NOTES ON INSECTS INJURIOUS TO FRUIT AND FOREST TREES.

By Mr. C. S. Gregson,

LATE PRESIDENT OF THE NORTHERN ENTOMOLOGICAL SOCIETY.

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PREMISING that there are very great numbers of species of insects which feed upon fruit and forest trees without doing any perceptible damage, I purpose leaving them as harmless and treating only of such as are particularly injurious to the growth of our orchard and forest trees, not having seen anything likely to direct the gardener or forester to the proper and only cure for what is in some districts a source of very great loss. I have thought it best not only to give the life history of each particular species treated of, but also to state my opinion upon the best means of stopping or preventing the evil. Of all the misfortunes which befall an orchard or plantation nothing is so likely to eventually injure it as allowing branches broken by storms or otherwise to remain as they fall; in all cases they should be taken away and the injured parts of the tree cut smooth, else we run the risk of many sorts of insects depositing their eggs in the injured parts, which, once done, the tree is doomed to death. Timber-feeding coleoptera, lepidoptera, diptera &c., are all in search of such places to hide their eggs, free from the prying eyes of the tits and creepers, and where the young larva can commence eating its proper food the moment it requires it. Once the larva begins to feed, its excrement becomes food for other insects, and the tree is regularly beset with natural enemies, damp gets in, fungi grow, and though the tree to-day may be worth

one, ten or twenty pounds, in a few years it cumbers the ground, its very bark has become useless, and the forest we admire at a distance has not a tree in it worth cutting for its timber. See Sherwood forest of to-day.

If I succeed in shewing how our trees can be kept in health, free from their natural enemies, I shall have accomplished my object; and though as an entomologist I may be blamed for shewing the forester and gardener how to exterminate the members of the family I especially study, still, as the benefit of the many must first be studied, I am willing to take the entomologist's blame, especially as I am likely, if my advice is followed, to get the good wishes of my ornithological friends.

On the 15th of March, 1855, eight years ago, I read a little paper before this Society on some of the causes of the abundance or scarcity of insects, in which I attempted to shew the value of birds on an estate. Since then this paper, published in vol. vii, page 237, of your Transactions, has been published many times, re-hashed it is true, but still shewing that it has done its work both at home and abroad. A short time ago it, or one singularly like it, was issued in France. Should my present good word for our birds work its way as well and as far as that has done, your Society will have done its work well in disseminating a better and a wiser treatment of the feathered friends which nature's God, ever bounteous, ever just, sent us to assist in counteracting superabundance.

I have recently been pursuing my researches in the birch-woods around Llangollen, by the kind permission of T. H. Cox, Esq., Sir Watkin W. Wynn's land steward. Here I find the birch trees attacked by a lepidopterous larva which penetrates the bark (pl. v. fig. A) eating between the wood and the bark and so injuring the growth of the tree. In these woods I also find several species of coleoptera (tree borers)

which, having once got into a tree, leave it only when it has become one rotten mass. Some of these beetles are common to both oak and birch, and it is not likely the eye of a forester will detect them unless he is specially directed to them. Perhaps the easiest way to keep them in check is to encourage the woodpeckers, jays and magpies, which love to frequent these woods. No greater mistake can be made by a gamekeeper than to shoot these birds, in a wood where trees are intended to be a source of profit to the estate.

I know what a gamekeeper will say, if told he must not kill magpies &c. I have heard many say "they eat my eggs." Well, for the sake of argument, suppose they do eat eggs, they can only eat them during one month of the twelve, while all the remaining eleven months they are eating food which is either eating his master's food or his property; and, as these birds breed at the same time as the game and then require insect or animal food (worms &c.) for their young, the chances are in favour of the game eggs being let alone, that is, supposing they do eat eggs, about which I am not quite sure. Few birds will allow other birds to approach their eggs or young, and pheasants and partridges, being true *galinulæ*, know how to strike a foe with their heel that is only armed with a bill; they can also strike with the wing as effectually as do the *columbidæ*, and I should not doubt the result of a battle between a magpie and a partridge.

