XVII. *On the forms of* Zygæna Trifolii, *with some remarks on the question of specific difference, as opposed to local or phytophagic variation, in that genus.* By T. H. Briggs, B.A.

[Read 6th November, 1871.]

In the 'Zoologist' for 1861, Mr. Newman observes, touching another *Zygæna*, that "it is a dangerous thing to write about our British *Zygænæ*, if anyone incline to take up the genus, I heartily wish him well through it." And yet I am about to ask aid from Lepidopterists generally, in working out some curious facts connected with this, confessedly, difficult genus—difficult, because of the similarity of the perfect insects themselves, more so by the similarity and variation of their respective larvæ, and yet even more so by the great confusion of their synonymy; the difficulties are crowned by the fact of an unusual and extraordinary affinity existing between the different so-called species, and the frequent occurrence of intermediate forms or hybrids—as yet, I cannot say which—that are found amongst them. My theory and proposition is, that two permanent forms of a *Zygæna* now existing in England, and confused under the special name *Trifolii*, *have an equal right with Loniceræ to the title of Species.*

In the 'Entomologists Annual' for 1862, some remarks by Prof. Zeller in the 'Isis' for 1840, are translated by Mr. Stainton, in which we find the following words,—"Since that Nature, in the formation of species of *Zygæna* (productive or reproductive) is not yet at an end, appears to me conclusive, from the constant copulation of specimens of different species *without constraint, and when in a condition of perfect liberty.*"

Undoubtedly true as the fact is upon which Zeller bases this theory, it is somewhat difficult to follow his reasoning.

Once admit that a *form* has become a species, and Nature is at an end, so far as relates to the *formation* of that species; the progress of Nature, then (if any) is only to widen the separation. The sexual union of forms might be of common occurrence, but the fact is, the examples on record are not what we consider *forms*, but *well-defined species*, as subsequently mentioned by Boisduval. Such a union would be strongly suggestive of

the common origin of those *Zygænæ* at no remote date, and that a union of this nature was the result of a habit acquired as a form, not yet being lost in the species; hence the species being, so to speak, new species, it would be inferential to suppose forms, not yet species, existing, yet to become species. If we examine the result of such a union, would it not bear strongly upon the title of any "form" to the rank of "species"? If the eggs resulting were fertile, and produced moths like either parent, it would go far to prove the parents only "forms" of each other, not yet sufficiently separated to attain to the rank of species. If the eggs were fertile and produced hybrids, it would show that each parent was a species of itself, since they produced offspring *unlike* themselves, though probably closely allied, and their common origin of no very remote date. But if the eggs were sterile, would it not show that the line of demarcation was already established between those allied species, though the difference might be so slight, as to baffle our efforts to define it? I can find no instance on record, however, of even hybrids being *bred* from these unions, although we constantly *catch* specimens that if they are not hybrids, what are they? In his Monograph of the genus published in 1829, M. Boisduval observes, "Je dois dire ici qu'il m'est arrivé quelquefois de trouver des espèces différentes accouplées ensemble, ainsi j'ai trouvé plusieurs fois la Filipendulæ accouplée avec la Peucedani, et la Trifolii avec l'Hippocrepidis; j'ai fait pondre les femelles pour obtenir des hybrides, *mais jamais je n'ai été assez heureux pour voir éclore les œufs résultant de ces marriages adultérins, quoique les œufs des Zygænes éclosent très facilement;* il est possible, cependant, que quelques uns éclosent dans la nature." So far as our present knowledge goes, therefore, the genus seems to consist *certainly* of a number of closely allied species, many of which species *probably* have different forms, some of which forms *may be* on the journey towards future species—the great difficulty yet remains, how to distinguish a local or Phytophagic 'form' from a 'species,' it being impossible to apply the above test of an accidental natural union between two supposed species, although when that does occur, one can test species or forms by the result. We must therefore, in most cases, separate 'form' from 'species' by other means. In the 'Entomologists Annual' for 1861, Stainton, referring to the allied genus *Procris*, says, "attention has been called

to the various forms which *Procris Statices* assumes in different localities, but still we do not feel at liberty to state that any new species of that genus have been added to our lists, further series of specimens from various localities are necessary; it may be, that in an insect so local and so gregarious as a *Procris*, each little tribe or colony will be found to differ more or less from other tribes or colonies of the same species."

These remarks apply with equal force to the *Zygænæ* but since we do allow more than one 5-spotted native species, it follows that whether or no Zeller's theory is the true one, a certain amount of constant variation among these little tribes, will suffice to elevate it into a presumptive species. If such a constant variation were confined to one little tribe or colony, and not found elsewhere, I presume such a colony would be considered a local form of the nearest allied species, but if it can be shown, as I intend to endeavour to do, in the present paper, that an exactly similar constant variation occurs in numerous colonies in various parts of England, and that such constant variation is not confined to the imago, but is also found in the respective larvæ, such colonies or tribes surely have acquired an *equal* right with *Loniceræ* to appear in our lists as 'species.'

The chief points by which we can differentiate these insects, are—

(1.) The size and disposition of the red spots on the fore-wings.
(2.) The black border to the hind-wings.
(3.) The antennæ.
(4.) The time of appearance of the perfect insect.
(5.) The larva.
(6.) The food-plant.
(7.) The habitat.

