X. *Some Account of the Musca Pumilionis of Gmelin's Edition of the Syst. Naturæ. By William Markwick, Esq. F. L. S. With additional Remarks by T. Marsham, Esq. Sec. L. S.*

Read Nov. 1, 1791.

EARLY in the course of the last spring some fields of wheat in the neighbourhood of Battle appearing to be much blighted, a friend of mine discovered it to be caused by a small insect of the grub or caterpillar kind, lodged in the centre or very heart of the stem, just above the root. About the latter end of March I procured some of the wheat, examined it, and found in most of it a small larva or caterpillar alive; but in some it was already changed into the chrysalis state.

Being exceedingly anxious to determine the species of this apparently destructive animal, I planted some of the diseased roots in my garden under a hand glass, where they flourished very much, and threw out strong shoots on each side (the middle shoot withered); but whether the flies escaped through some hole in the glass, or whether they were devoured by a colony of ants which made their nest under the glass, I cannot tell, as I did not succeed in this attempt; for when I pulled up the wheat and examined it, there was an empty chrysalis in each plant. However, I had better luck in my next attempt: I placed several of the diseased roots of the wheat in a small flower-pot filled with bran, and covered it over close with gauze, in such a manner that no insect could get in from
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the outside, nor could any escape from within. On the 14th of May three small flies were discovered sitting on the inside of the gauze. [See tab. 15. fig. d, D.] A few days after three more of the same flies appeared; there were in the flower-pot of bran six roots of diseased wheat, which produced six flies: on examining the roots afterwards, I found an empty shell of the chrysalis in each, so that I think there can be no doubt of the identity of the insect in question.

I mentioned that the larva and chrysalis were always found deposited on the principal stem just above the root. This stem it invariably destroyed, which gave the crop a most disastrous appearance, so that there was scarcely a hope of any produce: but after the larva had changed into its chrysalis state the mischief ceased, and the root was not so materially injured as to prevent its throwing out fresh shoots on each side, or stocking itself as the farmers term it; as I experienced by those which I planted in my garden.

In short, at harvest time I was most agreeably surprised to find a good crop of wheat, and the ears large and fine throughout the whole field. My friend thinks it the best crop on his farm, and supposes he shall have about three quarters and a half of threshed corn from each acre.

I hope some other gentlemen of the Linnean Society have had opportunities of making their observations upon this subject. I do not pretend to any very great skill in Entomology; I only relate facts, and have endeavoured to be very accurate in stating them.

During my observations upon this insect, a variety of thoughts suggested themselves to my mind. It was hinted to me, that possibly this was what has been called the Hessian fly, whose depredations in America have been so notorious. If so, a little good English husbandry, by keeping the ground in heart, and thus enabling the wounded shoots to repair themselves by strong lateral ones, prevents our being alarmed to so great a degree. I had my doubts how and
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what time the egg of the caterpillar was introduced into the field. It was imagined it might have been carried on in the manure; but the only manure applied to this field was lime, and I do not understand that to be the receptaculum of any of the genus of musca. The kind of wheat sown was a white wheat, lately introduced here from Surry: my friend could not recollect with certainty its name, but thought it was called white Zealand wheat. None but what was sown early, about the latter end of September, or the beginning of October, was affected by this insect; and in one field, where a part of it was early sown with white, and the other with red wheat at the same time, the white wheat was much affected, and the red but very little. The reason why the early-sown wheat only was affected is, I should imagine, because the cold at the approach of winter destroyed the fly before the late-sown wheat was sprung out of the ground: consequently it could not lay its egg in that.

The soil is rather stiff with a gravelly bottom. I shall be very glad to meet with the observations of some other of our scientific friends. I can scarcely flatter myself that our investigation of this insect will be productive of so much benefit to the public, as to find out a remedy for the evil by destroying it effectually; but it is with some such view that I trouble the Society with these observations.

I have made as accurate a drawing as I was able of the insect in all its stages of growth, and the situation in which it is found in the principal shoot or stem of the plant.

CATSFIELD,
Aug. 29, 1791.

EXPLANATION of TAB. 15.

- a. The caterpillar of its natural size, as it is found in the centre of the green wheat just above the root.
- b. The pupa in the stem.
- c. The pupa of its natural size. C. the same magnified.
- d. The fly of its natural size. D. the same magnified.
- E. The wing magnified.

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Musca pumilionis.

IN addition to the foregoing accurate and valuable observations of Mr. Markwick, it may not be improper to observe, that the larva of this fly was sent several months since, with some of the roots of wheat that were attacked, to Arthur Young, Esq. who being apprehensive that they were the larva of the Hessian fly, sent the roots of wheat to Sir Joseph Banks, enclosed in a glass phial, for his opinion. Upon examination, it was found that the insect was still in the stem or principal shoot of the plant, in its pupa state. These being carefully preserved, the fly appeared in a few days; and Sir Joseph Banks determined it to be the *Musca Pumilionis* of Gmelin's *Systema Naturæ*, and by letter communicated this information to Mr. Young, accompanied with an engraving of the fly, both of which were published in the 91st number of the *Annals of Agriculture*.