As a proof how birds like beetles, I some time since took out of my roof a nest of young starlings for my children and placed them in a cage so situated that the parent birds could feed them. I cleaned out the cage every night, and regularly every morning by six o'clock we looked at our nurslings, when we found from eleven to eighteen *carabi violacii* and *carabi catenulati* in the cage, divested of their legs by the old birds to prevent their escape. These were over and above what the young required for breakfast, but these and

what the old birds could find for them during the day were required to satisfy them until dusk. If, then, one nest of young require so much food, we might reasonably hope for the very best results to our fruit and forest trees if their natural enemies are regularly kept under by the agents nature's God sent to keep an equilibrium.

One word more. Formerly our land was full of the kite and the buzzard, the latter an especial snake feeder, and then vipers and snakes were seldom seen by husbandmen. Now, in some districts of North Lancashire and Westmoreland, the viper is in such plenty that I have killed very many in one day, and the turf cutters are in constant dread of them, whilst ordinary husbandmen will not cross a moss for fear of them. True, much unnecessary fear exists of their power to injure; but that it does exist was forcibly exhibited at the King's Arms, Hawkshead, to two of us who had been entomologizing on the moors. A stout man who had just succeeded in subduing a refractory bull, ran right out of the house because a friend of mine shewed him a viper in a box on the table. These snakes now thin our ground and low-breeding birds so effectually that the tree creepers, the wrens, pipits and tits are scarce where they ought to be in profusion, and the result is that the larvæ of such species of lepidoptera as *Hibernia defoliaria, abraxes, ulmata &c.*, defoliate the elms; *Tortrix viridana* the oak; *Cheimatobia boreata* the birches; *Abraxes, Grossulariata* and *Halia Wavaria* the currant trees &c.; *Penthina cynosbana* the cherries; and *Hyponomeuta padi* spins its nets over thousands of larvæ on every branch of the garden cherry as well as on the wild cherry tree which is grown so largely in some places for the manufacture of lasts, causing much mischief to this, one of the finest and handsomest trees grown in England; whilst *Hyponomeuta padella* damages the plums and *H. malivorellus* helps the last species to defoliate the apples, *H. evonymellus* is confined to the spindle tree

and effectually prevents its growth, and three years ago I discovered a new species in this genus which injured the buckthorn hedges in North Lancashire and Westmoreland; but, as I observed before, I do not intend to go into all the species which do injury, but, confining myself to those which really cause a perceptible loss upon an estate, proceed to point them out as follows:—

Oak.—Genus Quercus.

Cossus ligniperda, amongst the lepidoptera, is the greatest enemy this forest king has. This moth lays its eggs upon an injured part of the tree in June and July. The young are soon hatched, and commence eating under the bark and thence into the solid timber—feeding at least three seasons, sometimes four, before they leave the tree to enter the earth to assume the pupa state, which they generally do about August, remaining in pupa until the next June or July.

Suppose a tree is discovered to be attacked by this insect, one remedy only remains, which is to cut it down and sell or use it, for if left standing it serves as a breeding ground for its kind, and after the first brood reach maturity they instinctively deposit eggs upon the same tree, so that whenever a tree is found infested with this moth, larvæ are always found within it, in each yearly stage of development. The larvæ grow about one inch per year for three years and, when full fed, are three-eighths of an inch thick, so that the burrows they cut into a full grown oak are almost half-an-inch in diameter; these run in all directions, and soon render the timber valueless, eventually killing the tree. Therefore I say, cut it down.

Pygeæra Bucephala. This moth feeds upon the leaves of oak, birch, sallow, sycamore and chesnut, in the larva state. The perfect insect deposits its eggs upon the branches in July, and the young larvæ are gregarious, feeding together in

hundreds, stripping branch after branch of every leaf during August and September, until part of the tree seems to be dead. The effect is that part of the tree, having no leaves upon it, fails to ripen its wood and the tree is disfigured in shape. Though not otherwise particularly injured by this insect, to destroy it let foresters go round their woods (outside trees are most likely to be attacked, and hedge row trees in August and September.) Wherever a branch, however small, is seen stripped of leaves, let the trees be beat with a pole; the shock will knock off the larvæ, and the fall will injure or kill them. Where birds are scarce this larva abounds.

Orthosia Miniosa. This larva does a little injury to oak plantations until they are 30 or 40 years old; after that no perceptible injury can be observed. The egg is deposited on the young shoots of oak in April and May; the larva is gregarious, living under a web. The perfect insect appears at the end of summer and hybernates through the winter; in spring, it deposits its eggs and dies.

