

BOOK NOTICES.

THE GYPSY MOTH.—A report of the work of destroying the insect in the Commonwealth of Massachusetts, together with an account of its history and habits both in Massachusetts and Europe. By E. H. Forbush and C. H. Fernald.

This report, a handsome volume of nearly 600 pages, well printed and most copiously illustrated with chromolithographs, photogravures, and wood cuts, gives a full account of the introduction of the now notorious "Gypsy moth" into America by Leopold Trouvelot in 1868 or 1869, traces its history, and records the efforts which have been made to exterminate it by the State of Massachusetts up to the end of 1895. The spread of this insect for the first ten years was remarkably slow, in the light of what we now know of its capabilities for harm. During that period it was not noticed by anyone but the introducer. The first extensive outbreak was in 1889, but for ten years before that it had given great annoyance to the people living in the part of the town of Medford where it was first introduced. It had also spread and had gained a foothold in thirty townships without attracting public attention. Since that time its history is well known. In 1890 the first Gypsy Moth Commission was appointed and the work of fighting the pest was inaugurated. In February of the next year this commission was removed and another one substituted. On 12th of March, Mr. E. H. Forbush, the present very efficient Director of Field Work, was appointed, and on 18th June Prof. C. H. Fernald began his labours as Entomological Advisor. Since that time the work has been pushed on with great energy, and the present valuable report is an outcome of the combined efforts of a practical, energetic manager and a careful scientific entomologist. The two parts of this report, prepared by the above-named officers, are quite distinct and form together a very complete treatise, not only upon the Gypsy moth, but upon the general principles which it is necessary to study when combatting any injurious insect. This carefully-prepared report, therefore, cannot but be for a long time an indispensable book of reference for economic entomologists.

There are in this volume many things which will attract the attention of entomologists. Indeed, it is so full and there are so many different subjects treated of, that even to give the titles would take more space than is at my disposal. The first thing which will be noticed is the adoption of the generic name *Porthetria*. Articles of particular note deal with

the studies made as to the methods of distribution of the Gypsy moth, and the measures practised for the destruction of the insect in its different stages; spraying apparatus; and particularly the care of spraying machinery; methods of pruning; and some charming observations upon insect-eating birds.

The scientific work contained in Professor Fernald's report is of great value and contains a record of most painstaking and patient work. Probably one of the most interesting sections is that which deals with Natural Enemies, in which most excellent work has been done. Prof. Fernald has been aided in this work by efficient assistants, and the whole information so gained has been pieced together by a master hand.

With regard to spraying, some surprising results have been obtained. In the first place, the caterpillar of the Gypsy moth seems to be little affected by applications of Paris green when applied of the strength ordinarily used for other mandibulate insects. Mr. Forbush says: "It became evident before the end of the season of 1891, that spraying, while reducing the numbers of the moth, could not be relied upon as a means of extermination, for many caterpillars survived its effects."

The following conclusion, on page 139, will show entomologists that the matter of controlling mandibulate insects, by means of active poisons, is still a fertile field for careful work, in which useful and laurel-bearing results are still to be reaped:—

"Every effort was made during the spraying season to determine why the results of spraying were not uniform and satisfactory. The feeding caterpillars were watched day and night by many observers. The spraying was most carefully superintended, and the conclusion finally arrived at was that, under ordinary conditions, spraying with Paris green for the Gypsy moth was ineffective and unsatisfactory."

Paris green was on the whole the most fatal insecticide, and when used in the proportion of one pound to 150 gallons of water, did not burn foliage; but with larger proportions, did considerable harm. The injury developed so rapidly that within a short time the leaves were all killed and the surviving larvæ had to go elsewhere to feed. "Therefore, a strong Paris green mixture had little better effect than a weak one. Lime was then used with the Paris green, with a view of neutralizing the burning; but considerable injury to the foliage still continued."

