Ants and Aphides in West Somerset.

BY W. CECIL CRAWLEY, B.A., F.E.S.

THE following paper is a compilation of notes and observations on the ants, ant-aphides and other myrmecophilous insects, made at Porlock during the summers of 1915 and 1916, with the addition of a few notes made in 1904 and 1911, and a list of the species, containing several new to the district, and a few aphides new to science.

LIST OF ANTS (FORMICIDAE).

Sub-fam. MYRMICINAE.

1. *Leptothorax acervorum*, F. (New record for county). This, the only species of the genus that I have succeeded in finding at Porlock, is far from common. The only places I have found nests are in the woods on Porlock Hill (1915 and 1916), above the Selworthy Woods (1915), and up the slopes of the Horner Valley (1915–16). These ants, which nest mostly in small decaying stumps, may be seen carrying off small flies, and licking the honey-dew dropped on leaves by aphides, though they do not appear to attend the aphides themselves. As is the case with most ants, they will readily carry off fragments of cake, biscuit, and even bread; these fragments, after having been licked for some time, are cast out of the nest.
2. *Tetramorium caespitum*, L. Fairly abundant on the slopes and in the combes round Bossington Hill. In 1904 there was a large colony in Hawkecombe, but I have not found it there since. This species is very courageous,

but I have found that both workers and males, when isolated and alarmed, will sham death. It is rare to see a marriage-flight, though males and winged females may be found in the nest in July and August. Forel has observed marriage-flights in Switzerland, but Donisthorpe (*British Ants*, 1915) does not record having seen the flight, and I have never done so. It is clear from the following observations that fertilization may sometimes take place in the nest (adelphogamy).

In June, 1912, at Seaton, Devon, I took a colony without a fertile queen, but with male and female pupae. These hatched in due course, and after some time the wings were removed from two females, this pointing to their having been fertilized. Later on the colony accepted a queen of the parasitic ant, *Anergates atratulus*, Sch. (Ent. Rec. 24, 9, 1912). The *Tetramorium* workers thereupon put to death all their own males and females, including the two deälated ones. The same year at Seaton there was an enormous colony in a mound on the cliffs, with a great many males and winged females. I kept this nest under constant observation, but up to the end of September there had been no marriage-flight. In the beginning of that month I found several deälated females among the others. Again in July, 1915, I established in an observation nest at Porlock a colony consisting of many hundred workers and a quantity of males and alate females. By the 29th all the males had died, and I observed a female lay an egg, which was immediately removed by a worker. From this time on the females gradually lost their wings, and by September there were fourteen deälated females, and the number of eggs had increased. During the autumn and winter the nest was kept in a warm room, and an enormous quantity of eggs was laid. By November 11th there were several pupae, which produced workers in December. Again this spring (1916) the females laid eggs, which produced workers during the summer. There are now (November, 1916) nine queens remaining, with eggs and larvae. This appears to be a conclusive proof that this species can

replenish its supply of queens by adelphogamy (by "queen" I here mean fertilized female), and therefore the value of my experiment with *Anergates*, illustrating how the parasite succeeds in becoming sole queen in the host colony, was not impaired by the absence of an old fertile queen.

3. *Myrmica ruginodis*, Nyl. Extremely abundant everywhere. In addition to the nests under stones, there are many on the hills among the heather, where the ants raise structures of earth to catch the sunlight. Nests were found at 1700 feet.
4. *M. laevinodis*, Nyl. Not nearly so common as the preceding, which it closely resembles. Scattered throughout the Porlock district.
5. *M. scabrinodis*, Nyl. Extremely abundant everywhere. The colonies of this ant vary very much. Some are composed entirely of uniformly small dark or small light workers (by no means incipient colonies), or uniformly large dark ones, and others consisting of small workers have a few very large individuals, almost gynecoid. Whereas almost all nests of the two previous species contain several or many queens, those of this one occasionally have many, but often a careful search fails to reveal a single queen. This ant (and the two other species to a less degree) preys on colonies of *Lasius flavus*, with which ant it often shares the same stone or hillock. Fragments of dead *flavus* workers may often be found in the nest-galleries, and I have more than once seen the actual capture of a *flavus* worker.