The first two of these points are in some species most variable, in others tolerably constant; the antennæ aid the determination considerably, when the one sex in one species is compared with the *same sex* in another, but I have too often seen in collections a series of males marked "*Trifolii*," and the females with their slenderer

antennæ labelled "*Loniceræ*"!! I attach great importance to all the remaining points. Touching the larva, the usual description of "yellowish" or "greenish," "with four rows of black spots," is exactly equivalent to describing the imago as "green, with red spots," or a *Smerinthus* caterpillar as "green, with stripes on his side, and a horn on his tail." I have found these spots on the larvæ vary in the different forms or species in size and shape, although the following remark will apply to the caterpillars equally with the imagines, viz., that the general type only can be described—*aberrant examples will be found in which all the characteristics of some other type are fully developed,* but such aberrancy seems confined to the *then stage* of the insect's existence; for instance, that if in a number of *Loniceræ* caterpillars we find one quite unlike the rest, and *exactly* resembling a *Trifolii* caterpillar, such caterpillar will not be a *Trifolii* caterpillar accidentally in company with *Loniceræ,* but will be a *Loniceræ caterpillar that from some unknown cause has assumed the markings of Trifolii,* and the moth produced from such caterpillar will be a typical *Loniceræ.* Conversely, often when catching *Trifolii,* say we imagine we have come across a solitary example of *Loniceræ.* In most cases, such supposed *Loniceræ* is only *Trifolii* imago having assumed the characteristics of *Loniceræ,* and, in all probability, produced from a typical *Trifolii* caterpillar. I have several times personally met with examples of this singular fact, which, if further substantiated, will go far to explain what many authors have remarked, the occasional turning up of one species in the locality of another. In short, that *mimicry is common throughout the genus.*

I now proceed to differentiate my two supposed species —comparing them with *Filipendulæ* and *Loniceræ.*

(1.) *Zygæna Filipendulæ.*

Imago. Too well known for description. Antennæ mediate in thickness between *Loniceræ* and the two forms of *Trifolii,* those of the ♂ much thicker than those of the ♀; a very narrow black border to hind-wings in both sexes.

Larva. Full description set out in the appendix to this paper.

Obs. The caterpillar varies much in different individuals, as subsequently mentioned, but apparently *within a given range of variation:* in some thousands I have minutely examined, I have never seen the spots in the shape of those of *Loniceræ* as described.

(2.) *Zygæna Loniceræ.*

Imago. Nearly if not quite of the same size as *Z. Filipendulæ*. Central red spots of fore-wings nearly always disunited (this seems a constant character in *this* species, while in *Trifolii* it is its most variable); hind-wings paler and more pinky-red than in any other English five-spotted species. The antennæ are much slenderer than those of the other species, and considerably longer than in *Trifolii* (either form), those of the ♂ being, as usual, much thicker than those of the ♀; this character cannot fail to distinguish it at once from either form of *Trifolii, care being taken to compare the same sex;* the difference in the thickness of the antennæ between a ♂ *Loniceræ* and a ♂ of either form of *Trifolii* is very striking, but that between a ♂ *Loniceræ* and a ♀ *Trifolii* very small. Neglect of this common precaution has aided the present confusion.

Black border to hind-wings not very broad, broader in the ♂ than in the ♀; in typical specimens *much sinuate* on the inner margin.

Larva. Fully described in the appendix as *Zygæna*, No. 2. The leading characteristics which differentiate it from other species are—the long hairs, greener ground colour, more conspicuous orange spot, and different shape of the black spots as set out in the description.

Time of appearance of perfect insect same as *Filipendulæ.*

Locality. Hill sides; common; often in parks where fern grows. *Never to my knowledge in marshy places.*

(3.) *Zygæna* ———.

(Hereinafter called 'the late *Trifolii.*')

Imago. Expans. alar. 1′ 2″ to 1′ 5″. Antennæ much thicker and shorter than in *Filipendulæ* or *Loniceræ*, those of the ♂ being *much* thicker than those of the ♀.

In typical specimens the fore-wings are of a very brilliant green, with the red spots large, and generally with the central pair more or less united, especially in the ♂. In the male all the spots often coalesce and form one band, but this *rarely* occurs in the ♀. Hind-wings bright deep red, with a *broad* black border, slightly sinuate on the inner margin; the border is broader in the ♂ than in the ♀.

Larva fully described in the appendix to this paper as *Zygæna*, No. 1 (*Trifolii*).

The insect is found in *marshy places*; the caterpillar feeds on the large sort of Trefoil that grows among the rushes, often attaining the height of a foot, or more. The insect is exceedingly local, generally being confined to one little spot only.

Time of appearance of perfect insect varies from the second week in June to the second week in July, according to the season, *but always about one month later than the next described species;* it appears at the *same time* as *Filipendulæ*.

I have never yet found this insect in company with *Z. Filipendulæ;* it is apparently rarer than the next species. In most collections I have found the males of this species classed as curious varieties of *Trifolii*, or as *Loniceræ with the spots confluent;* the females I have found nearly always classed as *typical Loniceræ*.

It is distinguished from *Trifolii* usually so-called (the next species), by its size, its larva, its locality, its food plant, and especially by its time of appearance.

(4.) *Zygæna Trifolii.*

(The small form, hereinafter called 'the early *Trifolii*.')

