XIX. *Further Observations on the Wheat Insect, in a Letter to the Rev. Samuel Goodenough, LL.D. F.R.S. Tr.L.S. By Thomas Marsham, Esq. Sec. L. S.*

Read February 6, 1798.

DEAR SIR,

THE very imperfect knowledge that we gained of the wheat insect in the year 1795, which through you was communicated to the *Linneæan Society*, who have honoured it with a place in the Third Volume of their *Transactions*, has stimulated me to pursue the enquiry with greater earnestness, though not with additional zeal; for it has always been my invariable opinion, that the enriching of a cabinet with the works of the creation is but a secondary consideration at best, and of little utility, unless an endeavour to investigate their nature, œconomy, and properties, be provoked by it. Indeed I often lament, that my situation in the metropolis, and the few opportunities I have of enjoying the country, prevent me from pursuing my favourite study as fervently as I could wish. In the present case I consider myself only as the first institutor of an enquiry that has become important by the persevering assiduity and accurate examination of our mutual friends, to whom I was so much indebted in the former case. Early in June 1797, I wrote both to Mr. Kirby and Mr. Markwick, requesting that they would again turn their attention to the wheat fields, and examine the ears of that grain as they advanced, from the first appearance of

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of the flower, until the seed was ripe; and the result of their unre-mitted endeavours, with a few of my own observations, I now lay before you, requesting, that if you think them worthy their atten-tion, you will present them to our valuable Society; for such I think it may be truly styled, since the opinion of the Public has so fully stamped its consequence.

Mr. Markwick, in a letter to me dated the 17th July 1797, states as follows:—"On the 12th of this month I first discovered some of the little flies (which I send you inclosed) sitting between the husks or clefts of the ears of wheat: the next day they ap-peared to me more abundant; and then, for the first time, I found a few of the small yellow larvæ, which infested the wheat in the year 1795, sitting close to the stamina, exactly as they are repre-sented in the 3d vol. of the *Linneæan Transactions*, page 251. Tab. 22. fig. 10. a; since that time I have found the larvæ in much greater abundance, and the fly is also to be seen, though I think not in such great numbers. The other insects which I have discovered on the wheat, are the *Thrips physapus*, in its larva and perfect state, as in the year 1795; and some of the ears were infested with the plant louse (*Aphis*) called here the Dolphin." On the 25th of July, I received also a letter from Mr. Kirby, that contained some valuable hints, which induced me to send a copy of it to Mr. Mark-wick; and on the 17th of September I was favoured with the fol-lowing letter from that gentleman:—

"I want words to express the pleasure I received from your last let-ter, as well as from your obliging communication of that of your very ingenious and learned friend Mr. Kirby, and should have acknow-ledged the obligation sooner, but waited until the end of harvest, with the ill-founded hope of having something to communicate re-lative to our little insect worthy of your notice; for I am sorry to say,

that I have not had any success in discovering the perfect state of this insect: however, I will relate exactly what has happened.

“ I inclosed several ears of wheat, containing a number of the small yellow larvæ, in a flower-pot, closely stopped at the bottom, and covered with gauze at the top; and have at different times found dead, at the bottom of the pot, two different sorts of very small flies, one of which was a short thick black fly, with very long transparent wings, and long slender smooth antennæ, of which I have sent two rude figures somewhat magnified, see Tab. xix. No. vi. fig. 1. a and b. The other fly was as minute, if not less, with a yellow body, spotted and transparent wings, and long jointed antennæ, beset with small hairs or bristles at each joint, at least so they appeared to me through a magnifying glass; but that you may, if you please, examine them yourself, I have sent two along with the others, being all that I found of that kind, though I fear they are not in a good state; and I have also inclosed such figures as I was able to make of them, see Tab. xix. No. vi. fig. 2, a and b. To your learned friend's question as to the quantity of mischief done by this unknown fly, I fear I cannot give a satisfactory answer: I certainly think his average of two grains in each ear destroyed by this insect not too great, for I scarcely examined any ears in which there were not more than that injured. But, after all, are not our fears with respect to the injury that the wheat has received from this insect greater than they ought to be? and does not the wheat suffer as much from insects or some other cause every year, even in those years that are most productive?

“ By what I can learn from enquiries, and from my own observation, there is a good crop of wheat in this neighbourhood: one farmer, who has begun to thresh out his wheat, has found it yield well; and when in my own field I had the curiosity to rub out a few ears,
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and to count the number of grains in each, in none I found fewer than forty, and in one sixty-two; nay, my servant found one with seventy grains, most of which were perfect, there being only three or four shrivelled in each ear—a proof, I hope, that notwithstanding the depredations of this and other insects, the crop will not turn out deficient.” In another part of his letter, Mr. Markwick, with great probability, conjectures, “that these larvæ may feed on the farina, or male dust of the stamina, and possibly prevent the proper fertilization of the pistil in such a manner as to occasion the future grain to be shrivelled and imperfect.”