Probably one of the most remarkable facts discovered by the entomologists is related by Prof. Fernald, on page 476, where he says: "One

interesting result obtained from the analyses of the different stages of the Gypsy moth made in 1893 and 1894 is that pupæ and imagoes from caterpillars which have been reared on leaves sprayed with Paris green or arsenate of lead may contain arsenic in recognizable quantities. Several pupæ and a few female imagoes obtained under these conditions, when subjected to chemical analysis, gave ample evidence of the presence of arsenic in their bodies. This shows that the presence of arsenic in the pupa may not materially interfere with the processes involved in the development of the imago. Since, as has been repeatedly demonstrated, moths reared from poisoned larvæ are capable of reproduction, it is also evident that the arsenic contained in their bodies does not injure the reproductive function." With reference to the amount of arsenic which could be consumed by some of these caterpillars, and yet leave them "normally active and healthy," it was found that some of them had in their bodies, in proportion to their weight, an amount equivalent to $12\frac{1}{2}$ times the fatal dose for an adult human being, in proportion to the weight of the latter.

The work of the Gypsy Moth Committee has been criticised, examined and studied by practical men who were entomologists and others who were not. As far as I can learn, the general verdict is that excellent work, and, under the circumstances, remarkably so, has been done. The insect is not exterminated, it is true; but there seems every reason to hope, judging from what has been done and the behaviour of the species in other countries where it was once alarmingly abundant, that this is possible if money be supplied and if it be given at the time when it can be made use of to the best advantage. On pages 38 to 93 of the report will be found an instructive account of the constant efforts of the committee to get funds to carry on the work properly, and year after year it was the same story of reduced, and what was almost worse, delayed, appropriations, resulting in the necessity of modifying the whole plan of work arranged for the year; so that instead of making vigorous efforts for the extermination of the insect, and fighting it at the time this could be most effectively done—early in the season when the caterpillars were small—all that could be done was to try and prevent the further spread of the enemy from the localities known to be infested. The appropriations which have been made for this work are considerable, about \$525,000 up to the present time, and this amount would certainly have produced far better results could the committee have obtained the grants

at the time they required them, so that they could have begun the work early in the season and continued employing, from year to year, those assistants who had been taught, at an expense of much time and trouble, what was required of them.

J. FLETCHER.

Mittheilungen aus dem Roemer-Museum, Hildesheim. No. 6.—Juni, 1896. DIE SATURNIIDEN (Nachtpfauenaugen), von A. Radcliffe Grote, A. M.

This paper of 28 pages is illustrated by three plates and eighteen cuts. The illustrations are from photographs of living moths and are remarkably fine. The author defines the superfamily Saturniides and gives a table separating the families and a number of genera. The value of this table is unfortunately vitiated by the curious spacing, which renders it practically impossible to follow it.

The Saturniides are divided into two families, and each of these into three subfamilies. The Endromidæ, Bombycidæ, and Lacosomidæ are shown not to belong to the group, principally on larval characters. The relations of the Sphingidæ are also briefly discussed. Following are remarks on parthenogenesis and hybridization in the group, a discussion of the subfamilies adopted, geographical distribution, nomenclature, certain corrections to the author's previous paper on the Apatelidæ, and a list of European and North American Saturnians.

No fault is to be found with the classification which the author has worked out, regarded as an artificial grouping. A certain character of venation is selected (position of vein IV, on primaries) and the groups referred strictly by this character. A natural classification, which should combine several such special ones, is not attempted. As compared with the reviewer's classification on larval characters, the position of the groups represented by Hemileuca and Aglia are transposed. Mr. Grote must, therefore, suppose that the larva of Aglia is derived from a Citheronia type independently of the Saturnia branch. The larva should have re-acquired the pair of anal tubercles which are already entirely lost in Citheronia, and lost the unpaired tubercle on joint 13. He must also suppose that the stinging spines have been twice separately evolved in the group. On the other hand, to reconcile his grouping with mine it is only necessary to suppose that vein IV, has moved toward IV₁ in Hemileuca separately from the types of Attacus and Saturnia, where this process is congenital.

HARRISON G. DYAR.

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