This is the insect usually known as *Trifolii;* expans. alar. 1′ 2″ to 1′ 3″. Antennæ almost as thick as in the last species. Head much more densely clothed with hairs. In typical specimens the fore-wings are of a darker green than in any other species, with the central spots small and disunited, but in some colonies the confluent spots are of common occurrence. Hind-wings dark red, in some specimens *quite crimson*, with a much broader black border than in any other British species; with a tendency to *no* sinuation on the inner margin, but to a uniform breadth throughout.

Larva. I cannot say that I have yet *bred* the insect, but I subsequently adduce the evidence of others on the subject.

This insect is found in *dry-places*,* and is widely distributed, especially on the sea-coast.

Time of appearance of imago, from second week in May to second week in June, always about one month earlier than the last species.

I have nearly always found this insect in company with *Z. Filipendulæ*.

The knowledge of the existence of these two forms of *Trifolii, as forms*, is no novelty either to our English or Continental authors, and varieties of them, not the types, were described *as species* by the late Mr. Stephens; the confusion in the synonymy almost baffles elucidation, and is by no means the least intricate problem in the genus.

Fabricius in his 'Entomologia Systematica (1793) gives only *one* 5-spotted species, viz.:—

LOTI.

Sphinx Loti, W. V.
Sphinx Loniceræ, Esper.

And he observes concerning it—

"Habitat in Loto corniculato, nimis affinis *Z. Filipendulæ*." As Fabricius only knew *one* 5-spotted species, the expression *nimis affinis* cannot be read in the same way as if he had our present knowledge; the most *aberrant* five-spot, *to us*, would probably have been *nimis affinis* to Fabricius. *So, in fact, it is impossible to say which insect the Loti*, Fab. *was;* the probability is in favour of the *Loniceræ* of the present day.

Haworth, following Fabricius, gives only *Zygæna Loti*, also adding "habitat in Loto corniculato;" evidently supposing his *Loti* to be the *Loti* of Fabricius; but the following remark occurs in a note to Humphreys and Westwood's "British Moths, and their transformations."

---

* I do not say that the early *Trifolii* is exclusively confined to dry places; as *Filipendulæ* is often found in marshes, this species *ought* also, but I have never found it in marshes.—T. H. B.

"Mr. Stephens refers the *Z. Loti*, of Haworth, to the preceding species (*Loti*, H. & W., *Loniceræ*, Hüb.), but having received, however, from Mr. Haworth specimens of his *L. Loti*, I am enabled to state that they are identical with the *Trifolii* of Stephens."

Hübner figures—

On p. 2, fig. 7, *Loniceræ*, ♀; pl. 5-32, *Loti*, ♀, a *six-spotted* species; pl. 17-79, *Trifolii*, ♀; pl. 82, *Loti*, ♂, a small 5-spotted species, apparently *Trifolii* of the present day; pl. 29-133, *Orobi*, *Trifolii* with central spots disunited; pl. 134 and 135, *Trifolii*, males of *Trifolii* with central spots more or less confluent; pl. 35-160, *Loniceræ*, ♂.

His figure of the caterpillar of *Loniceræ*, together with those of the moths, are very good representations of the *Loniceræ* of the present day. His caterpillar of *Loti* is unlike any I have ever seen, perhaps it is the larva of the 6-spotted species.

Boisduval, in 1829, published a most elaborate and valuable monograph of the genus, and in his section of the genus with "cinq taches plus ou moins arrondies," the following species are included.

A. Ailes un peu transparentes.

Corsica, Meliloti, Exulans, Cynaræ, Achilleæ, Janthina, Concinna.

B. Ailes d'un bleu foncé.

Loniceræ, Trifolii.

I need only mention two insects in the first section, *Achilleæ* with the fifth spot *securiform* (because *Loti*, Fab., is given as a synonym) and *Meliloti*, the origin of further confusion.

Meliloti, *Z. Meliloti*, Ochs.

Sphinx Loti (mas.), Hübner.

Meliloti, Esper.

This insect has the wings most decidedly semi-transparent, nearly as much so as *Z. Minos*, and has not yet occurred here.

In the sub-section "Ailes d'un bleu foncé," the two species are thus differentiated:—

TRIFOLII (no synonym of *Loti* or *Loniceræ* attached). *Trifolii*, Ochs., Esper., Hüb., Borkh.

M. Boisduval says of the caterpillar, "on rémarque en outre sous le ventre un petit point noir sur chaque anneau," a character I have never seen in the larva of the *late Trifolii*, but under the name *Trifolii*, so far as I can comprehend, M. Boisduval comprised all the forms or varieties of *Trifolii*.*

LONICERÆ thus stands. *L. Loniceræ*, Ochs., Esper, Hüb.

Z. Loti, Fab. (*Loti*, Fab., as I have before mentioned, Boisduval also gives as a synonym of *Achilleæ*).

M. Boisduval's remarks, "Elle est de la taille de la filipendulæ avec laquelle elle a été quelques fois confondue. La variété à taches réunies en une seule bande irregulière est *assez rare;*" and of the caterpillar, "On rémarque sur chaque anneau *un point jaune* placé entre les deux bandes;" and also its "apple-green" colour, sufficiently serve to identify the insect with the *Loniceræ* of our present lists.

From this time the Continental authors seem only to have allowed these two species, but our English authors did not accept this view.

Stephens, in his illustrations, gives three 5-spotted species, viz.:—*Meliloti*, Ochs.; *Trifolii*, Esper.; and *Loti*, Fab.

