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## TABLE OF CONTENTS.

OSBORN—Entomological Work in Ohio.....	453
GORMLEY—Onagraceae of Ohio.....	463
SCHAFFNER—Peculiar Varieties of <i>Amaranthus retroflexus</i> .....	469
MEETINGS OF THE BIOLOGICAL CLUB.....	471

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## ENTOMOLOGICAL WORK IN OHIO. \*

HERBERT OSBORN.

Probably the first careful work upon insects occurring within the borders of Ohio should be attributed to Thomas Say, whose extended residence in Indiana made possible a study of many insects which were common to this region. While very few of these described species, twenty-six so far noted, were from specimens actually collected in Ohio, we may very fairly consider that all of the species credited to Indiana might be considered as common within our area. Says' residence from 1825 till his death in 1834 on the Wabash River at New Harmony, Ind., covered practically the same faunal conditions as are to be found in this state. Of the species described distinctly from Ohio the majority appear to be aquatic forms and to have been collected quite largely along the river; some of them, evidently, upon river boats which must have been the means of transportation at the time. Very few of the species recorded have economic importance.

Between the time of Say and up to the beginning of Experiment Station Work in the State there seems to have been a great dearth of Entomological Workers and very few records for Ohio insects appear in descriptive or faunistic papers. Among the persons in the state who gave attention to Entomology during this period we may note particularly Dr. Jared P. Kirtland who covered a wide range of Natural History subjects.

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\*Contribution from the Department of Zoology and Entomology, Ohio State University, No. 38.

Dr. Kirtland's work is worthy of special mention since it appeared at a time when but little attention was given to entomological matters and it appears from papers both in Entomology and Ornithology that he was a man of scientific attainments and his work of special merit.

He was a professor in the Medical College at Cleveland, but evidently a naturalist of the old school interested in all phases of natural history and making contributions to Botany Ornithology, Ichthyology and Entomology. His papers\* in Entomology, as far as I can discover, appeared during the years 1838, 1841 and 1851-57. Several of them relate particularly to Ohio insects.

Another naturalist of a little later date, Mr. J. Kirkpatrick published a number of articles in the Reports of the Board of Agriculture, "Field Notes" and "Ohio Farmer," during the years 1855-68. Also an article on Grape Vine Flea Beetle, in "Field Notes," reprinted in Practical Entom., Vol. I, 1865, p. 40.

Mr. J. H. Klippart published a paper on the wheat plant including notices of its parasites, Cincinnati, 1860 and is credited with three articles in Field Notes, 1861, these being discussions with Mr. Walsh upon the life history of the army worm.

Prof. E. W. Claypole, first of Antioch, later of Buchtel College, a man with extremely broad acquaintance in all branches of Natural History, gave particular attention to the insects of the state. A number of articles in the Canadian Entomologist and other Journals are from his pen.

Prof. Wright of Oberlin gave some attention to collections but so far as I am aware published no papers which would be considered strictly entomological.

The work of Mr. Chas. Dury of Cincinnati, is worthy of special mention as his studies have covered a long period of time and have been of a very intensive character, especially with reference to Coleoptera. His papers have appeared mostly in the Journal of the Cincinnati Society of Natural History and constitute a very valuable contribution to the Entomological Literature of the state. Among his papers of special state interest are the Catalog of Coleoptera of Cincinnati and Lists of Lepidoptera for the same locality. He also has contributed largely to the material used by

\*Descriptions of new species of Libythea and Macroglossa. Family Visitor, Cleveland, Ohio, 1851, Silliman, Am. Jour. 1852, vol. 13, pp. 336-338.

An improved method of killing and preserving Lepidopterous insects for Cabinets specimens. Silliman, Am. Jour. Sci. 1852, v. 13, p. 286.

Diurnal Lepidoptera of the State of Ohio. Annals of Science, Cleveland, Ohio, 1854, Jan. p. 5, Feb. p. 45, Mar. p. 73.

On the Larva of the Thyreus Abbottii. Pr. Acad. Nat. Sci. Phila. 1857, p. 148.

Gordius aquaticus dans une Sauterelle. L'Institute, 1836, iv. p. 172-173.