The following description of the fly is given by Gmelin, taken from the *Swedish Transactions*.

Musca Pumilionis—nigra, subtus, capite, thoracisque duabus lineis flavis, halteribus albis, pedibus cinereis apice nigris.

Habitat, larva, capite acuto apice nigro, in *Secalis culmis* adeo incremento eorum noxia, ut vix 1, 2, 3 pollicum altitudinem assequantur.

An account of this fly and its destructive properties was first published in the *Transactions of the Royal Academy of Sciences at Stockholm* for the year 1778, by Mr. Ol. Bjerkander, who discovered it on the young shoots of the rye in the month of May, at the lowermost joint, which stopped the growth of those shoots, and made them appear as dwarfs; which circumstance suggested the name *Pumilionis*. He describes the larva to be white, two lines in length, composed of 10 rings, the head pointed at the

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end, black, and resembling a V. They passed into their pupa state the 25th of the same month. The pupa was yellow, shining, rather more than one line in length, and composed of rings.—The flies appeared the 12th of June and the following days; the perfect animal is well described above.

At what time these eggs are deposited in the rye, that gentleman observes, is not yet determined. The larvæ were small on the 23d April, and full grown the 25th May: on the sides of the stems were seen no holes, from whence he conjectures that the eggs or larvæ must enter at the top of the leaves. The fly, when hatched, forces its way upwards, and flies out of its nest.

The dwarf stems Mr. Bjerkander observed began to grow yellow and decay the 14th June, and were in such abundance, that in some fields, 8, 12, or 14, were found in a square of two feet; from whence he concludes that great injury is done to the rye, and strongly recommends that the stems should be pulled up and burnt, while the insect is in the larva or pupa state; and by this means he thinks one or two persons might destroy many thousands of them in a day, he himself having picked up 350 stems in a few hours.

It will certainly be a pleasing satisfaction to the public in general, and to the farmer in particular, to know, that this insect is not the Hessian fly of America; and also, from the careful experiments of Mr. Markwick, to find that its destructive properties are not of that magnitude as were at first apprehended, or as Mr. Bjerkander supposed; though perhaps an increase of the fly may render it a formidable enemy. It is therefore much to be wished, that such gentlemen as have leisure and opportunity would pay some attention to this subject, and, with Mr. Markwick, pursue his experiments with a view to discover all the particular properties and natural œconomy of this animal. Now, as this fly is bred here so early as May, it is probable there is more than one brood in the year; for having been favoured with two or three of the flies by Sir Joseph Banks,

Banks, I find that they are not uncommon, having frequently found them in autumn on umbelliferous plants; and insects of this order seldom live so long in their perfect state, and are rarely seen abroad so late in the year as the latter end of October: indeed, if there are two breeds in the year, a question will arise, upon what plant is the second brood nourished? for wheat sown the latter end of September, or the beginning of October, must be some time before it appears above ground. And yet I cannot believe that the egg is carried there either by manure or by any other means than by the parent fly, from this singular property, that only one larva is found on each plant, and that always in the principal stem; for although the Muscæ in general deposit a number of eggs in one spot, it is always where plenty of food is at hand to nourish the young larvæ immediately on their being hatched. I am therefore desirous to offer the following hints for observation, hoping that some gentleman will take up the subject, and examine it still more closely. When it appears evident that a fly has attacked a field of wheat, rye, &c. watch carefully the animal through all its stages, but more especially when the fly takes wing, observing on what plants it settles, and whether it is partial to any particular plant; and if this can be determined with precision, attend to see it deposit its eggs, carefully examining whether it lays more than one at a time. If afterwards the larvæ appear on those plants, observe in what manner they feed, continuing the remarks till the perfect insect appears, when it must be again watched with attention, and traced to its next place of depositing its eggs, to determine whether wheat or rye be its natural food in spring, or whether its attack on these plants be only in particular seasons when its own natural food may have failed; for Mr. Markwick takes notice, that it was only the early sown wheat that was affected.

From the foregoing observations of Mr. Markwick, that the

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diseased plants, instead of being lost, produced a number of lateral shoots, and the crop in the field of wheat in which the fly had made some havock turned out exceeding well, it follows that Mr. Bjerkander's advice of picking up and burning the stems that are infested, would be highly prejudicial; but perhaps pinching the central leaves, just above the crown of the root, where the insect is usually found, might effectually destroy it, and leave the plant in a state to throw out its lateral shoots. If, however, a method could be discovered to destroy the parent animal, it would certainly be the most efficacious.

Nov. 1, 1791

THOMAS MARSHAM.