

XXIII. *Observations on the Insects that infested the Corn in the Year 1795.*
In a Letter to the Rev. Samuel Goodenough, LL. D. F. R. S. Tr. L. S.
By Thomas Marsham, Esq. Sec. L. S.

Read May 3, 1796.

DEAR SIR,

TOWARDS the end of July last, a friend of mine (Mr. Long) who had the management of a farm in Hertfordshire, was telling me that an insect had made its appearance among the wheat, which threatened to do much mischief; that it was found, in many instances, to have attacked one, two, or more grains in an ear; and that it was discoverable by those grains appearing yellow, or as it were ripe, while all the remaining grains in the same ear were perfectly green.—I desired that gentleman to bring me up some of the diseased ears, which he did; and I found them exactly as he had described them.—On opening those grains that seemed diseased, I found in many of them an orange-coloured powder, and in several, one or two very minute *larvæ*, differing in colour, from a yellowish white to a deep yellow. They were too minute for examination by the naked eye; but by applying a deep magnifier I perceived them to be the *larvæ* of a small *musca*, and to resemble very much those aphidivorous *larvæ* that produce one particular family of the *muscæ*. They were thick at one end, and gradually diminished to a point at the other, where the head was situate. They extended and contracted themselves at pleasure; to which was
added

added a leaping motion, frequently jumping full half an inch from the paper on which I examined them. The grain where these insects had possession appeared a little thrunk. Besides these *larvæ*, I frequently met with the *Thrips physapus* running about between the husks, and also several very small *Ichneumons*, one of which settled upon a *larva* while under my glass; and I saw it repeatedly wound the little maggot with its tube, and I have no doubt it deposited its eggs. This was seen also by Mr. M^cLeay, F.L.S. who was examining them with me.—I placed this wheat in water, and Mr. Long continued to supply me with fresh ears every week; and also, at my request, tied some gauze round several of the diseased ears, while growing in the field, which stood until the corn was ripe; but I was not able, with all my care, to discover the fly produced from the before-mentioned *larva*. Anxious, however, to determine, if possible, the history and progress of this little animal, which now seemed to create universal alarm; and knowing that my various avocations would prevent my quitting London; I had written, on the first hearing of the insect, to several of my friends who reside in the country, and to you among the rest, requesting their particular attention to this subject, and the result of that application I now give you.—From the observations you were enabled to make, you will remember that you had observed only the *Thrips physapus*, which you concluded to have been the insect, if it was an insect which did the mischief, although you could not discover any material injury that had occurred.—From our truly valuable friends Wm. Markwick, Esq. of Catsfield, near Battle, and the Rev. Wm. Kirby, of Barham, of whose accuracy and attention to this subject we have both received very convincing proofs, I received the following accounts.

Mr. Markwick, in his letter of the 9th of August, says: “I repaired immediately to my wheat fields on receiving your letter,

“ and gathered such as I thought appeared to answer best to your
 “ description of diseased ears, and brought them home for investigation. From your account of the destructive properties of this
 “ little insect, I expected to find it buried in the very heart of the
 “ grain, after having eaten its way thither ; but, to my great satisfaction, no such thing has yet occurred ; and, from what I have
 “ hitherto observed, I have great doubt with respect to its *destructive*
 “ *properties*. This opinion may perhaps surprise you ; and my own
 “ future observations, as well as those of your more skilful and
 “ learned friends, may possibly prove me in an error ; but my reasons for thinking so at present are, that when in the field the crop
 “ appeared to be very fine, and I had great difficulty in finding any
 “ ears that I supposed to be diseased. In some few ears I found the
 “ insect lodged between the husks or outward scales of the *calyx* ;
 “ nay, even in those where I found the insect, the grain itself did
 “ not appear to have received any injury, only the husk seemed
 “ rather discoloured. I think I have discovered this little insect
 “ both in the *larva* and *chrysalis* state ; but it is so minute, that I
 “ will not be positive whether what I took for the *chrysalis* was not
 “ a dead insect. I have placed all that I have yet found in an open
 “ box, along with some ears of wheat, and covered it with fine
 “ gauze, to prevent the fly, or perfect insect, from escaping, when it
 “ comes forth. If I should be so fortunate as to succeed in this,
 “ or can make any further observations towards investigating the
 “ natural history of this little animal, you may depend on hearing
 “ from me again. It is with great pleasure that I can, I believe
 “ with truth, inform you, that our wheat in general is very fine
 “ this year, the grain large and full, and a prospect of its yielding
 “ well when it comes to be threshed.”