Sub-fam. CAMPONOTINAE.

6. *Lasius flavus*, F. This, the most abundant of our ants, is found everywhere, but apparently ceases at about 1000 feet. Batches of small black aphid eggs may be found in the nests up to the middle of May, and in one colony composed of uniformly large pale workers, so that at first sight I mistook them for *L. umbratus*, I found on April 21st, 1915, and April 22nd, 1916, quantities of a

larger pale brown egg. The miniature aphis that hatched from these eggs appears to be a species of *Lachnus*. The eggs disappeared about May 15th, and further search failed to locate the aphids. Except in incipient colonies, where large numbers of queens, which have combined for the purpose of founding a colony, may occasionally be found with a few small workers, it is rare to find more than one queen with this species. She is enormously fertile throughout the spring and summer. Previously to 1916, I had only found one colony with two queens, but on May 25th there was a small colony in the Horner Valley, with sex larvae full-grown (and therefore the colony was of at least two years' standing), which had two queens together in the same cell ; and beyond Culbone on July 5th I found a fairly large colony with two obese queens, but no sex larvae or pupae.

Mention is made later of the short-winged females of this species, whose abdomens were occupied by one or more parasitic worms of the genus *Mermis*.

A peculiarly situated nest found in 1904 perhaps merits description. It was about the size of a child's football (say 8 inches in diameter), and was fixed on the side of a wall about a foot from the top. It was composed of earth held together by moss, and had no connection with the soil between the stones of the wall. It is probable that the ants (or a queen founding her colony) had established themselves in the tuft of moss, and then added earth until it assumed its full shape.

7. *Lasius niger*, L. Almost as abundant (including the forms *alienus* and *niger* var. *alieno-niger*) as the preceding. It nests usually under flat stones, but also builds mounds where stones are not obtainable. This ant is remarkable for the smoothness and regularity of its nest-cells, some of which I have found to be over 2 inches in length and $\frac{3}{4}$ of an inch high.

The pure large dark *niger* is almost entirely confined, in the flat district, to the western portion of the marshes by the sea, the nests on the eastern part being entirely, and those on the hills mostly, either var. *alieno-niger* or

alienus. Many of the nests, as well as those of *flavus* and *Myrmica*, are covered by the sea at high water in winter.

Nearly every nest contains fragments of *L. flavus* workers which are devoured by the larvae. The method by which the ants rob the *flavus* nests of both workers and larvae is shewn by the following incident. On May 18th, 1916, I lifted up a stone covering a nest of *flavus*. Some *niger* workers prowling near immediately rushed in among the *flavus*, saluting them in the characteristic way of this genus, as though they were their own species, and then picking up the *flavus* larvae and carrying them off. Some, still in a friendly way, actually tried to rob ants of the larvae they were carrying to a place of safety. On other occasions I have seen the *niger* carry off *flavus* workers into their nest. This is the only British ant that constructs covered galleries above ground. Some I have seen were over a yard long, and led from one entrance of the nest to another. The variety of myrmecophilous insects in some nests is remarkable. One that I examined on May 13th, 1916, contained the following: *Cyphodeirus* (or *Beckia*) *albinos*, *Platyarthrus hoffmanseggii*, the coccid *Ripersia formicarii*, and the aphids *Forda formicaria* and *viridana*, *Tetraneura ulmi*, *Tycheoides setulosa* and *setariae*, *Trama radicis*, and *Aphis plantaginis*.

The abdomen of the fertile queen in the egg-laying season becomes greatly distended; that of one I took at Porlock measured 6·5mm. × 4·5mm., and the ant laid an egg every fifteen seconds or so. In the autumn her abdomen had reached the normal size of about 4mm. × 3mm.