Localities and Habits of certain species of insects. Silliman, Am. Jour. Sci. vol. xvii.

other workers and references to his collections may be found in reports on the Odonata by Kellicott, Diptera by Prof. Jas. S. Hine, Hemiptera by H. Osborn, and in other reports.

#### EXPERIMENT STATION ENTOMOLOGY.

Official Entomological work in Ohio may be considered as having started with the organization of the Experiment Station in 1882. While no official entomologist was connected with the Station at this organization it is interesting to note that quite an extended article was included in the First Annual Report of the Director, Prof. W. R. Lazenby, whose activity in Horticultural and Forestry lines has continued thru many years. The paper on insects in this First Annual Report occupies some twenty-four pages and discusses in general terms the nature of insect injuries and special remedies with discussions on the life history and habits with treatment for insects of the vegetable garden, the fruit garden, orchard and field crops.

Later reports of the station include references to insect studies, those up to 1886 apparently being under the direction of Prof. Lazenby, altho I understand that he was assisted in this work by Mr. Alwood.

In 1886, Mr. W. B. Alwood was given the title of Entomologist to the Station, and the Annual Report for the year 1886 includes a quite extensive paper by him. The first part is devoted to "Notes on Insects and Insecticides," and the second section under the title of "Injurious Insects" includes discussions of the better known and more common insects of orchard and garden. This report is in considerable part a compilation from the writings of Riley and other entomologists but includes references to Ohio observations and conditions. It must have served a very excellent purpose in furnishing information to the people of the state concerning the insects that are most troublesome here. Mr. Alwood\* also reported to the Division of Entomology of the U. S. Department of Agriculture certain work on Ohio Insects.

Mr. Alwood's connection as Entomologist seems to have terminated at the end of the year 1886. The following report of 1887 contains no mention of insect work.

Soon after the reorganization of the Experiment Station under the National Experiment Station Act, Prof. C. M. Weed was appointed as Entomologist to the station, and since that time there has been no year without some official entomological work connected with the Ohio Station. Prof. Weed's studies concerned particularly the insects affecting fruits and his experiments and reports upon the remedies of plum curculio marked a distinct

\*Report on Ohio Insects. Bull 13, Div. Ent. U. S. Dept. Ag. 1887.

Tests with Insecticides on Garden Insects, Bull 13, Div. Ent. U. S. Dept. Ag. 1887.

advance in that field. He also continued extended studies on the autumn life histories of Aphids and studies of certain aquatic insects. He also at this time was doing considerable work upon the Phalangidæ from the faunistic and systematic standpoint.

With Mr. Weed's transfer to New Hampshire in 1891, Prof. F. M. Webster was assigned to the Ohio Station, his relation being at first field agent for the Division of Entomology of the U. S. Department of Agriculture and his connection with the station altho incidental afforded him opportunity to publish studies upon the Ohio insects and to give the station the benefit of an experienced entomologist. This relation continued until 1892, when Mr. Webster was appointed Entomologist to the Ohio Station, a position which he occupied for a number of years—1892-1902. During this time he carried on some of his most valuable field studies and published a number of excellent papers.

The Bulletins which perhaps should be noted as of particular value are those related to the "Chinch Bug in Ohio," "Insects Affecting Wheat," "Insects Affecting Raspberries and Blackberries," "The Periodical Cicada in Ohio," "Reports Upon the San José Scale and Methods of Control."

Aside from his station reports he published a considerable number of papers in the Journal of the Cincinnati Society of Natural History and in various Entomological Journals.

Following Mr. Webster, Mr. P. J. Parrott served as state entomologist during the years 1902-1904, but left the position to accept that of entomologist with the New York Experiment Station at Geneva. Mr. Parrott's work dealt with studies of San José Scale and with applications for general treatment of insects and was marked by his vigorous method as apparent in his further work at New York.

He was succeeded by Mr. H. A. Gossard who has been in charge up to the present time and under whose management the department has seen a very marked growth, the staff of special workers, now numbering five, and the field covered being much wider than that possible with any of his predecessors.