In a letter dated Oct. 1, 1795, the same gentleman adds, “ I was
 “ in hopes that I should have been able to trace the minute insect

“ which was lately found in the ears of wheat, through all its
“ changes; but am sorry to say that my researches have not been
“ attended with that success I could wish. I have never met with
“ it in the state of a small *white larva*, as you describe it to be at
“ first. But whenever I have seen it, its first state was a very small
“ *caterpillar* or *larva*, of a bright yellow colour, which had neither
“ legs, antennæ, nor wings (See tab. 22, fig. 1 and 2), and which
“ changes into an egg-shaped *chrysalis* of the same colour (See tab.
“ 22, fig. 3 and 4).

“ In my former letter to you, I speak of this *larva* as being found
“ only between the outer husks or scales of the *calyx*. But this is
“ not always the case; for I have since found it between the *corolla*
“ and the grain, and even on the grain itself; but amongst the vast
“ number of grains which I have examined, I could never clearly
“ discover that this insect had eaten into any of them. I have fre-
“ quently found it sitting on fine full grain, which did not appear
“ to be injured in the least. Sometimes indeed I found it on grain
“ that was blighted, or shrivelled; but even then I could not dis-
“ cover that it was eaten by the insect. In those ears where I
“ found these insects (to the number, perhaps, of two or three,
“ seldom more, in one ear), the grains were in general full, and not
“ eaten at all. In one ear, containing 33 grains, I found four of
“ these insects, three of them on one single grain; yet neither that,
“ nor any of the other grains in the same ear, was eaten in the
“ least. In short, from all that I have been able to observe, I am
“ persuaded that the wheat has received no damage from these very
“ minute insects; for, being so minute, they must abound in im-
“ mense numbers to do any material mischief, even supposing them
“ to feed on the grain; neither of which is, I believe, the case:
“ for their numbers were, comparatively speaking, small; in most
“ of

“ of the ears which I examined, none at all. And when I did find
 “ them, there were but few, and these few had not, that I could
 “ discover, fed on or injured the grain. Since the harvest has been
 “ got in, I have found the same insect in the husks of the wild
 “ bearded oats (*avena fatua*), but have not yet seen it in its fly or
 “ perfect state. Should that happen from the *chrysalides* in my
 “ possession, you shall hear from me again.—Amongst the ears of
 “ wheat I found several small black flies (as they appeared to me),
 “ and imagined that they were produced from the above-mentioned
 “ small yellow *chrysalides*; but on consulting our very accurate
 “ friend Dr. Goodenough, he convinced me that this small black
 “ fly was the *Thrips physapus* of Linnæus; and that a small yel-
 “ lowish transparent insect, with 6 legs and 2 antennæ (found
 “ also amongst the wheat), was its *larva* (See tab. 22, fig. 5, 6,
 “ 7, 8).”

Mr. Kirby's communication to me on this subject was in a
 letter dated August 27, 1795, wherein he says—“ You ask me
 “ to make enquiries concerning the insect which has infested
 “ the *wheat* this summer: what follows is the result of those
 “ enquiries, which I hope will give you satisfaction. Before I
 “ had received your letter I had paid some slight attention to the
 “ subject, being informed of the circumstance by some intelligent
 “ neighbours; but your request added a stimulus to my endeavours,
 “ and I flatter myself that the result of my researches will prove
 “ clear and satisfactory. I had from the first suspected the insects
 “ to be the *Thrips physapus*, a species very common every summer,
 “ and, after the closest investigation, my suspicions are turned into
 “ conviction. I examined a great number of ears, and in them
 “ found this insect in all its states, between the *interior valve* of the
 “ *corolla*