In describing *Meliloti*, he agrees with Boisduval's description of the continental *Meliloti*, and his own insects in the British Museum do not agree with his description as regards the semi-transparency of the wings. Stephens' specimens of *Meliloti* in the British Museum are small, not typical specimens of the late *Trifolii* of the present paper.

Of *Trifolii*, Mr. Stephens observes, "alar. expans. 11″-1′ 2″-1′ 3″. Found abundantly in many parts of the

* M. Boisduval observes, however, that *Trifolii* appears some time before *Filipendulæ*, whereas the late *Trifolii* appears at the same time.—T. H. B.

country, at the *end of May and beginning of June*. It has generally been considered the *Loti* of Fabr., but that insect is considerably larger and is subsequently noticed. Caterpillar dusky yellow, with four rows of black spots, two on the back, and two on each side; feeds on trefoil." I have examined these specimens in the British Museum, and they are the small *early Trifolii* of the present paper.

Of *Loti*, Mr. Stephens says, "Considerably larger than the foregoing, which it greatly resembles. Caterpillar pale green, with a row of black spots on the back, and one on each side; the latter in the females with a bright yellow streak beneath." These specimens in the British Museum are small specimens of the *Loniceræ* of the present day.

Mr. Stephens' three species will therefore be as follows—

Meliloti, Ste. = Small specimens of the *late Trifolii*.
Trifolii, Ste. = *Early Trifolii*.
Loti, Ste. = *Loniceræ*.

Stephens' opinion is followed by Prof. Westwood in his "Brit. Moths, and their transformations," where the three species are thus set out:—

A. Loti.

Loti, Fab., Don., Steph., Wood, Duncan, not *Sphinx Loti* of Hübner and Esper.
Loniceræ, Esper.

A. Trifolii.

Trifolii, Esper, Stephens, Wood.
Z. Loti, Haw.
S. Loniceræ, (?) Esper.

A. Meliloti.

Meliloti, Esper, Och., Steph., Wood.
Sphinx Loti, Hübner.

The observations attached to '*Loti*,' or *Loniceræ* as it is now called, "here again varieties occur, in which the spots are more or less confluent;" and "Mr. Curtis states, that it is common in *marshy* places, at the beginning of May, and the beginning and end of June," must be attributed to some other species.

Mr. Humphreys expresses an opinion in Westwood and Humphreys' "British Moths, and their transformations," that all the five spots "constitute but one species;" and adds, "I have not figured the larva of *A. Loti*, as I cannot but suspect that there has been some mistake respecting it; for while the species in its perfect state is so very similar to *A. Filipendulæ*, the caterpillar is represented as totally different, not only in colour, but also in shape, being what is termed onisciform."

Hübner, from whom Mr. Humphreys copied, represents *A. Filipendulæ* larva as stretched out feeding, *A. Loti* larva as in repose; and it is only in repose that these larvæ assume an onisciform appearance, so *that* portion of the difficulty is soon explained; as to the colour, Mr. Humphreys has erroneously considered *his loti* and Hübner's as identical. Hübner's *loti*, ♀, as before stated, being a 6-spotted species, and his *loti*, ♂, is given in the very work that Mr. Humphreys introduces this observation into as a synonym of *A. Meliloti!!*

In a note to the first edition of the same work, Mr. Bree observes, "The two species (*Filipendulæ* and *Loti*) occur in this neighbourhood (near Coventry), but in different localities, *Loti being found in heathy bogs*, *Filipendulæ* in low meadows and grassy woods. Occasionally I have met with specimens of each in the locality of the other, but this was not usual, which tended to convince me, amongst other circumstances, that they were distinct species. . . . . I have often seen the cater-

---

Note. In the National Collection in the British Museum, only '*Trifolii*' and '*Loniceræ*' are recognized.

Trifolii comprises :—

(1.) *Trifolii*, Esper.

(2.) *Meliloti*, Ste., late *Trifolii*; specimens with spots not confluent.

(3.) A fine series of typical specimens of the marsh, or late *Trifolii* of this paper, *queried as Trifolii*.

(4.) Three abnormal varieties of the late *Trifolii* (?).

(5.) The early *Trifolii* of this paper, but not typical specimens.

(6.) Typical specimens of the early *Trifolii*, labelled '*Orobi*,' Hüb.

Loniceræ comprises :—

(1.) *Loniceræ*, Esper.

(2.) *Loniceræ*, Hübner; both typical *Loniceræ*.

(3.) *Loti*, Ste.; small specimens of *Loniceræ*.

In no one specimen of *Loniceræ* in the Brit. Mus. are the central red spots of the fore-wing confluent.

T. H. B.

pillars of each, and though I have never compared them side by side, yet I can safely say there is no very obvious difference between them." The *Loti* here mentioned as inhabiting heathy bogs was probably not *Loti*, Humphrey & West. (*Loniceræ*), which, so far as my experience goes, does not inhabit marshes, but the large late *Trifolii* of the present paper.

Now if, in all these works, *all the scientific names were omitted*, I think any one carefully reading the facts recorded, would come to the conclusion that, at least, *three* species or forms were included in the descriptions, even when only professing to describe two. All the authors (since Hübner) recognise by "*Trifolii*" a small *Zygæna* occurring in May and June, with a broad black border to the hind-wings. If, then, dismissing *Trifolii* from our minds, we compare the descriptions of *Loti* or *Loniceræ*, by which name authors seem to have meant, pretty unanimously, a larger insect than *Trifolii* occurring later in the year, we find decided contradictory evidence.