Tortrix Viridana. This small and beautiful light green moth does more mischief in one season to oak trees than all the other lepidoptera put together. Its eggs are laid in July, on the young shoots of oaks, its larvæ are hatched in May following and feed through June between united leaves of (almost exclusively) oak. In 1851 and 1852 I visited Wharncliffe woods (I believe the largest woods in England.) The oaks were perfectly defoliated and the most wonderful sight I ever witnessed could be seen everywhere around me. Countless indeed were the larvæ of this species, as they hung by their tiny silken threads in hundreds from every branch, and doubtless most of them would perish for want of food, for even these large woods could not supply this host. To strike a tree in July on which this species has fed freely, is to give the nearest representation of a snow storm I know; they fly out in thousands, and generally gently down to the ground.

There is but one remedy for these, and that is to encourage the breeding of small birds, especially insectivora and granivorous birds; the latter being supplied with two stomachs, if I may so express it, can and do live as freely on insects as upon grain, and always feed their young upon insects. Stop all sparrow killing, and if need be put up sparrow boxes all round the cottages nearest to the plantations, for the house sparrow (*Passer domesticus*) will not breed where man is not, and the tree sparrow (*P. montana*) loves to build in orchards, as do other finches.

We have not any coleoptera in this district which do very much damage to any but decaying oak trees, and as these should always be removed, I need not occupy time and space by a mere enumeration of names. I will just say that our finest coleoptera eat this tree. Many of the long horned brethren deposit their eggs on injured parts of the tree, and thus we Entomologists know where and what to expect when we see neglected oak woods where birds are scarce.

Oak Cynips. Touching the cynips of the oak, I need not say more than that in my opinion small birds offer the only chance we have to combat this evil on our oak leaves.

Tipulu. These singular flies are to oak woods what Fungi are; they live inside the wood of decaying or dead trees, and though they injure decaying trees, perhaps this is counterbalanced by the rapidity with which they assist the decomposition of dead trees and branches on the ground, thus forming new and rich soil for the healthy trees to flourish in.

Fungi should never be allowed to grow in well kept woods. Once let a fungus get into a wood, and rest assured every sickly tree will be attacked, and if attacked death follows most assuredly. This is particularly the case in birch woods, where the *Polypores* are generally found growing upon the sides of the trees, sometimes 25 feet high. Let all such

attacked trees be cut at once, otherwise they will become useless.

Ash.—Fraxina Excelsior.

This wood, so extensively grown for the use of the wheelwright and coach-maker, in some counties attains a very large size, and is depended upon, as a source of income, by landowners in the north of England, where it is grown very profitably for hoop-wood on land unfit for cultivation, and is cut every fifteen years. Such being the case, let us examine and see why in some seasons it appears as though a blight had passed over it. In May and June we find the whole plantation stripped of every leaf—the terminal shoots covered with a dirty spider-web-like net, in which is a small, light green larva, having darker stripes along its sides, and at once we see the cause. This common little lepidopterous larva has destroyed one year's growth and injured the trees to such an extent that they will never recover the straightness they once had, and in that consists their value. But suppose they have escaped this evil; and in July we find every leaf mined by a small larva forming blotches all over it—the leaf curling up and having quite a dead appearance. Then we have escaped one pest to be injured by another; for here is inevitably the larva of another lepidopterous insect, *Prays Curtisella*, whose ravages I have repeatedly seen extend all through ash plantations. The remedy here is unquestionably the encouragement of small birds. Again, the goat moth, *Cossus ligniperda*, and the coleopterous *Sinodendron cylinaricum* bore into and destroy large ash timber; but the remedy here is the woodman's eye and axe, aided by fire—for if the trees are felled and left in the woods, these internal feeders go on feasting upon the food with which they fall, or change to the next tree. Another wonderfully destructive little beetle

is *biphyllus fraxini* (?), *lunatus F.* Thousands of these insects feed under the bark of the ash, forming little galleries, which are so arranged that every inch or so there is a cross gallery (pl. v. fig. G), by which the insect in the cocoon can, when perfect, work its way to an orifice in this cross gallery and escape. This species eventually loosens the bark from the tree to such an extent that death follows. It is an insidious enemy and, without birds to eat the beetles as they appear, it cannot be kept in check. *Dorces parallelipedus,* living as it does in the interior of ashes, can only be got at by woodpeckers, and it forms a dainty meal for them, which they spare no labour to secure. Last May I observed above a bushel of refuse chips at the foot of an old ash in Wales, thrown out by *Picus viridis* whilst in search of this larva in the rotten portions of the tree.