“ *corolla* and the grain. It takes its station in the longitudinal fer-
 “ row of the seed, in the bottom of which it seems to fix its rostrum;
 “ probably sucks the milky juice which swells the grain, and thus
 “ by depriving it of *part*, and in some cases perhaps the *whole*, of its
 “ moisture, occasions it to shrink up, and become what the farmers
 “ in this part of the world call *pungled*. If your correspondent in
 “ Hertfordshire means the same insect, he is mistaken in asserting
 • “ that only a single grain in an ear is injured by it. I have myself
 “ seen ears in which a *fourth part* of the grain was destroyed, or
 “ materially hurt.—I have frequently seen two of the insects upon
 “ a single grain, and am told that sometimes more are observed.
 “ What is singular, when I met with them on the grain in the
 “ *imago* state, they were often in *pairs*, one of which was *apterous*.
 “ These I take to be the sexes. I once found a large species *and*
 “ *aculeato* (*Thrips aculeata* Mus. Kirby) in which the same distinc-
 “ tion takes place. The *larva* of *Thrips physapus* is yellow, has six
 “ legs, which, with the antennæ and head, are black and white.
 “ Sometimes it is all yellow. It is very nimble in its motions, and
 “ although brought away in the grain, soon makes its escape.—
 “ The *pupa* is whitish, with black eyes, and wings apparent. It is
 “ very slow and sluggish in its motions. The *imago* it is needless to
 “ describe; it is so like itself in every state, that it is impossible to
 “ mistake it. There was an orange-coloured powder in every grain
 “ in which the insect was found, which I imagine is its excrement.
 “ All the farmers that I consulted respecting it agreed in saying
 “ that it did most mischief to the *late* sown wheats, and that such
 “ as were sown early received little or no injury. This I think very
 “ probable; for when the grain is arrived at a certain degree of
 “ hardness and consistency (which perhaps was the case with the
 “ early sown wheats, before the insect made any material attack),
 “ I suppose

“ I suppose it is not liable to be hurt. Linnæus says of this insect,
 “ ‘ *Spicas fcales inanit*,’ but nobody seems to have apprehended the
 “ injury it is capable of doing to wheat. An intelligent farmer,
 “ who first pointed it out to me, assured me that he was firmly
 “ persuaded that it was this insect which occasioned what was called
 “ the blight last year, which was the cause of so defective a crop.
 “ The part of one field that I examined, and which was particu-
 “ larly injured, was to the north of a high edge; but the above-
 “ mentioned farmer informed me that he had found them plentiful
 “ in a very *open* country. To me they appeared more injurious in
 “ the *heavy* than in the *light* lands. Last year the bearded wheat
 “ (called by our farmers *clog-wheat*) escaped with the least injury;
 “ but this year, as far as my information and observation went,
 “ it was the most injured. I observed in one or two instances
 “ the *Forficula auricularia* upon the ear; and upon examining the
 “ grain, each time, to which it had applied itself, I found upon it
 “ the *Thrips*. Query:—Does it not devour them? Gmelin has a
 “ species of *Thrips* under the name of *Thrips rufa* (*Gmel. Syst. tom. i.*
 “ *pt. 4. Thrips 10.*) from a German writer (*Gleichen, Neues im Reiche*
 “ *der Pflanz.*), which I suspect to be the *larva* I have been describing,
 “ or perhaps the *pupa*, which he says ‘ *habitat in tritici spicis*,’ and
 “ adds, with a query, ‘ *An forsan larva minutissima?*’ The only me-
 “ thod which can be serviceable to prevent the ravages of this
 “ insect is, to sow the wheat early. It is probable that it does con-
 “ siderable damage *every* year, as it is a very common insect. Nor
 “ do I imagine it has been more injurious than usual in the present
 “ year, only the scarcity has excited people’s attention to every
 “ thing that might hurt the grain. I found three other distinct
 “ insects, in the *larva* state, upon the wheat, but in no quantity; two
 “ of which escaped me, but one I had an opportunity of describing.