8. *L. niger* var. *alieno-niger*. This, and No. 9 *L. alienus*, have similar habits to *niger*, but are smaller, less black, more timid, and do not travel such distances from their nests.

The females of *L. alienus*, as detailed later, are sometimes infested with a Mermis, the presence of which stops the full development of the wings. These ants prey on *L. flavus*, but not to such an extent as *L. niger*. I also found dead *M. scabrinodis* used as food.

10. *L. fuliginosus.* In the summer of 1904 there was a colony of this species in Porlock, one of their tracks crossing a lane near the village. In 1911 this colony had disappeared, and I have since failed to find another.

Colonies often vanish in a remarkable way, while still flourishing, and leave no trace. The females, which are parasitic upon *L. umbratus* for the purpose of founding their colonies, may be fertilized in the nest without a flight.

11. *Formica fusca*, L. Very abundant everywhere, particularly in the combes under stones. I found it, with *M. ruginodis*, the only two species, on the top of Dunkery Beacon (1700 feet). The curious slug-like larvae and pupae of the fly *Microdon mutabilis* are common in the nests of this ant at Porlock : I have found them up to 1000 feet.

12. *F. fusca* var. *glebaria*, Nyl. (New to county). This ant is confined to the marshes on the sea-shore, where it is fairly abundant, and true *fusca* correspondingly scarce. I first found it in April, 1915.

It appears that the brood of this ant develops more quickly than with *fusca* ; thus on May 30th of this year nests of *glebaria* had sex pupae, whereas those of *fusca* near by and on the hills contained only eggs.

The marriage-flight of *glebaria* took place before July 14th but I did not witness it.

13. *F. rufa*, L. Very abundant almost everywhere, especially in the fir woods up the combes. From experiments made in 1904 and this year, it seems likely that most of the nests in each combe (sometimes numbering over one hundred) are really members of the same colony, the different nests having been formed by colonization. I found that workers and queens transferred from nest to nest, often far apart, were nearly always received amicably, and in a few cases I kept the ants in an artificial nest for some weeks, and the strangers were never attacked. On the other hand, many experiments show that strangers from a different district are always attacked. On July 21st of this year I watched a new nest being

colonized. It was situated about 12 yards from the parent nest, at the other side of a path, and all the pine twigs, etc., to build the nest had been carried across. The path was covered with ants, many carrying larvae, a few carrying other workers, and some carrying queens. Not a single myrmecophile could be found crossing with the ants.

These nests sometimes reach an enormous size. The largest I have seen was in the Horner Valley, April, 1915, and measured 10ft. 6ins. in one direction, and 9ft. in another, and was 2 feet high, though not yet built up. My walking-stick could easily be pushed down to the handle in the centre of the nest. The bracken which covers these nests appears to turn yellow much sooner than that growing elsewhere.

The ants use the foot bridges to cross the streams, and one nest, situated on a treeless island, had the wood-work of a sluice as its only means of access to food and building material. Additional notes on the food of this species will be found under a separate heading.

There were no marriage-flights properly so-called of this ant during 1915 and 1916. On June 11th, 1916, and several times later I picked up one or two males and females a long way from any nests, and once or twice saw single males trying to fly from their nests.

"MIXED NESTS."

Colonies of different species of ant often occupy the space under the same stone. When the stone is lifted, the two species mingle, and this may lead to the supposition that the ants are actually living together. Where two species actually live in common, they constitute a "combined colony," such as *Formica sanguinea* and *F. fusca*, where the latter are brought as pupae to the nest of the former after a slave-raid; or *Lasius niger* and *L. umbratus*, where the existence of the yellow *umbratus* among the black *niger* is due to the presence of a parasitic queen of *umbratus* which has been adopted by the other species. These latter "combined colonies" are rarely

met with, but " mixed nests " are very common in the spring, when the ants first come to the surface of the ground, and more than one colony tries to possess the advantage of nesting under the same stone.