Birch, (*Belula alba.*)

A northern tree, flourishing well on hill sides. It produces a large and valuable tree when left to grow, but when young it is much used in Lancashire for making bobbins, and the straight fifteen-year shoots in plantations are also used for hoop-wood. Many insects feed upon its leaves; but I do not know of one insect which eats its living timber, though many eat it when it is dead; and I have recently discovered the habits of one species, *Trochellium scolæforme,* which eat the bark. For this discovery we are indebted to Mr. Cox, the obliging land steward of Sir Watkin Williams Wynne, who not only gave me liberty to visit the woods near Llangollen to work out its life history, but allowed me to remove the trees, in which this insect was discovered feeding, to my residence where, with hammer and chisel, I have followed its larva through its various sinuous windings under the bark, and so got correct figures of it in its various stages (Figs. B, C, D, E, F). The

eggs, as yet quite unknown, must remain for description at some future time. They are evidently deposited on the bark as I have seen the minute holes the larvæ eat when they make an entrance into the bark, sometimes near the collar of the tree, at other times at a height of several feet. The young larva enters generally in a cleft of the bark where it is softer than elsewhere and eats a sinuous burrow (pl. v. fig. E) into the inner bark, widening it as it grows, still eating nearer to the wood, and so working the bark loose, and drinking the sap of the tree; it lives in a secure dwelling upon the very life of the tree, and remaining as it does for at least two years in the larval state, it has plenty of time to continue the injury, and it only depends upon the quantity of larvæ in a tree whether its days shall be many or few. It is a flattish larva, flesh coloured, with a darker dorsal ganglia seen through its somewhat transparent body; the head is brown, pointed, hornlike; corslet, lighter coloured; and the mandibles rasp off the hard dry bark of the birch, sometimes above three inches thick, when it is eating its way towards the outside of the bark to make up in round pieces like a little logwood mill. When full fed it is nearly one inch long. Having eaten its way to the outside, leaving only a thin skin of bark between it and the outer world, it spins a thick, tough silken cocoon to which the "chips" it has made adheres, and changes to a beautiful brownish chrysalis, darker towards the head, and having the antennæ sheath carried below the wings as in the genus *Dianthæcia;* the perfect insect appears in twenty or thirty days (June and July) and is one of our finest and handsomest Trochilliums.

Chematobia borearia feeds on the leaves of birch and, in some seasons, such numbers of this larva appear that they defoliate the tree; the sap which should then nourish the leaves returns and meets the rising sap and both together force the bark outwards till it bursts, and we then get the

rough-barked birch instead of the beautiful silver bark so ornamental and so wonderfully spectral when seen by moonlight. It is fed upon by several other lepidoptera all of which are readily cleared by birds, and in the broken branches or dead trunks live hosts of coleopterous and dipterous larvæ, which soon cause the tree to crumble away, and by their assistance it quickly makes new soil for other species of trees to grow in : it is a fact patent to all who pay any attention to the growth of trees, that the same species will not grow profitably twice upon the same ground.

The small but magnificent *Argyresthia gœdartella* feeds in the bark of this tree, but does not go deep enough to do much injury, though its numbers upon a large tree are fabulous.

Elm.—Genus Ulmus.

In this district we have two species of elm ; the wych or red elm does well in our woods, whilst the English or white elm grows well only as a hedge row tree. Its natural enemy, *Scolytes destructor*, once in a plantation of white elms, continues with them for life. To Capt. Cox we are all indebted for a knowledge of the life history of this very properly named insect. He tells us that by carefully going over trees infested by this beetle and cutting out the infected parts, the trees in Regent's park have been preserved from destruction and restored to a healthy state. From my own limited observations on this species I find the eggs are deposited by the parent near, in fact upon, the part she was bred upon, so that they are sure of a ready entrance under the bark, whilst those deposited on a healthy part generally die or get devoured by small birds ; once under the bark they are safe and run their galleries upwards or downwards until the tree is dead, for, living between the trunk and bark, no sap can rise to nourish the tree.