“ *Larva*

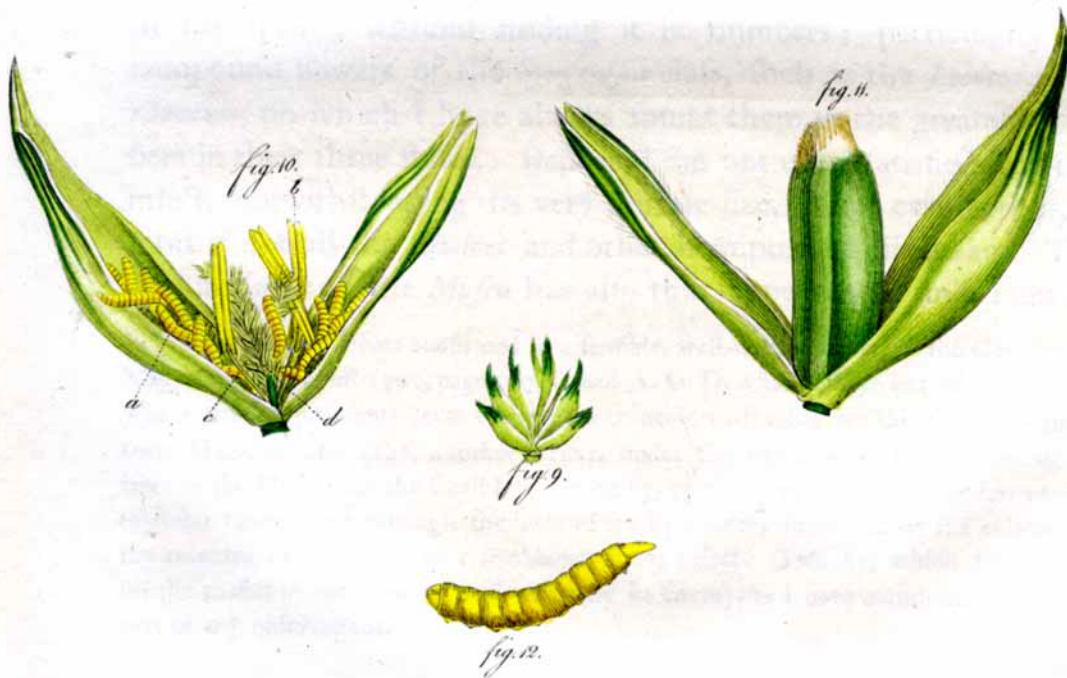
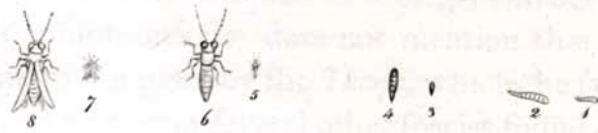
“ *Larva* citron-coloured, without feet, head acute, tail truncated,
 “ margined with a plicato-papillose margin; length three-fourths of
 “ a line. This species I found between the corolla and the grain.—
 “ Of the other two, the one was lodged in the kernel, and the other,
 “ which was a long (about five lines) hexapod, very swift, devoured
 “ it with extreme voraciousness. This is all I have been able to
 “ collect upon this subject; and I wish it may prove satisfactory to
 “ you and the Linnean Society, and serviceable to the public. We
 “ cannot help reflecting, on this occasion, what seemingly small and
 “ insignificant creatures may, in the hand of Divine Providence,
 “ become the causes of the most alarming visitations; and, if allowed
 “ to increase to a certain pitch, almost of the destruction of the hu-
 “ man race.”