#### INSTRUCTION IN ENTOMOLOGY.

As far as entomological instruction is concerned I do not find any indication of definite entomological courses being offered in any of the Ohio Institutions prior to the introduction of the course in Entomology in the Ohio State University by Dr. D. S. Kellicott in the year 1895.

Dr. Kellicott was a man of broad training, a graduate of Syracuse University, interested in many fields of entomology, an expert microscopist, a specialist in Protozoa, Rotifera, and Comparative Anatomy as well as an expert in Entomology and his course in Entomology must have been of very high grade.

According to the department statement of 1895-6 he offered a course in Zoology—4 (Entomology) bearing a credit of three hours in the third term of the second year of the short course in Agriculture. The description is—Lectures on the stages, anatomy and classification of insects. Will be followed by field work, with especial reference to economic entomology. A collection of 25 species of insects of economic importance will be required of each student.

Another course, Zoology 5, (Entomology,) carrying three credit hours for third term Junior year in Agriculture, and five hours a week for Juniors in Horticulture and Forestry. This was evidently an advanced course, as it specifies that the course is open to all students who have had Zoology I or its equivalent. The description is "First few weeks of the term there will be three lectures a week on the Morphology and systematic position of insects; the remaining weeks will be largely given to collecting, preserving, identifying, studying habits and methods of destroying injurious species. A collection of fifty species correctly set and named will be required of each student."

There was offered also Zoology 6, Advanced Entomology, carrying three or five credit hours thru the year. Described as "open to all who are prepared for it."

It is a matter of some interest to note that even at that time the course in entomology for the students of the long course in agriculture required a year of Zoology as preparation. This plan has been retained up to the present time and I believe is an excellent feature and one which is in part responsible for the excellent work that the students can accomplish in economic entomology.

Prof. Kellicott's Odonata of Ohio remains an important treatise on the group.

With the year 1895 and following Prof. Kellicott was assisted by Mr. J. S. Hine whose work has continued up to the present and whose many contributions on the Diptera and other groups of insects have been an important addition to the knowledge of the fauna of the state.

After the untimely death of Prof. Kellicott in 1898 the speaker was elected to the position made vacant on the staff and the organization of the department has undergone but little change except for the natural growth of the succeeding years since that time.

In recent years courses in Apiculture, Medical Entomology, Forest Entomology, Entomological Literature and Taxonomy have been added.

In 1912 a distinct four year course in Applied Entomology was projected, adopted by the College of Agriculture and students in this course commenced work in the following year 1913-14. Three students in this course, are candidates for the degree of B. Sc. in Entomology this year.

## THE LAKE LABORATORY.

A feature of the work which may be mentioned here was the organization of a Lake Laboratory at Sandusky, Ohio. This was first established under the direction of Prof. Kellicott in 1895, and served as a research station for advanced students and instructors but without definite courses of instruction.

In 1900 the Laboratory organization was modified so as to provide for courses of instruction and since that time summer sessions have been held with a staff of various instructors from institutions in Ohio or adjacent states. Courses in Entomology have been offered as part of the regular curriculum. The Laboratory provides opportunity for a considerable amount of research work, and investigation of problems of insect life have their place among other studies undertaken there.

## STATE INSPECTION OF ORCHARDS AND NURSERIES.

The state inspection of Nurseries was first provided for in connection with the Experiment Station and Prof. Webster was the official inspector during the years 1900-1902.

In 1902 under provision in the state laws the work of inspection was transferred to the Department of Agriculture and Mr. A. F. Burgess was appointed as the first official inspector. Mr. Burgess' work was of a very high character and at once commanded respect of Entomologists in other states and may be considered as one of the influences in developing a higher standard for this work throughout the country. His service terminated in the year 1907, and after a short interim the position was filled by the appointment of Mr. C. W. Mally, once assistant to Webster in the Ohio Station, and who had been for several years assistant to the government entomologist of South Africa. His connection with the inspection service in Ohio lasted only for about one year as he was recalled by a flattering offer from the South African government where he is still engaged. On his departure Mr. N. E. Shaw received the appointment (1908) and still remains the chief of the inspection service with a capable staff of inspectors.