During the fortnight from April 18th to May 1st, 1915, I found at Porlock in different localities the following mixed nests :—

14 of *Lasius flavus* and *Myrmica scabrinodis*.
5 of ,, ,, and *L. niger*.
5 of *L. flavus* and *Formica fusca*.
1 of ,, and *M. ruginodis*.
3 of *F. fusca* and *M. scabrinodis*.
2 of ,, and *M. ruginodis*.
1 of ,, and *L. niger*.
1 of *F. fusca* var. *glebaria* and *M. scabrinodis*.
1 triple nest of *Lasius flavus*, *M. ruginodis*, and *Leptothorax acervorum*.

This total of thirty-three mixed nests could no doubt have been added to if the search had been continued. Many of them examined later were found to contain only one species, the stronger colony having ousted the weaker.

ADDITIONAL REMARKS ON ANTS' FOOD.

Worker ants require very little food; in fact, captive colonies with no brood will often refuse all animal food and only drink a little honey occasionally. In the spring and early summer, however, the young growing larvae require an immense quantity of food. Perhaps the majority of our native ants depend principally upon the secretion of aphides and only partly upon animal food, while with a few the reverse is the case. The absence of aphid secretion in ants' nests kept in captivity is probably the chief factor which makes it so difficult to rear females under these conditions, but with those species that are principally carnivorous, a generous diet of animal matter sometimes results in the production of females.

F. rufa, as we see under " Aphididae," obtains a quantity of its supplies from aphids, but perhaps the greatest portion of

its food consists of insects. Several writers have remarked on the abundance and extraordinary variety of insects brought in to a large nest of this species, and the amount of flies, caterpillars, beetles and bugs annually destroyed by a single nest must be enormous.

On a path in Horner Woods, May 10th, 1916, I was struck by a large number of green caterpillars carried by three ants along a track of more than 50 yards; the number of caterpillars averaged ten for every yard of the track. If the ants, as seems probable, had obtained their larvae from the oaks and other trees, the labour of transporting them must have been enormous, as many were nearly an inch in length and required two or even three ants to drag them along. Also in one nest of *L. niger* (1915) there were three species of caterpillar used as food.

These ants, as well as *F. fusca*, *L. niger*, and the species of *Myrmica*, lick the young half-opened fronds of bracken and the leaf-buds of many trees and bushes. I noticed a number of *M. ruginodis* licking a half-opened bud of a peony; the bud they were engaged on was more open than those without the ants. Some years ago I remarked a similar phenomenon with other flower buds in Oxfordshire, the ant being *L. fuliginosus*: from several years' observations there was no doubt that the removal of the sticky secretion by the ants brought out the flowers more rapidly.

Many flowers are frequented by ants. The species of *Myrmica* bury themselves almost out of sight in dandelion and other flowers, and often become covered with pollen. Foxglove flowers are also frequented by *Myrmica*. In the neighbourhood of Horner the flowers of the water hemlock growing in water were covered with workers of *F. ruga*, evidently obtaining honey. I have seen *L. niger* workers burying their heads in hawthorn blossom, and licking the underside of young laurel leaves. Innumerable similar instances have been observed. Many species of Coccidae and Psyllidae are attended by ants. A pupal form of the latter excretes a thread of sticky liquid, which forms a tube and ends in a ball of the substance. Ants (*Myrmica*, *F. rufa*, etc.) may be seen licking these balls on hawthorn and pear leaves.

APHIDIDAE CONNECTED WITH ANTS.

1. *Forda formicaria*, Heyden.

Food-plant. Various grass roots.