In some seasons wych elm in woods suffers defoliation from the attacks of *Abraxes ulmata* and *Hybernia defoliaria*. The first lays its eggs in July, and the larva, after eating most ravenously for six or eight weeks, goes into the earth, and appears at the end of the following June a beautiful but sluggish moth. The larvæ sometimes make up so close together in the earth that I have known above thirty pupæ to be taken out of a space not larger than my hand. *H. defoliaria*, as its name implies, is very injurious; it has done its injury before *ulmata* commences. This moth appears and lays its eggs on the terminal shoots of trees in November, and the young larvœ are just hatched in time to commence eating the buds as they open into leaf; should the spring be late, all the worse for the trees, as this larva makes no scruple to eat direct into the young bud. This is especially the case when the eggs are laid on oak or birch, on both of which trees it feeds quite as well as it does upon elm.

This larva is an especial favorite of blackbirds and thrushes, and I pity the whole genus Hybernia if there be starlings building near, for they delight in carrying these long larvæ to their young. The coleopterous family *Anobium* loves the elm, though I have never seen them alive in the living timber; but when once they get into a dead branch they go on until it is no unusual sight to see one side of an elm dead, evidently owing to their attacks, whilst the other is apparently healthy.

Lime.

This tree, generally grown as an avenue or hedge-row tree in the north, is extensively grown in some counties for its timber; everywhere it attains great size, and its light-coloured foliage adds much to the beauty of our woodland scenery; it is rarely injured by wood-borers, but has an enemy (small it is true) in *Chrysoclista Linnœella*, which bores into its bark

and lives therein. In July the insect appears in the perfect state and may then be found in *copula* on the trunks of the trees it has fed upon. Laying its eggs upon the same tree, it perpetuates a colony, which eventually destroy the bark in blotches; the wood then decays, and *Anobium paniceum* and *A. nitidum* get a footing and the tree is doomed as a timber tree, though it may live long as an embellishment to park or lawn; if a sickly tree can be so considered in well-kept grounds.

In some seasons this tree suffers entire defoliation from the attacks of the larvæ of *Cidaria fluctuaria*, which infest the tree from bottom to top, first eating holes in its leaves, then spinning a slight web over them, the ribs of the leaves alone remaining to prove their growth. A few other moths feed upon it, particularly *Xanthia citrago* and the whole of the genus Hybernia; but as these rarely do much perceptible injury in consequence of the fondness birds have for them, we may pass them by.

Sycamore

Has few insectivorous enemies. *B. perla* and its congener love to hide under its shade; *Melalontha vulgaris* seeks it for shade and for food whilst in its perfect state only, as it lives in the earth whilst a larva; it has its own *aphis*, which small birds are particularly fond of, especially in wet weather, as the *aphides* are on the underside of its broad leaves and easy to find. I am not acquainted with any insect which perceptibly injures its growth. Its timber is used largely in the manufacture of tools and by brush makers. This tree is only attacked by coleopterous wood-borers where branches have been broken off and the stump left to die. It attains the greatest height of any tree I know, but rarely squares three feet, growing best on the banks of streams. Under the bark which flakes

off the larvæ of *Stigmonota regiana* are found full fed in May, and in March and April the larvæ of *Nola cristulalis* may be found in the same places; neither of them do any harm, but both supply our little birds with food when the ground is covered with snow. At this time the flakes of bark turn outwards on the loose side and our birds revel on a rich banquet that nature has provided for them when all other food is covered—another of the many wonderful lessons the naturalist reads in the great book of nature.

Holly.