## BIOLOGICAL SURVEY.

As far back as in 1838 with the publication of Dr. Kirtland's papers on Ohio Animals the desirability of a Zoological Survey was urged and we find this idea prominently mentioned in the Volume on Zoology and Botany published in 1882. Dr. Newberry in the introduction of that report says "It is possible also that there are some who will fail to appreciate the value of these detailed reports on the Natural History of the State; but with the exception of some scattered newspaper or magazine articles, nothing has been published in regard to the Zoology of Ohio since the catalog prepared by Dr. Kirtland was issued in 1838, and in that interval

there has been felt a constant want in every town, village, hamlet, and farmhouse of a better knowledge of the surrounding objects of nature. In every district school questions are constantly arising, inspired by the natural curiosity of the child, which the teacher has not been able to answer, from the want of means of information in regard to the animals and plants of the State. An interest in nature is almost universal, and its development wholesome and happifying. Hence, the distribution of documents that will enable every one to learn the character and history of the objects that surround him, will prove not only a gratification but a benefit to a great multitude. All this for the educational influence of such reports. Their bearing upon the practical life of our people is not less real, since a knowledge of the habits of the animals that contribute to the support of man, the birds of the air, the beasts of the field, the fishes of the water, will be of great service as a guide in all efforts to increase the productiveness of these sources of aliment."

This volume of the Geological Survey included only reports upon the vertebrate animals but calls attention to the intention that reports upon the lower animals would be forth-coming in later volumes. This expectation was not realized and altho the desirability of a Biological Survey was recognized and urged at various times no systematic work in this connection was undertaken. The many contributions in this line came thru the work of the Experiment Station and from individuals, members of the Ohio Academy of Science or entirely independent workers. Recently, however, and as result of efforts of the State Academy of Science, a Biological Survey has been inaugurated in the University with the co-operation of a number of Ohio Institutions, and it is hoped that means will be available to push forward the studies on the state fauna and flora. Naturally some part of these must be entomological and, since the reports of the Geological Survey and a number of earlier papers have dealt especially with vertebrates, it will be but natural that the groups of insects will be treated as opportunity offers. From the great number of species and the prominence of the group it must result that considerable time and co-operation of a large number of workers will be necessary to make such a study in any degree complete. A Bulletin on the Syrphidæ of Ohio has already been issued and work upon Orthoptera, Spiders, Odonata, Coccidæ, Hemiptera and some other groups is in contemplation or under way.

#### CO-OPERATIVE EFFORTS.

The recent steps toward unifying Entomological work are so freshly in mind that a brief statement only seems necessary to indicate the present status. With the organization of the Agricultural Commission there seemed to be an opportunity for a co-

ordination or correlation of the work in this line carried forward under different agencies, and a conference of the heads of the several departments resulted in an agreement that certain recommendations to the Agricultural Commission would be desirable. Being assured by the Commission that such an effort would be entirely acceptable, a statement of the lines of co-operation which seemed desirable was presented to the Commission and later, on invitation, the whole matter was discussed in conference with the Agricultural Commission with an agreement upon the recommendations made.

The provisions of these recommendations were in brief to provide for conferences and co-operative work among the different Entomological workers to distribute lines of work with reference to securing highest efficiency, to avoid duplications and unnecessary expense in time and travel and to arrange for an annual meeting at which reports of progress, comparison of results and discussion of future projects might be considered. It is under this provision that we meet today in what it is hoped may be only the first of many annual gatherings.

What this co-operation means in the development of Entomological work in the State of course remains to be seen but that it is a basis for more effective and satisfactory work seems certain and as one result of this action we have this meeting and conference and feel very confident that an understanding of the problems being studied by the different individuals will result not only in a greater appreciation of the work being done by others, but will make possible such an interchange of ideas and opportunity for assistance as to stimulate and advance the Entomological work in the state.

It may be noted in a general survey of all of these state activities that whereas twenty-five years ago a single entomologist was responsible for all of the entomological duties of the state, there are now some seventeen different trained entomologists who give a large part of, or their entire time to this particular line of work and it is very apparent to all of us that the entomological problems pressing for solution are just as numerous and urgent today as a generation or century ago.