From the observations and accurate investigation of my friends above mentioned, it should appear, that very little damage to the wheat is to be dreaded from the havock of the insects they have described. It is, indeed, rather unfortunate that none of us could succeed in breeding the fly, which the small larva, remarked by us all, is destined to produce.—From Mr. Kirby's letter, and the remarks of the farmer, the *Thrips physapus* is the insect that is supposed to do the mischief; and this seems confirmed by the great Linnæus, and also by Gleichen (in a French work on the microscope) quoted by Gmelin, and to such authorities it is with the utmost diffidence I hazard a contrary opinion. I cannot, however, help stating that opinion, being persuaded that the attachment of this minute insect to the grain arises from the grain being first in a diseased state, of which the orange-coloured powder, called by many farmers the *red gum*, seems a proof. For this powder, you informed me, was not the excrement of an insect (as I had supposed), but the farina or seed of a small *Lycoperdon* of Linnæus, or *Æcidium*

of later authors, which attaches itself to decayed leaves, &c. The *Lycoperdon* itself is very minute, and before its bursting has the appearance of a flattish, smooth, irregular, yellow exudation, or gum*. The first step towards putrefaction, either in plants or animals, is a well-known invitation to numerous kinds of insects; and therefore the shrinking of the grain, or the abortion, alluded to by Linnæus when he says *Thrips physapus* "*spicas secales inanit*," may have arisen from some other cause than the depredation of insects.—Gleichen, who was in search of microscopic objects, and consequently turned his attention to the singular and elegant structure of the various parts of minute insects, does not mention that the smallest injury was done to the grain by the *Thrips*, which, he says, "*habitat in tritici spicis*," and he figures several other species found on different flowers. That wheat is not the only plant on which the *Thrips physapus* is to be met with, must be evident to every entomologist; for it is scarcely possible to gather any flower during the whole summer, and even in the spring, without finding it in numbers; particularly the compound flowers of the *Syngenesia* class, such as the *Leontodon Taraxacum*, on which I have always found them in the greatest numbers in their three states. Besides, I am not quite satisfied that this insect, notwithstanding its very minute size, is not carnivorous, as most if not all the *Cimices* and other hemipterous insects are. The minute *larva* of the *Musca* has also that appearance; and, I am in-

* This opinion seems confirmed in a sensible, well-written letter, in the Gentleman's Magazine for August 1795, page 627, signed A. O. O. which I have but very lately seen. The writer's sentiments seem entirely to coincide with mine on this subject.—In the same Magazine and page, another writer, under the signature C. takes notice of the larva of the *Musca*, and the small *Ichneumon* fly, of the former of which he has added a tolerable figure: but although the body of the fly conveys some idea of the animal, yet the antennæ and legs bear no resemblance to any insect. This fly, which he mistakes for the parent of the larva, is most assuredly its enemy, as I have mentioned in the first part of my observations.

clined



clined to think, feeds even on the *Thrips*, which has been one principal reason why we could not breed it.—Mr. Kirby, indeed, mentions that one of two insects which he saw, beside those particularly described, was devoured voraciously by the other, which was a hexapod, and therefore very probably a *Thrips*, or at least an hemipterous insect. The *Forficula auricularia*, which Mr. Kirby also met with on the wheat, I presume, from many observations I had an opportunity of making about two years since, is not carnivorous, having seen it devour various species of culinary plants with great avidity. Its time of feeding is about midnight.

Having communicated to Sir Joseph Banks my thoughts on the subject of these insects, he shewed me, and kindly permitted me to make use of an elegant drawing (See tab. 22. fig. 9—12) which he had directed to be made from some wheat sent him from Yorkshire. This drawing seems to open a new field in the entomological science.

FIG. 9 represents a spicula of the *Triticum hybernum* of its natural size.

FIG. 10 is a flower expanded, and highly magnified.

- A. A cluster of the little larvæ before described, much magnified, that had taken up their residence in the corolla.
- B. The stamina of their usual size.
- C. The styles, ditto.
- D. The germen scarce at all swelled.

FIG. 11. The germen nearly complete, as it appeared in the other flowers of the same ear.

FIG. 12. The larva magnified.

It is curious to observe that the parts of fructification remained unhurt much beyond the usual time, although the fruit was not produced.