In addition to the foregoing remarks, I can only subjoin a few observations of my own on the ears of wheat sent me by Mr. Markwick, and let Mr. Kirby's accurate and valuable experiments follow as a separate paper. On close examination of a number of ears, I found from two to six grains inhabited by the larvæ, as represented in Tab. 22. fig. 10. a. in the 3d vol. of the *Linneæan Transactions*, except that the number of the larvæ was greater in many of them, and in one or two I found what appeared to be a pupa. Having inclosed several of those ears in large phials, with gauze over the mouth, I soon perceived that they became covered with mould, and the larvæ quitting them fell to the bottom of the phials and perished. I then procured one of the chimnies made use of for Argand's lamps, in which I inclosed some other ears, covering each end with gauze: by this means a free circulation of air being permitted to pass through, the corn remained clean, and the little animals have not quitted their situation; which leads me to conclude that they will change into the pupa state, as many appeared to have done that were left in the box in which they came, so that I have great hopes of breeding the fly at the proper season of the year, which I presume is now approaching. The figure from Mr. Markwick's drawing, represented in Tab. xix. No. vi. fig. 2, agrees in general with the description of *Tipula*

Tritici of Mr. Kirby, and perhaps may prove to be the different sex; or it is possible that Mr. Kirby might have taken his insect immediately on its quitting the pupa state, and before the wings were completely dry, so that the obsolete clouds with which they are marked had not become visible. The manner in which both these Gentlemen met with this fly leaves very little doubt in my mind of its being the true parent of the larvæ we have described; and this opinion is very much strengthened by the very great affinity there seems to be between our *Tipula* and the *Tipula Juniperina* of Linnæus, and *Tipula Pini* of the Baron De Geer, Tom. vi. p. 417. Tab. xxvi. fig. 8—19; it however differs in colour from the Latin descriptions of those insects, although it agrees in the other particulars. But the long French description which De Geer gives of *Tipula Pini*, varies very little from that of our insect; and the figure, being uncoloured, would pass for it very well, as the antennæ and wings seem exactly to correspond: even the account of the larva is nearly the same, except that he remarks a thin green line passing through the body of his, which he conjectures to proceed from the food, viz. the leaves of the pine; if this be the fact, such a line would not be visible in our larvæ, as they feed on the pollen of the wheat, which is nearly their own colour: another difference is, that the larvæ of *T. Pini* form little resinous cases to preserve themselves during the Winter; but both continue unchanged until Spring, as appears by Mr. Kirby's opening one of the cases, which he supposed contained the pupa, and finding the larva unchanged, from which I conclude that we have not yet seen the pupa. The flies of *T. Juniperina* and *T. Pini* do not come forth until May, which time will exactly suit our little animal for depositing its eggs in readiness for the blossom of the wheat; and from the appearance of some of the little cases which I have by me, that are so transparent as to admit of a perfect view of the larva, I am of opinion that they are approach-

ing to the pupa state, as the maggot becomes more white and opake, and is evidently shrunk in length. Another circumstance mentioned by the accurate De Geer, that unites them still more closely, and confirms my conjecture of the two sexes, is the difference between male and female; for he says, *Fœminæ alæ nigricantes*, agreeing with the clouded wings in our figure, and at the same time confirming Mr. Kirby's description of his. In short, so nearly are these insects allied, that I should have little hesitation to pronounce them the same, had they not fed on plants so very different in their nature and properties. The *Ichneumon Tipulæ* of Mr. Kirby has been so fully observed by all parties, that it requires nothing to be added here. I can only now observe, that the difficulty of investigating and fully exploring the secret works of the Creator must be my apology for still offering imperfect hints instead of a complete history, but I have done so with a view to excite other labourers to favour us with their communications and experiments; for, to use the words of my valuable friend Kirby, "If we can advance one step, it is something; and who can entirely remove the awful veil that conceals from mortal eyes the full beauty of the face of Nature, that envelopes in darkness her secret operations? To get now and then a glimpse of the footsteps of him who is 'wonderful in working' is all that we can expect. The united force of such observations, like rays collected by a lens, which, although when separate they operate but slightly either as light or fire, will in time illuminate a subject, and make us see clearly in what darkness we were before. To collect these separate rays is the office of the *Linneean Society*, by whose means the light which each conveys is caught ere it be dissipated, and thus many mysteries of Nature are elucidated, which otherwise might for ever have remained in obscurity."

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