Described as "habitat in Loto corniculato," true of *Loniceræ*, but not of the marsh insect, Boisduval's description of the caterpillar being quite at variance with that of the marsh, or late *Trifolii*, the confluency of the spots as "assez rare," and "of common occurrence," described as "found in marshy places," where *Loniceræ* does not occur, all which to my mind points to the conclusion, that *Loti* or *Loniceræ* often included, beside itself, *a large species of 5-spotted Zygæna inhabiting marshy places;* but that often this large species, if small or not typical specimens, *got included with Trifolii* the early species.

The publication of Mr. Stainton's Manual, produced a change. Mr. Stainton following the continental authors, only allows two species, *Trifolii* and *Loniceræ*, for the first time so-called in this country; the points of difference Mr. Stainton relies on, are, in *Trifolii*, the central pair of red spots large and generally united; in *Loniceræ*, small and never united, and the thicker antennæ, and broader black border to the hind-wings in *Trifolii*. This opinion was nearly universally accepted; a *Zygæna* always *approximated* to one or the other, and was classed accordingly; but I have found out two points from inspection of a great many cabinets; first—the *type* of the small

early male *Trifolii* with the broadest black band of any, but the central red spots *small and seldom united,* was regarded as an *aberrant variety*—while the female of the *marsh form* with antennæ just as slender as a ♂ *Loniceræ,* and an equally narrow black border, has been nearly invariably classed as *Loniceræ* (I am only speaking of ordinary collectors). Very shortly after the publication of the part of Stainton's Manual, comprising the *Zygænæ,* Mr. Newman expressed his dissatisfaction. Speaking of the insects and the authors, he says (Intelligencer, vol. 1, p. 180) that he cannot understand *them,* the *them* being equally applicable to either or both, the insects or the authors.

In Doubleday's list (2nd edition) *Loniceræ* and *Trifolii* are the only two 5-spotted species, and their synonymy is extremely scanty, *Trifolii* being given as *Trifolii,* Esper, and *Loti,* Haw., and *Loniceræ* as *Loniceræ,* Esper (Fabricius, Hübner, Stephens, or Westwood not being mentioned). In his recent list, Staudinger follows the same arrangement, but he apparently separates the types of the early *Trifolii* under one of the following varieties.

B. Var. *Orobi,* mac. mediis separatis.

C. Var. *Syracusia,* minor, al. ant. maculis parvis disjunctis, post. margine lato nigro.

On June 16th, 1864, I found *Z. Trifolii* in abundance in some rough dry fields, abounding in *Lotus corniculatus,* bordering on Barnwell Wold, Northamptonshire; the insects were very much worn, of a very small form, in fact, types of the "early" *Trifolii; Filipendulæ,* which also occurs there, was just coming out. The *Trifolii* were so worn, I could catch but few worth keeping.

On the 27th of the some month, in the same year, I found the large late *Trifolii* just coming out in a marshy spot in Tilgate Forest. I also got many pupæ. The insects were so much larger, and so different in appearance from the Barnwell Wold specimens, and the fact of the *same* species being so much later in a much more southern and less exposed locality, and the thickness of the antennæ in each, and the generally confluent central spots in the Tilgate insect, precluding the possibility of referring either to *Loniceræ,* I was at once struck with the impression that they were *not* one and the same species (I had never taken *Trifolii* before this year). *Filipendulæ* does not occur here.

In the summer of 1866, I heard that *Trifolii* occurred in Stowe Wood near Oxford, and I found a marshy place exactly similar to the spot in Tilgate Forest; here, on the 17th May, with the aid of M. Dembski, I found a few *very young* larvæ of a species of *Zygæna*, feeding on the large species of *Trifolium* I have before mentioned, amongst the rushes; when they were larger I described them (see Appendix, No. 1).

I then wrote at once to Mr. Whall at Thurning, close to Barnwell Wold, begging if it were possible, for some larvæ of the small early *Trifolii* found there. One caterpillar of a *Zygæna* was all that could be found; *Mr. Whall stating that the caterpillars were nearly all spun up* (*Obs.*— The Stowe Wood larvæ were quite young). This caterpillar was quite different in its markings from the Stowe Wood larvæ, as will be seen by comparing its description (Appendix, No. 3). *As Filipendulæ also occurs here, it is just possible that it might have been a variety of that insect*, but it agreed with Mr. Hellins' description of *Trifolii* (Ent. Mo. Mag. iii. p. 118) *in the peculiar shape of the dorsal black spots;* Mr. Hellins especially mentions the ×*-like* dorsal black spots. I have spoken of the dorsal *line, i. e.*, the ground-colour, as consisting of a row of transverse *lozenge-shaped* spots, this is the same peculiarity differently expressed. I determined to write to Mr. Hellins as soon as convenient, asking if his *Trifolii* came from a dry or moist locality—I anticipated the answer, *dry*. This caterpillar unfortunately died.