Another very marked feature is that whereas in the earlier days the work and reports of the entomologist were received with little confidence and even with contempt by most cultivators, the attitude at present is one of anxious attention to everything that can be suggested in the way of practical measures for insect control.



## FORECAST.

The outlook for Entomological work may be considered as never more favorable and the opportunities in this line are strikingly shown in comparison with conditions a quarter century or more ago. My own recollection covers the development of practically all the methods of insect control, dependent upon the arsenical poison methods and fumigation, of quarantine, inspection and largely those measures which are connected with the rotation of crops based upon certain definite conditions in development or habit which make such control possible.

Looking ahead it may be pretty confidently predicted that Entomological Science especially that part which is particularly concerned in the control of injurious insects must undergo a great development and that the recognition of Entomological work must increase from year to year.

Along the lines of development which seem now to be especially promising are those based on studies of insect ecology, insect reactions and migration. While the use of arsenical poisons has reached a high degree of perfection it seems that these should be considered rather as temporary measures and that just as rapidly as possibly they should be replaced by control measures which do not necessitate the use of compounds which present such a degree of danger in their common use. The possibilities in the development of control measures based upon the use of repellants, or baits seem to deserve most careful investigation. This appears to me to be one of the fields in which there is opportunity for most valuable research.

The introduction of insect diseases and insect parasites is another phase which deserves continued investigation. While for some of the forms already tested the results have been discouraging, advantage has been shown in a sufficient number of cases to indicate that further study is needed for the determination of those fungi and bacteria which may be amenable to artificial control and especially the continued experiments with the transportation or introduction of parasitic insects for the checking of species not otherwise readily controlled. Along the line of adjustment of farm and orchard methods there is a large opportunity for more precise determination of the dependence of insects upon certain crop conditions and the adjustment of cultural methods to circumvent insect injury.

Especially along the line of exclusion of menacing insects of other countries there is opportunity for most careful study, a study which should cover the destructive insects of other portions of our own domain, also of adjacent countries and even those which are so remote as to offer little direct opportunity for migra-

tion, since our modern means of rapid transportation offer abundant opportunities for introduction of injurious species thru commerce.

Some idea of the growth of Entomological Science may be inferred from the fact that thirty years ago the official workers in Entomology numbered not more than a dozen while today the number runs up into the hundreds. Something over five hundred are represented in Entomological Societies of this country.

Among the problems which are attracting Entomologists or Biologists there are numerous questions which depend for their solution upon the application of related Sciences. The development of special machinery involves the mechanician or mechanical engineer, the preparation of insecticides is largely chemical, preparation and formation of emulsions is a physical question, while any of the direct problems confronting the Entomologist involve plant or animal physiology in such manner that acquaintance with these branches of Science is almost essential. Furthermore acquaintance with principles of Agriculture and Horticulture lie at the foundation of so many of the methods of control that no Entomologist can feel himself qualified for economic work without some knowledge of these subjects.

It will be noted from this that while Entomologists must be specialists in the study of insects, they cannot by any means ignore general training in Science and Agriculture. The broader their preparatory work in these lines the better equipped they will be to recognize effective methods of application for insect control.

#### PUBLICATIONS.

Among the various Ohio publications which have served for the distribution of entomological matter are the Quarterly Journal and Review, Cincinnati, 1846; Annals of Science, Cleveland, Ohio, 1854; Family Visitor, published at Cleveland during the years 1850-52; Cincinnati Quarterly Journal of Science, 1874; The Ohio State Agricultural Reports; The Ohio Horticultural Society Reports; Proceedings of the Columbus Horticultural Society; The Ohio Farmer; Journal of Cincinnati Society of Natural History; Field Notes (1861); Ohio Naturalist, 1902 to present date; Ohio Geological Survey, 1838 and 1874; Ohio Academy of Science Proceedings, 1891 to date; Experiment Station Reports and Bulletins; Ohio Biological Survey and State Board of Health Reports.

Articles have also appeared in periodicals outside of the state such as Silliman's Journal of Science, The Canadian Entomologist, American Naturalist, American Entomologist, Journal of Economic Entomology, Annals of the Entomological Society of America, Entomological News, Psyche, etc.