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Entomology Department

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ENTOMOLOGY DEPARTMENT

BY C. B. WILLIAMS

STAFF

During the period Mr. R. A. French joined the staff as an Assistant Experimental Officer, Dr. G. O. Evans has worked on a grant from the Forestry Commission, and Mr. J. E. Satchell has worked since August, 1949 on an Agricultural Research Council Scholarship. Mr. C. J. Banks also came to work early in 1949 on a research grant for the Agricultural Research Council to study Biological Control, but unfortunately was taken ill shortly afterwards and was not able to resume his investigations during the year.

INSECT ECOLOGY

Dr. Williams has continued his work on the relation of insect abundance to weather conditions. Trapping, on which this work is based, was continued throughout the year in three traps—bringing the post-war period of trapping to 3½ years. Trapping will be stopped early in 1950 when the fourth post-war year is completed. All the work of the year supports the previously published results on the relation of activity to weather conditions. Insects are, in general, more abundant after wet weather in the summer and after warm weather in the winter.

Work was continued on the relative abundance of different species of insects in random samples of wild populations, with particular reference to the interpretation of the frequency distribution either as a logarithmic series or a log-normal distribution. A big experiment carried out in July 1949 unfortunately gave inconclusive results.

Many of the results of these investigations have been found to be applicable to botanical problems and a paper is in the press discussing the relation of the logarithmic series to quadrat sampling of plant.

Work on migration of insects continues chiefly through the co-operation of naturalists in different parts of the world. There was no outstanding immigration of pests into Britain during 1949.

GALL MIDGES

Dr. Barnes reports that the expected fall in numbers of the wheat blossom midges in 1949 took place, there being 7,698 larvæ of the species in the 500 ear samples as compared with 15,417 in 1948. The percentage grain attack fell from 14.7 to 7.7. The year 1949 was not such a good one for emergence as was 1948 and the weather at the time of oviposition was not particularly favourable. The descent of the larvæ from the ears took place about 17th July which was about the same as in 1946 and 1947, but earlier than in 1948, and later than in 1945, a particularly early year.

His investigation of *Contarinia nasturtii* was particularly successful. He was able to rear this midge obtained from the blossom of *Rorippa amphibia* both on the blossom of this plant and of swedes, and also midges from rape leaves on turnip, radish, swede and cabbage leaves as well as on the blossom of radish. The cross between midges obtained from *Rorippa* blossom and rape

leaves proved fertile, the offspring being reared successfully on turnip leaves and *Rorippa* blossom. It can therefore now be stated that *Contarinia nasturtii*, the swede midge, will both cause blossom and leaf damage on cultivated Crucifers and that only one species of midge is involved.

The general work on the biology of gall midges has continued; species on sweet chestnut, wheat, barley and among lettuce, poppy and Calendula seed having been reared and over 1,000 slides having been added to the collection. Volume 6 of Gall Midges of Economic Importance dealing with those attacking Miscellaneous Crops was published on 15th September, 1949. Mr. C. S. Tsi of the National Peking University spent the last month of the year studying gall midges with Dr. Barnes.

SLUGS

The ecological investigations on slugs has mainly been concentrated on two particular lines. A nightly (for 214 successive nights and at intervals subsequently) study was made on a population of 1,000 individuals of the Grey Field Slug introduced into a garden where this species was previously absent although it was the dominant species in surrounding gardens. The study showed that this species of slug was able to maintain itself and breed successfully in this garden and that apparently its previous absence was probably due to the very great drying-out capacity of the soil (due to lack of humus). This lack has been diminished during recent years, but the drought of 1949 nearly caused a complete wipe-out again. This diminution in numbers during the summer and autumn of 1949 was also apparent in neighbouring gardens, although other slug species (perhaps thicker skinned) did not show a similar reduction in numbers due to the lack of moisture. This study also emphasized the differences in temperature in the various parts of a typical garden, under walls, plants, trees, etc., with the result that individual Grey Field Slugs were seen active on all but five nights during the winter of 1948-49.

The other particular investigation on slugs was a preliminary experiment in marking slugs by painting the shell of *Testacella* with cellulose acetate paint. Two groups were marked and such individuals were seen fairly regularly for about a month after marking but more infrequently later. One marked individual was, however, observed a year but a day after marking. If a satisfactory method can be found it will make possible studies of absolute populations.

Additional information was gathered concerning the life history, breeding, mating periods, etc. of several species of slugs.