Before this larva died, I wrote to J. H. Wood, Esq., of Tarrington, in Herefordshire, who had informed me that *Trifolii* and *Loniceræ* both occurred in that neighbourhood. He wrote me at once, stating that he was unsuccessful in finding me any *Trifolii* larvæ, but sent six *Loniceræ* larvæ feeding on *Lotus corniculatus*; these are the larvæ described in the appendix to this paper as *Zygæna*, No. 2. I then wrote to Folkestone for larvæ of *Filipendulæ*, which duly arrived; thus at the same time I had four distinct varieties of *Zygæna* larvæ, *Filipendulæ*, *Loniceræ*, and the late marsh *Trifolii*, all of which I bred, and the supposed early *Trifolii* which died, but whose peculiar characteristics, so different from the late *Trifolii*, is corroborated by Mr. Hellins, as before mentioned. I took all the larvæ to Professor Westwood, who himself enlarged, and closely corrected the appended descriptions.

On the 13th of June this same year (1866), I went to the marshy place in Tilgate Forest, before mentioned, in search for larvæ, hoping, of course, to find them identical in their markings with the Stowe Wood caterpillar. I found some *Zygæna* larvæ there in tolerable abundance, feeding on the same plants as in Stowe Wood Marsh; *their markings, to the minutest particular, were identical with the Stowe Wood caterpillars,* the same slight range of variation, and no more. These larvæ afterwards, in the first week in July, produced the late *Trifolii* I had found there in 1864, *and at the same time* the Stowe Marsh caterpillars began to come out, and produced the *late Trifolii,* exactly identical with those of Tilgate Forest. Here, then, were two colonies, one in Northamptonshire, one in Sussex, traced from larva to imago, and exactly agreeing in every point, including time of appearance. On the 3rd of July, while these insects from Tilgate and Stowe Wood were just beginning to come out, I visited Barnwell Wold, a locality intermediate in geographical position, and, as I expected, the early *Trifolii* was *over;* I caught five only, *very worn;* I was told *it had been abundant.*

I had been also informed of another locality near Oxford, where *Trifolii* occurred, *viz., the dry slopes of Shotover Hill;* in 1867, M. Dembski sent me two *Zygæna* larvæ found there: these larvæ had all the characteristics of the Barnwell Wold caterpillar, to wit, the tendency to the confluency of the dorsal spots, and the tendency to the × -like shape, which I have *never* seen in the late *Trifolii;* to breed one of these was the only link I now wanted, and at a consultation held with Professor Westwood, it was determined to put one into whiskey and water, and breed the other; the weakest looking was accordingly consigned to the bottle, and two days afterwards the other on which I rested my hopes, produced an abundant crop of Ichneumons.

In 1870, on June 17th, the late *Trifolii* was not out in Tilgate Forest; on June 18th, I found the early *Trifolii* at Folkestone over, I caught a few worn specimens only. I had written a few days previously to Mr. Hellins, asking him the nature of the locality of the caterpillars described by him in 'Ent. Mo. Mag. iii. p. 118,' and also sending him some larvæ, of the late *Trifolii,* from Stowe Wood, Mr. Hellins kindly answered my letter at once, and said,

"I have compared the larva you sent me with Mr. Buckler's figures, and find it more nearly resembles *Filipendulæ* than *Trifolii*, both species appear to vary much in the larva state. . . . I imagine the *Trifolii* spoken of by me (Ent. Mo. Mag. iii., p. 118)) were *the ordinary sea-side fellows, feeding on Birds-foot Trefoil.* . . . I see Mr. Buckler's figures decidedly gave the long hairs you now mention to *Loniceræ*."

The caterpillar of the early *Trifolii* seems very hard to find, possibly from the fact that where the insect occurs, its food plant is always in such abundance; the food plant of the marsh, or late *Trifolii* is often limited in its range, and the larva consequently easily found; all my endeavours to get caterpillars of the early *Trifolii* were fruitless. Dr. Wood, however, sent me from Tarrington five larvæ of, as he considered, *Loniceræ*, stating that they came from a different locality from the former *Loniceræ*, about eight miles distant from it; they were found on a *dry bank*. These larvæ I considered to be the early *Trifolii, but they possessed the "conspicuous yellow spot"* so many authors have observed in *Loniceræ* (the *long hairs*, the *greenish* ground colour, and *the little tail to the posterior lateral spot*, observed both by Mr. Buckler and myself were all *absent*); the lateral row of spots were nearly confluent, dorsal spots as large as in *Filipendulæ*, dorsal line *narrow* in *all;* the minute black spot below the second lateral spot present in one individual, and in another individual there was a strong tendency to the × -like spots, but the spots were only *nearly* confluent; they nearly approximated to some of the varieties of *Z. Filipendulæ*, except in the *much clearer* and paler ground colour. In short, they united certain characteristics of the caterpillar of the early *Trifolii* with that of *Loniceræ;* the characteristics of the larva of the *late Trifolii* were altogether absent. I only bred one, a ♂, which, on June 20, produced an undoubted *Z. Loniceræ*, as evidenced by the structure of the antennæ, but there was a slight tendency to a confluency of the red spots of the fore-wing—a character of the marsh *Trifolii*. I purpose to investigate this colony further, as the result is eminently unsatisfactory. Mr. Buckler has published descriptions of *two* varieties of *Loniceræ* larvæ (Ent. Mo. Mag. iv. 253), but both comprise the salient points of difference, that *Loniceræ ought* to possess; particular mention is made in

the first, of the greenish ground colour, and the orange spot, but no mention of the "little tail;" but in a drawing Mr. Buckler has kindly sent me of a segment of one of the variety found feeding on *Lathyrus pratensis*, this little tail is accurately delineated. Mr. Buckler has kindly given me all the information in his power, and has sent me diagrams of the 6th segment in *Trifolii*, *Loniceræ*, and *Filipendulæ*; this diagram of *Trifolii differs from my marsh Trifolii altogether*, having the lateral spots united below, and the tendency to the ×-shaped dorsal spots.