Hosts. (Porlock district). *Myrmica ruginodis, laevinodis,* and *scabrinodis ; Lasius flavus, niger, niger* var. *alieno-niger, alienus.*

This, the commonest ant-aphis, varies, in the apterous form, from white, creamy-white, greenish-white, dark-green, dull and bright yellow, to pale pink. It is always found on roots, generally in clusters, often those aphids of a similar colour together. When a nest is disturbed, the ants *L. niger* pull them off the roots and carry them below, but *L. flavus* and the species of *Myrmica* do not so readily do so. In the case of *niger*, these aphids are generally in the principal part of the nest, but *L. flavus* more often keeps them in an outlying part. I first found the nymphs at Porlock on May 15th, 1915, in a nest of *L. niger*. They were in large numbers on grass roots, and were a pinkish white. I again found some on May 13th, 1916, and succeeded in hatching some alate forms. Immediately on emerging they ran about very actively, evidently trying to escape. It seems clear from their exceptional activity, greater than that of any other aphids I have seen, that they leave the ants' nests at once, and perhaps have an entirely different terrestrial existence. This would account for their never having been found before. This alate ♀ and that of *F. viridana*, are described in *The Entomologists' Record*, 1916.

The apterous forms live for some time without food in artificial nests, and are readily received into strange nests. As the ants sometimes remove the aphids from the roots, it is probable that they replace them, though I have never seen this. In hot dry weather stones are untenanted by both ants and aphids, but after rain both appear again.

2. *F. viridana*, Buck.

Food-plant. Grass roots, and roots of milfoil.

Hosts. L. niger, alieno-niger, alienus, flavus. Not so

common as the preceding, but of similar habits. I have never found them in the same clusters as *formicaria*.

They are generally of a honey-yellow colour. I took nymphs on April 30th, 1916, with *L. alieno-niger*, and succeeded in hatching some alatae, which are easily distinguished from those of *formicaria*.

3. *Tetraneura ulmi*, Geoff.

Food-plant. Grass roots.

Hosts. L. flavus, niger, alieno-niger, alienus, Myrmica ruginodis and *scabrinodis*.

Common. The apterae, which are a rich orange, dusted with a mealy powder giving a purple tint, are found clustered on roots, and never free in the nest, as sometimes happens with *Forda*.

4. *Tycheoides setulosa*, Pass.

Food-plant. Grass roots.

Hosts. L. flavus, niger, and *alieno-niger*.

Sometimes found walking among the ants. Generally creamy white, and mealy, but sometimes tinged with green.

5. *T. setariae*, Pass. Similar to the preceding but less common. With the same ants as *setulosa*, from which it is readily distinguished by the form of the antennae.

6. *Trama radicis*, Halt. Fairly common in the spring with *L. niger, alieno-niger*, and *flavus*. They feed on grass roots, and those of milfoil, but are generally found walking among the ants, who salute them as they do other ants. This, and the following species are, in my opinion, the most highly myrmecophilous of all our aphids. They vibrate their antennae in a circular manner, and when greeted by an ant, lift one or both of their long hind legs in the air and vibrate them. In May, 1915, I found an exceptionally large colony in a nest of *L. niger*, and on being disturbed the aphids left the root they were feeding on, and went down out of sight. Some were picked up and carried off by the ants. I failed to rear the winged forms from the nymphs. I have often kept *Trama* in artificial nests, and watched the ants drink the drops of honey extruded from the anal orifice. Sometimes an

aphis left the nest, but was always accompanied by an ant, who finally carried it back. In fact, the ants never left the aphids by themselves. The introduction of one of these aphids into a nest of *L. niger* always causes a crowd of ants to surround and caress it, even though the aphis extrudes no honey.

7. *T. troglodytes*, Heyd. Not so common as the former, but of identical habits and living with the same hosts.

8. *Anoecia corni*, F.
Food-plant. Grass roots.
Hosts. *L. flavus*, and *alieno-niger*.
The apterous females are dull green in colour, and hairy; the larvae pale green; the nymphs pale green with darker wing-covers. I took one alate female, and bred others. The number and position of the antennal sensoria in both alate and apterous females differs slightly in different specimens. Not common in this district.