To some it may appear superfluous to enumerate this tree, for though every body knows it as an ornamental, few know it as a timber, tree, yet our engravers for calico and paper printers use it in great abundance, as do millwrights &c. It grows best on gravel or shale mountain sides, and when so grown presents a most gorgeous object as a back ground to timber lands, its red berries being an especial object of interest to any birds in the district. It rarely suffers from insects after it bears berries, for the eggs or larvæ are taken by most birds in preference to its fruit. Its principal enemy is *Grapholita nœvana*, a small moth which deposits its eggs on the terminal shoots in July. In spring these eggs hatch; the larvæ spin the young leaves together, and live between them, eating the house they live in, and stopping all growth. It has also a dipterous parasite, if I may so express it, which lives between the two skins of the leaf, forming reddish brown or yellowish blotches, quite disfiguring the tree, but otherwise not of much consequence. Should a branch be broken from one of these valuable trees, *Anobium molle* steps in and, once its eggs are hatched, we may cross off the value of that tree when taking stock; for ever eating, killing the trunk as it eats and reproducing its kind, without even coming to the surface, we can

suggest no remedy for the ravages of an enemy so insidious. This tree rarely squares more than 9 inches, but, like boxwood, it is joined to make large blocks. In Italy and Spain it has another enemy, *Buprestes cupreus;* but I have only seen one English example of this tree-destroyer; it was taken at Accrington, and shewn to me by a friend; it proved one of the most interesting captures of the year (1860) to entomologists.

Apple.

It may be asked, why have I wasted so much paper about these trees which grow everywhere; therefore, I leave them long before they are exhausted, to endeavour to shew what injures our fruit-trees, commencing with our most generally cultivated fruit-tree, the apple. This tree is attacked by many insects and plants, all tending to rob it of its value. Its bark supports several species of lichens, which again support a number of insects. Thus, *C. lichenaria* lives upon *Evernia prunastri*, and several species of moss live upon it, which give food and habitation to insects; the genus *Tortula* supports *Crambus falsellus*, and *Griminia pulvinata* is house and home for *Eudorea muralis*. I have found a *Gelechia* larva amongst *Bryam capillary* on apple-trees; its bark harbours the *Coeox*, known as the American bug; aud its blossoms supply food to *Eupethecia rectangulata* and *Chematobia brumata* &c. Its leaves are eaten by a host—*coleopterous*, *dipterous* and *lepidopterous*—amongst the latter are some of our handsomest *Micro-lepidoptera*, including *Ornix guttea*, *Lyonetia Clarkella*, *Lithocoletes*, *Pomifoliella*, &c. Its fruit is eaten by *Capocapsa pomonana*, one of the handsomest Tortrices in our list, to say nothing of the *aphides* which so often attack and injure this tree, or of the web-spinning genus *Hyponameuta*, which in some seasons cover the tree with a net, as they uncover it of leaves. With all these enemies, it is not

to be wondered at that the apple is a precarious fruit in England; but when we consider that it has yet a greater enemy in man, who shoots, poisons or otherwise destroys its greatest and natural friends, the wonder is we ever grow an apple at all. In addition to these feeding upon it, *Trochillium myopæforme* and *Semasia Wœberana* live under its bark; the first-mentioned quite freeing the bark from the trunk, and so injuring the tree.

Pear Trees

Are less injured by insects than any other fruit trees; with the exception of *Corsus ligniperda*, they are free from timber-borers; but this species once in an orchard of Jargonelles it will require the most careful watching to save them. For want of this care, the whole of the once extensive and flourishing pear-trees around Warrington are now removed: lately they cumbered the ground where ten years ago they paid the rent; and the whole of the mischief might have been avoided by removing one or two trees at first, or by observing where the young larvæ were attacking fresh trees. This wood is very valuable as a timber for glass-maker's blocks, &c.; the glass at white heat scarcely burning it or making it blaze—its leaves are also little eaten by insects. Though on one occasion I saw a tree defoliated by the larva of *Dilula augustiorana*, yet, on the whole, we have little to fear from insects on pear-trees, except as above, so far as my experience goes, and I do not interfere with what may have been observed by others.

Plums.—Genus Prunus.

Various as are the plums of our orchards, they are all subject to the same enemies, from the gigantic *Magnum*

bonum, the delicate green-gage, and the sweet golden drop, to the sour and bitter bullace of our hedges. We look in vain for a species that is peculiar to one variety. Various *aphides* occur at different places; but they do not confine themselves to any particular variety. *Penthina pruniana* favours the sloe, the damson, the Halewood, as freely as it does any of our finer varieties, but rarely does perceptible injury. Smaller moths mine the leaves of plums; but I am not aware of anything which does much injury, except *aphides*, and they are generally confined to wall fruit, which can be syringed, or to close-growing trees which want thinning, or to the young shoots; then they speak plainly, this tree requires pruning, and to prevent a recurrence, the cuttings should be burnt.