Now then, to sum up. Of the 5-spotted species in the imagos, we have *Loniceræ* distinguished by its slender antennæ; a *Zygæna* equally as large as *Loniceræ*, appearing about the same time, found in marshes; and a *Zygæna* found in dry places, appearing a month before the marsh one, and usually known as *Trifolii*.

I have found no intermediate *time of appearance*, in the four colonies I have especially observed; in Huntingdonshire, Oxfordshire, Sussex, and Kent, the early *Trifolii* in the most northern and most southern locality, has appeared simultaneously; and also the late *Trifolii* in the two intermediate localities, the early *Trifolii* always about one month before the other, and this invariably the case in the course of eight years' observation of the colonies. Is not this fact alone opposed to the supposition of their being simply "forms" of each other?

As regards the caterpillars, the salient points of difference in *Loniceræ* have been observed by Boisduval, and seem to be the same *now* as the "point jaune" is distinctly observed by Mr. Buckler and myself.

Of the two *Trifolii*—one has the spots very small, and *never** any tendency to the ×-like spots, and never has the lateral spots united; the other has the spots invariably larger, lateral spots nearly united, and a *more or less* tendency to confluency in the dorsal spots, and the assumption of the ×-like form. I have not seen any intermediate form of caterpillar in *Trifolii*, there is a gap, but *Filipendulæ* larva has a *range of variation* extending

* During the period 1864-1871, I have examined some hundreds.—T. H. B.

nearly over *both* these forms of *Trifolii*, and *Filipendulæ* larva seems to be a *connecting link between the two Trifolii*. But throughout *all* the caterpillars of *Filipendulæ*, *Loniceræ*, the early and the late *Trifolii*, the differences relied on as determinant, exist in a rudimentary form in the rest. The conspicuous orange spot in *Loniceræ*, is more faintly to be traced in the rest; the 'little tail' in the same insect, often appears in *Filipendulæ* and in the early *Trifolii*, as a "minute black spot below the second of the two lateral spots," and the ×-like spots themselves are only the smaller spots magnified and developed into a certain shape. *All the caterpillars may be described as yellowish-green or greenish-yellow, with two dorsal rows of black spots, larger or smaller, pointed or rounded, confluent or separate, and a lateral row on each side more or less confluent, and a more or less apparent dusky line above the feet.*

I have not said anything about the cocoons, as they are all similar; a *Loniceræ*, however, bred in 1866, spun a cocoon which presented a *reticulate* appearance. The one I bred this year did the same, others that spun up, however, did not, so I suspect this coincidence was accidental.

Now, if we find this constancy of variation and development and time of appearance, although there are no primary distinctive differences ranging through these four forms, are we to regard them as species or forms or what? Do other forms, perhaps intermediate, exist? Will not a further examination of the *general type* of other colonies show? I do not anticipate much trouble about the mimics and the hybrids, *they are exceptions*, and only troublesome so far as regards the particular specimen in question. A colony cannot be a *colony of hybrids*, or a *colony of mimics*; either they are *forms* or *species*, and surely this is capable of elucidation. One word as to the hybrids and mimics; a hybrid usually (if it be a hybrid) shows signs of degeneration, which might occur throughout a brood; mimicry would be peculiar to the individual.

This year on the 16th June at Folkestone, *Filipendulæ* larvæ swarmed in the warren, but no moths could I find; on Castle Hill the moths were out, but they were very *small*, and with a tendency to the obliteration of the sixth spot; antennæ shorter than usual; one specimen, a ♂,

is of the size, contour, and has the broad black border to the hind-wings, of the early *Trifolii* found at Folkestone (which *was* out). Surely these were Hybrids?

I possess a *bred* late *Trifolii* (♂) that has assumed the more slender antennæ of *Loniceræ;* also a *bred Loniceræ* (♂) that has much shorter antennæ than usual, approaching to *Trifolii*. These two bred specimens are hard to distinguish when placed together.

I also possess a remarkably large female *Zygæna* with *five* spots on the upper surface of the fore-wings, and *six* beneath; I caught it by itself, so cannot decide if it is a *Filipendulæ* mimicing the late *Trifolii*, or *vice versâ;* it has none of the appearances of a hybrid.

This season has been a bad one for *Trifolii*, but I shall hope next year to be able to elucidate some further facts connected with the history of these troublesome little creatures.

APPENDIX.

Larvæ of the genus Zygæna.

Generic characteristics. Legs sixteen; head *very small;* larva short and fat, and sluggish; when in repose assumes an onisciform appearance, but not so when stretched out feeding.

Larva of *Z. Filipendulæ* (full fed).

