a string at each side. The strings to the right and left are worked through a hole in the doors, or other woodwork.
should be poured out quickly in order not to inhale the fumes—there is no danger in inhaling a small quantity—and the bin closed and kept shut for at least five hours, after which time it should be well ventilated, as also the fumigated goods.

APPENDIX B.

For the benefit of those possessing no special knowledge of Entomology, it may be well to point out that, with a few exceptions, all insects are hatched from eggs. From the eggs the larvae or caterpillars hatch out, and after a time these change into pupae or chrysalides, each ultimately developing into an imago.

The Eggs.—These are exceedingly variable in shape, size, and colour. They may be laid singly or in groups. Sometimes they are protected by a gummy secretion, whilst others are fastened by a short thread. The food of the young in nearly all cases determines the place where the eggs are deposited, such, for instance, as on leaves, close to or in roots, in blossom buds, beneath the bark of trees, on cattle, meat or decaying animal or vegetable matter. The number of eggs laid by a single insect may be very few or many thousands; fifty to a hundred, however, may be taken as an average. The period of hatching, generally speaking, is not of long duration, though there are cases where they remain unhatched for a considerable length of time.

The Larva.—In a few cases this is produced alive, but usually it is hatched from an egg. The larvae of Butterflies, Moths, and Sawflies are commonly spoken of as caterpillars, those of Beetles as grubs, while those of Flies are known as maggots.

If a larva possesses legs, the first three segments behind the head each carry a pair, which are jointed and known as thoracic or true legs. Legs may also be present on the posterior segments, but these are never jointed; they are known as pseudopods or prolegs.

It is often very difficult to say exactly to what particular order a larva belongs, but, speaking in general terms, we may say that the larvae of Butterflies and Moths exhibit the following characters: A well-defined head provided with biting jaws, a pair of jointed limbs on each of the first three segments behind the head, a pair of pseudopods on the sixth, seventh, eighth and ninth segments, and sometimes a pair of larger anal feet on the twelfth segment, making a total of sixteen. The "Looper" caterpillars have pseudopods on the ninth and twelfth segments only, making a total of ten. The caterpillars of a few months are footless.

The larvae of Beetles possess a well-defined head and biting jaws, and a pair of jointed legs on the first three segments behind the head (Rose Chafer) or legs are entirely absent (Garden Weevil).

The larvae of Flies (Diptera) are generally legless and usually the head is merged into the thorax; some, however, possess pseudopods and a head.
Those of the Hymenoptera (e.g., sawflies, wood wasps, etc.) have six, eighteen, or twenty-two appendages, and in sawfly larvae the second abdominal segment always has a pair of pseudopods, in some cases (wood wasps) the limbs are vestigial, while in other cases they are absent.

The larval stage is usually the one in which the insect does the greatest amount of damage; they feed voraciously, the daily consumption of food often exceeding many times the weight of the larva. With a plentiful supply of food they rapidly increase in size, and, as the chitinous skin is only capable of a limited expansion, it ultimately splits, and the larva comes out with a new, and sometimes differently-coloured, skin. This process, known as moulting, usually takes place five times, but the number is variable; 2, 3, 4, 5, 7, 10, 11, 12, and even 20, 25, and 30 moults are known in different insects. The larva is now said to be full-fed, and it changes to a pupa or chrysalis.

The duration of the larval period is subject to much variation; sometimes it is only a few days, while in other cases it may last for months or even years.

The Pupa.—The full-fed larva generally either buries itself in the ground (Rose Chafer), forming a cell of earthly particles, or spins a silky cocoon (Codling Moth), in which it changes to the pupal condition. After a time the pupal case containing the insect cracks or splits, and the perfect insect or imago creeps out.

The Imago.—This is the fully-formed insect, and may be described as an animal consisting of thirteen segments, breathing by tracheal tubes, with a single pair of feelers, and having the body divided up into three distinct regions—head, thorax, and abdomen—the three segments of the thorax each carrying a pair of jointed legs.

On reaching the imago stage, the pairing of the sexes is soon effected; the female then lays her eggs, and shortly afterwards dies, the generation or life-cycle being thus completed. In some cases the perfect insect only lives a few hours or days, but in others they hibernate during the winter, and lay their eggs in the following spring.

Before the depredations of any particular species of insect can be effectively dealt with, it is important that all the stages and variations of the life-cycle should be clearly and thoroughly understood.
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