Apricots

Have many enemies; *aphides* are well understood, and their remedy, syringing, is regularly practised. Let us, therefore, pass to the leaf-rolling *Tortricina*, amongst which *Lozotenia rosaria*, and *L. heparana*, do most mischief. The eggs are deposited about the end of June and July, they batch in April and May, roll two or more leaves together, and tie them with a silk band, adding more leaves as they grow, and eating the foliage until it often happens that the tree is quite stripped of its leaves, and the fruit perishes. I cannot too strongly press upon the attention of gardeners the value of small birds, especially the Tits, for no eye but theirs can discover these eggs in winter; and they alone can extract the larva from between the leaves, when hatched, without injury to the trees. The Tits love to breed in any hole, especially in a garden wall. Any one neglecting to provide these holes for them behind his fruit-trees deserves to be disappointed of fruit. Let them once establish a colony in a garden, and besides the pleasure of having such lively and beautiful company

around him all day, the gardener will feel that his work is being done for him, whilst he looks on with a satisfaction unknown to him before. The birds unmolested, and in winter fed with a little meat of any kind, hung on a string near the holes, become so tame and attached to the place of their birth that he need never fear their leaving him until their food (insects) is scarce, and that, I presume, is what he is aiming at from day to day.

Cherry Trees

Require insectivorous birds more than any other tree. They are subject to the attack of *Penthina cynosbana* and *P. ochroleucana*, either of which defoliates the tree before the leaves have had time to mature their size. Both species are hatched in April, feed throughout May, and live between united leaves, which they eat. They attach other leaves to the ribs of the leaves already eaten; and as the foliage of the cherry grows in bunches, so each bunch is eaten by separate larvæ, until fruit alone remains. It may be asked, But what is so much eaten by birds as cherries? True, birds are fond of cherries, else why call the "merry" (the wild black cherry) "the bird cherry;" but as these birds have preserved to us a crop of fruit, are we not fairly called upon to pay the insurance? And as birds rarely touch cherries until they are dropping ripe, we, if so disposed, may cheat them of their due by gathering the fruit early.

Again, this tree has another enemy, *Hyponymeuta padi*, which spins its web all over the tree, especially on the large wild trees grown for last-makers in the lake district, and in some seasons, trees which will square from 18 to 24 inches, and which tower up with the oaks and ashes, are covered with what may well be taken for one great spider web, under which hundreds of thousands of a dirty-looking larva, half an

inch long, with small black dots upon it, may be found. If seen in June, the larvæ have turned into long white silk cocoons laid side by side, (pl. v. fig. H) from which, in a few days, a beautiful white moth emerges, having its wings dotted all over with minute black spots. This moth lays its eggs, becomes food for birds, spiders, ants, or dies a natural death. In any case it has perpetuated the mischief, or left food for our little songsters. Just as we the owners of the district destroy the birds, so the insects destroy our profit. Keep and protect the birds, remove injured parts of trees, smooth broken branches by cutting clean, destroy all trees now attacked by tree-borers. In most cases burn such trees, they are unfit for bearing timber, or even for rails, the larva now feeding on the small dead part has at once the whole dead timber to eat, if the wood is used, and sets to work right merrily; thus, we have so-called dry rot in our houses; and though it may take years to complete the work of destruction, yet it will surely be done. These *Malacoderma*, which seem so confined in their habits in a wood, only eating the dead branches of oak, ash, beech, sycamore, fir, elm, larch &c., once introduced into the building of a church, it is quite certain that that church will, eventually, be eaten by them. The most recent instance of this fact is that of Warrington church eaten by *Anobium nitidum*, *A. striatum*, and *Lasioderma testaceum*, and possibly by other species; but these were all I found on my journey to examine the old timber of which it was built.

In this paper, as in the one named in the first page of it, I have endeavoured to shew the value of birds on an estate. It may be that, loving birds as I do, I have over-drawn their value; but these notes are the result of careful study of the food and habits of birds, and a thorough knowledge of insects and their life history, together with a little knowledge of our glorious old English woods, and of their timber as a market-

able article, and are the result of years of careful observation made both where sparrow heads are paid for by parish officers, and where small birds are fostered and protected in gardens and plantations. Whatever may be thought of the conclusions arrived at, they are the convictions of one who hopes or expects nothing for his labour but that those who have used poisoned grain so freely and so effectively, or otherwise destroyed their feathered friends, will cease to do so for a few years, and watch the result: after that he fears nothing for the children of the air.