9. *Aphis plantaginis*, Schr.
Food-plant. Grass roots.
Hosts. *L. flavus*, *niger*, and *alieno-niger*.
In nearly every case the insects were in colonies consisting of a mother and numerous larvae, much paler green than the mature form.

10. *Macrosiphum myrmecophilum*, Theo.
Food-plant. Unknown.
Host. *L. niger*, *alieno-niger*, and *flavus*.
I first took it at Hurlstone Point, May 8th, 1915, with *L. niger*, an apterous female, a nymph, and a larva. It was described from these specimens by Theobald in *The Entomologist*, March, 1916. I took it again in 1916 in greater numbers. It was always free in the nests, and unnoticed by the ants. It probably finds protection in the ants' nests, and the winged form probably leaves the nest at once and lives above ground. The type has a single sensorium on the third segment of the antenna, but some specimens have two on one antenna and one on the other.

11. *Hyalopteroides pallida*, Theo.
The single specimen of this curious aphis, the type of a new genus and species, was taken at Porlock Weir in a nest of *L. niger*, free in the nest. I saw no notice taken of it by the ants, and do not know its food-plant. I have failed to find it since. It is described in *The Entomologist* as above.
12. *Myzus*, sp.
At Porlock, June 23rd, 1916, I found two specimens in a nest of *L. niger* in the marshes by the sea. They are apterae, pale pink in colour, and Mr. Theobald tells me they are a new species which he is about to describe. So far as I am aware, no species of *Myzus* have hitherto been found associated with ants.
13. *Geoica carnosa*, Buck. Apterae and larvae.
Food-plant. Grass roots, etc.
Hosts. Lasius flavus, niger, alieno-niger, and *Tetramorium caespitum.*
14. *Lachnus*, sp.
As already noted, I found both in 1915 and 1916 in the same nest of *L. flavus* quantities of a large brown aphis egg, quite different from the small black ones so common in spring with these ants. The immature form from these eggs is a species of *Lachnus*, of which genus one or two species have been found with ants.

TERRESTRIAL APHIDIDAE AND ANTS.

List of species habitually attended by ants.

1. *Thelaxes dryophila.* Alate and apterous ♀, nymphs and larvae. Oak, tops of leaf sprays. Attended by *Formica rufa* and *Myrmica ruginodis.*
2. *Aphis rumicis.* Alate and apterous ♀, etc. Thistles, foxgloves, etc. *Formica fusca* and var. *glebaria, Lasius niger, Myrmica ruginodis, laevinodis*, and *scabrinodis.*
3. *Macrosiphum jaceae.* Alatae, apterae, etc. Thistles. *F. fusca* and *L. niger.*
4. *Chaitophorus aceris.* Alatae, apterae, etc. Sycamore. *F. rufa, F. fusca, M. ruginodis.*

5. *Aphis*, sp. ? Apterae and larvae. In heads of milfoil. *F. fusca.*
6. *Aphis*, sp. ? Alatae and apterae. Thistles. *Formica fusca* var. *glebaria*, *L. niger.*
7. *Aphis*, sp. ? Alatae and apterae. Sorrel. *F. fusca* and *L. niger.*
8. *Aphis*, sp. ? Alatae and apterae. Bramble flowers, under calyx ; very minute. *F. rufa*, *M. ruginodis.*
9. *Aphis*, sp. ? Alatae and apterae. Holly. *F. rufa.*

This list is very incomplete owing to the difficulty of identifying the species as the literature is so difficult to obtain. It is only intended to show the aphids attended regularly and in great numbers by ants, so that the "honey-dew" clearly forms a substantial proportion of the ants' food. Most species of ants, including those that harbour and "domesticate" root-feeding aphids in their nests, and those, *e.g.* species of *Formica*, which do not do so, depend to a greater or less extent on the secretion from these insects for their food supply during the spring and summer.