POPULATION GROWTH AND DIURNAL PERIODICITY OF *Aphis fabæ*

Dr. Johnson reports that with two disc suction traps operating over a bean field and near a sugar beet crop, an hourly record has been obtained over a period of 6 weeks of the fluctuations in population and activity of the bean aphid and many other species. At the same time hourly records of wind-speed, temperature, hours of sunlight and rainfall have been taken. Together with these data the population growth on the crop has been studied and work

is in progress on the analysis of population and activity in relation to meteorological conditions.

COMPARISON OF TRAPS

Further work on the comparative performances of sticky traps and suction traps was undertaken.

MOVEMENTS OF INSECTS IN THE UPPER AIR

It has been shown during 1948-1949 that the aerial tow-nets normally used for studies and in use also at Cardington are subject to very grave sampling errors. This has necessitated a revision of trapping methods particularly those in use at Cardington. Special suction traps have been designed and constructed which will be used for aerial-drift studies at Cardington in 1950.

Much of the time in 1948-9 was occupied in analyzing and writing up the work of the last three years.

Dr. Raw reports as follows:—

CHAFERS

A study of the ecology of the garden chafer, *Phyllopertha horticola*, which was begun at Bristol was completed after appointment to the staff at Rothamsted. A thesis embodying the results of this study was accepted by the University of London in June 1949 for the Ph.D. degree. This work is now being redrafted for publication.

WIREWORMS

The changes in wireworm population under leys are being studied in the ley and arable rotations experiments in Highfield and Foster's Field. These experiments enable the problem to be studied under a variety of leys on the same soil type beginning, in Highfield, with a relatively high population from the permanent grassland, and in Foster's Field with a low population from the old arable land.

In collaboration with the Insecticides Department, plots in the wireworm experiment on Hoosfield were sampled to estimate the effect of the chemical treatments on the wireworm populations. It was found that the wireworm population fell rapidly on all the plots during the course of the experiment and this, together with the practical difficulty of making an accurate estimate of a relatively low wireworm population on arable land, masked any treatment effect which may have occurred.

EARTHWORMS

The cultures from the life history studies begun by Dr. A. C. Evans were kept going pending the appointment of a full time worker to continue the earthworm work. In the spring of 1949 Dr. Doeksen from Wageningen visited the Department and demonstrated an electrical technique for bringing earthworms to the soil surface. If this technique can be developed for quantitative work it will be a valuable aid to ecological studies.

In collaboration with Mr. Garner's Department, an exhibit on earthworms was staged at the Chelsea Flower Show in May 1949.

In August, 1949 Mr. J. E. Satchell was appointed to the department on an A.R.C. scholarship and will continue the work on earthworms, particularly the development of the electrical sampling technique.

Dr. G. Owen Evans reports as follows :—

TICKS

During the early part of 1949 the results of investigations on the ecology of *Ixodes ricinus* in Wales were prepared for presentation to the University of Wales for the degree of Ph.D. The thesis was successfully submitted in April and three papers on this work are now in press.

INVESTIGATIONS ON THE FAUNA OF FOREST SOILS

The major part of the field work has been conducted at the Forestry Commission's Nurseries at Ampthill, Bedfordshire. The chief project is the investigation of seasonal fluctuations in the soil fauna of a Spruce and Oak Forest. A study of this nature involves two fundamental problems, namely, the extraction and the identification of the fauna.

Extraction

A comparison of the Berlese and the Floatation Method, using 30 samples (soil and humus) 2 in. in diameter and to a depth of 3 in. from 4 sq. ft. of the floor of a spruce Forest, showed that there was no significant difference between the yields of arthropods above 0.5 m.m. in length. The Berlese technique was more satisfactory for smaller arthropods. This was probably due to the destruction of minute Acari during the washing process and the passage through the sieves (180 meshes to 1 in.) used in the floatation process. Extractions by the Berlese method from the Spruce stand in November yielded an estimate of 1,100 million arthropods per acre (to a depth of 3 in.) of which 330 million belonged to the Class Insecta and the remainder to the Arachnida.

Identification

The identification of the fauna presents one of the most difficult problems connected with faunistic surveys. A dearth of specialists in the field makes outside assistance limited. In the present studies Dr. Evans has concentrated on the Acarina (especially the Oribati-dæ) which are the most numerous of soil arthropods. A large number of samples collected from various sites have yielded over 60 species of Oribatid mites. These have been identified and mounted for future reference. Dr. H. Gisin, Geneva, has kindly assisted in the identification of the Collembola.