Without a book from which to cull one remark on this subject, all errors of judgment, if any, must be attributed to the writer.

Explanation of Plate V.

A.—Birch bark mined by *Trochillium scolæforme*, shewing the Larva *in situ*, and the hole it makes when the perfect insect escapes.

B.—The Larva, three-quarter size.

C.—Pupa, full size.

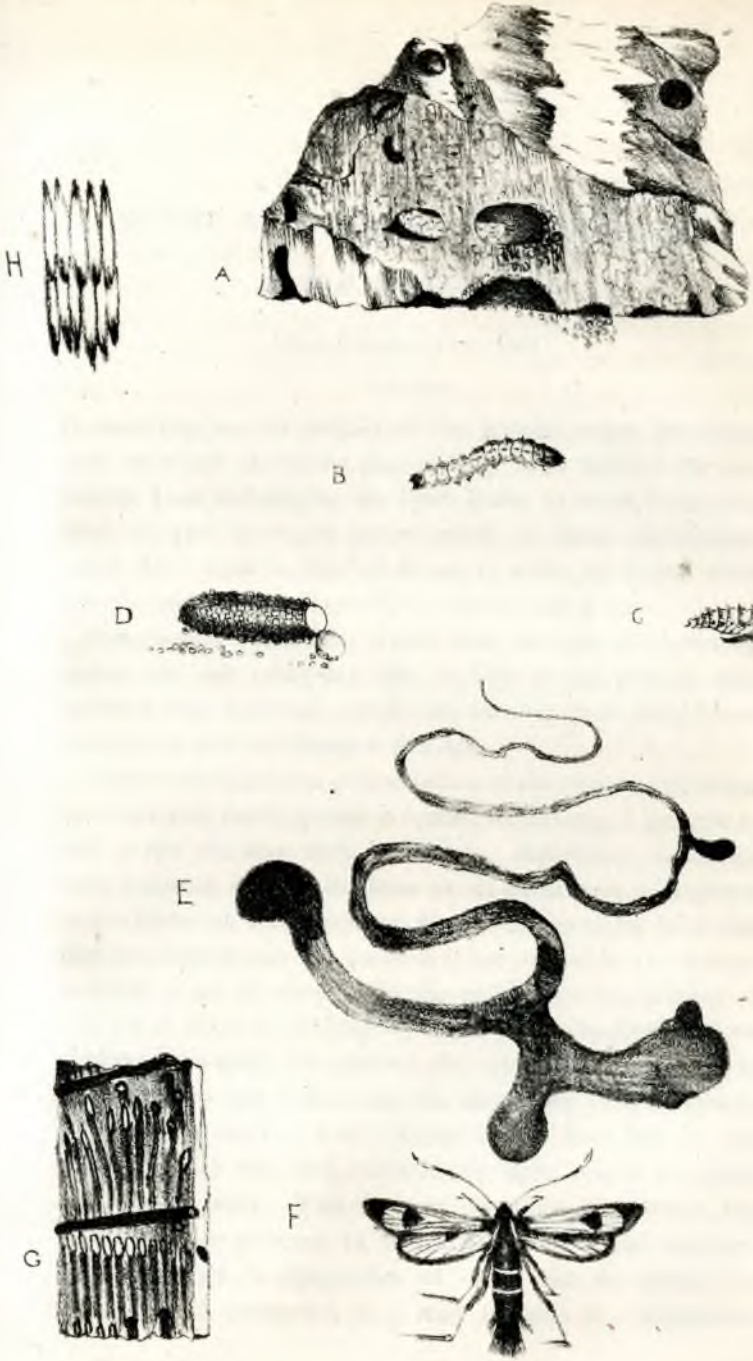
D.—Cocoon, full size.

E.—Tracks made by the Larva in the soft part of the bark.

F.—*T. scolæforme*, female.

G.—Pupa of *B. fraxini* (?) *lunatus*.

H.—Cocoons of *H. padi*.



C.S.C.