The common wood-ant, *F. rufa*, so abundant in the Porlock district, may be seen to ascend in large numbers several kinds of trees and other plants. Though the objective of the ants is in some cases the secretion on the opening leaf-buds, they are more often in search of aphides. Hardly a single oak-tree can be seen without an ascending stream of thin-bodied ants and a descending one of full-fed ones.

The small oak aphis *Thelaxes dryophila* (No. 1), which forms its colonies at the base of the young leaves, is almost invariably attended by these ants. The clusters of aphids are covered with ants, which walk carefully over their tiny bodies and imbibe the sweet secretion.

These ants also ascend fir-trees in large numbers, but I am not sure of their object here. The same ant, *F. fusca*, *M. ruginodis* and *scabrinodis*, lick the waxy globules extruded by the nymph of species of Psyllid.

The common aphis (*A. rumicis*, No. 2) is attended by vast numbers of *F. fusca*, *glebaria*, *L. niger*, and *Myrmica ruginodis*, *laevinodis*, and *scabrinodis*, very often two species of ant on

the same aphids, but they carefully avoid one another. At Culbone in July, 1916, a large bush of sycamore was covered by *rufa* attending *Chaitophorus aceris* (No. 4). Also immense numbers of *F. glebaria* were seen on milfoil with *Aphis* (No. 6). In all these cases a very large proportion of each ant colony must have been engaged in gathering supplies in this way.

Perhaps it is worth mentioning that I have never observed the common rose-aphis attended by ants, even where ants were visiting another species of aphis on an adjacent bush.

MERMITHOGYNES.

In the marshes at Porlock on July 14th, 1916, I found several females in a nest of *Lasius flavus* with very small wings and distended abdomens. About half the females visible in the nest were brachypterous, the rest being normal. On August 18th in the same locality I found similar females of *L. alienus*. The wings of the latter were proportionately smaller, and their abdomens larger, than those of *flavus*.

The abdomen of each of these females contained a large white nematode worm (Mermis) over an inch long; in some of the ants there were two worms. I kept several ants for two or three weeks, but the worms did not emerge—no doubt they should have been kept longer. Apart from the wings, which are perfectly formed but only a quarter the normal size, there is no external difference; the ovaries however of the parasitized ants were very small and less developed than in the normal ones. Previously in 1899 and 1900 I had taken similar parasitized females of these two species in Oxfordshire, but recorded them merely as brachypterous forms.

VARIOUS MYRMECOPHILOUS INSECTS.

A brief mention may be made of a few well-known myrmecophiles found at Porlock. Besides the larvae and pupae of the fly *Microdon mutabilis*, already referred to as found with *F. fusca* (and rarely with *M. scabrinodis*), there are the beetles *Atemeles emarginatus* with the same two species of ant and *M. ruginodis* and *laevinodis*; and *Claviger testaceus*, with

L. flavus and occasionally *L. alienus*. The larvae of *Atemeles*, when ready to pupate, are covered with earth by the worker ants, just as are their own larvae.

Two rare coccids are abundant at Porlock. One, *Ripersia formicarii* I first took there on April 25th, 1915, in a nest of *L. flavus*, and have since taken it many times with this ant, *L. niger*, *alieno-niger*, and *alienus*. The ants value the insects, and when disturbed, carry them down out of sight. The other, *Ortheziola vejdovskii*, a most curious insect, was taken with *L. flavus* on May 1st, 1915. I subsequently found it again in great numbers in nests of *L. flavus*, and occasionally in those of *L. alienus*, and *niger* var. *alieno-niger*. The ants take no notice of this scale, even when it is introduced into artificial nests. The scales fix themselves to thread-like roots round the unoccupied edges of nests under stones, and as I have found them almost as often under stones without ants, their association with the latter is very slight.