Body with whitish hairs scattered over it, but with a few black hairs on the back; hairs short, head and fore-legs black; head with transverse upper lip, and the membrane at the base of the antennæ white; ground colour greenish-yellow, arranged in a dorsal line, and two lines on each side; dorsal line with a brighter yellow spot in the fold formed by the hind-margin of

---

Note. I observed the food plant of the late *Trifolii* last year, in a marshy place on Wimbledon Common, but could find no larva. This season I have received information of the capture of *a few very large Trifolii in July*, just in *one spot only in the marsh, where I saw the food plant.*

each segment, the dorsal line becomes much narrower in the anterior segments. On each side of the dorsal line a row of large black spots, two on each segment, of which the anterior is the larger, with the inner posterior angle emarginate, and rounded on the side next the head; the posterior spot is narrow, and curved on the inner margin. In the segments immediately following the head, the anterior margin is narrowly blackish, often only partially margined with black, with the dorsal spots confluent, the anterior being greatly reduced in size; below which row of spots, a pale lateral line, with a bright yellow spot in the fold formed by the hind margin of each segment; below which line another row of black spots, two on each segment, of which the posterior spot on each segment is nearly spherical, and the anterior larger, and curved backwards, so as to terminate below the spherical spot, but sometimes uniting with it in the posterior segments; it (the anterior spot) also bears the black spiracles; the lower portion of this curved spot in which the spiracles are placed is often separated from the rest, as in *Zygæna*, No. 1 (*Trifolii*); a minute black spot is often placed below the posterior of these two spots, but this minute spot is as often obsolete. Then follows another pale lateral line; and between this line and the feet is a curved blackish mark on each segment, bearing a pale transverse lunule in its lower portion; a slight dusky line at the base of the feet; pro-legs and underside pale, with an interrupted dusky line (occasionally almost obsolete) down the middle of the belly.

Feeds on Trefoil, &c. Described June, 1866, from larvæ taken at Folkestone.

The larva has a great range of variation; its *limit* towards the *confluence* of the black spots is complete confluency; the angles become developed, and assume the ×-like appearance of the early *Trifolii*, but the ground-colour *always* more dusky, but the usual type is as described.

The *limit* the other way towards the *obliteration* of the black spots is seldom beyond that in the above description, the *limit* is attained before the range of variation of the marsh species begins. In some thousands, I have never seen one with the spots so small, and *consequently* the dorsal line so broad as in the late *Trifolii*; and I have before remarked, that I have never seen the spots in the shape of those of *Loniceræ*, as described.

Larva of *Zygæna*, No. 1 (late *Trifolii*).

Body with short white hairs scattered over it, with very few black hairs mixed with the white on the back. Head and fore-legs black; head with transverse upper-lip and membrane at base of antennæ, white; ground-colour pale yellowish, arranged in five lines, one dorsal and two lateral on each side; dorsal line *broad*, yellower in the fold formed by the hind margin of each segment; on each side of the dorsal line, a row of black spots, two on each segment, of which the anterior spot is the larger, somewhat semicircular, with the flat side turned towards the anus, but coming to a point on the back; posterior spot narrow, curved on the anterior margin, approaching in shape to a lunule; in the segment immediately following the head, the dorsal spots are confluent, the anterior being greatly reduced in size, the anterior margin of this segment is *partially* margined with blackish, leaving the middle portion of the yellowish ground-colour, below which row of spots, a *broad* pale yellowish line with a yellow spot in the fold, formed by the hind margin of each segment, but this spot is *not* very conspicuous, below which line another row of black spots on each side, two on each segment, of which the anterior is larger and curved backwards, and bears the black spiracles, but *very often* the lower portion of this spot which bears the black spiracles, is separated from the rest, and sometimes dwindles down to a mere dot. *No* minute black spot below the smaller of the two lateral spots, as is often the case in *Filipendulæ*; below which row of spots is the lower lateral line, and below this line and the feet is a row of dusky spots bearing a pale transverse lunule in the lower portion of each, but which lunule is sometimes absent, or nearly so; a dusky, very narrow streak at the base of the feet; pro-legs and underside yellowish, with a dusky interrupted line down the middle of the belly. Feeds on the large Trefoil found in marshes (and on that plant only).

Described June, 1866, from larvæ found in marshy ground in Stowe Wood; confirmed by others found in Tilgate Forest in a similar locality, and since confirmed by examination from year to year.

Take a *Filipendulæ* larva, give it a much clearer and cleaner ground-colour, diminish its spots *below the limit*

of smaller spots in Filipendulæ, so as to make all the *lines* broader, and you will have a specimen of this caterpillar.

As the variation in *Filipendulæ* tends towards *confluence*, the variation here is towards *obliteration*; but the caterpillar is *very* constant, its range of variation very small, as the limit towards *magnitude* of the spots in this species is attained before the limit of *Filipendulæ* towards *obliteration* commences; it follows, as a matter of course, that I have never seen *any tendency* towards the × -like dorsal markings, or ever seen the lateral spots united.*

Larva of *Zygæna*, No. 2 (*Loniceræ*).

Body with *long* white hairs scattered over it, with some black hairs mixed with the white on the back, hairs much longer and more dense than in the other species; head and fore-legs black, head with transverse upper-lip, membrane at base of antennæ, and articulations of lower organs of the mouth, white; ground-colour arranged in five lines, one dorsal and two lateral on either side; very pale yellowish tinged with green, sometimes quite green; dorsal line slightly yellowish in the fold formed by the hind margin of each segment, and rather narrow, not being nearly as broad as in the last species (the late *Trifolii*); on each side of the dorsal line a row of large black spots, two on each segment which almost meet, and in some cases are confluent; the anterior is slightly the larger, but there is very little difference in size, both being somewhat pear-shaped; the anterior with the larger portion below, the posterior with the larger portion above, leaving a small pale angulate space in the middle of the back of each segment; below which row of spots a narrow pale line with a *very conspicuous bright yellow spot* in the fold formed by the hind margin of each segment, below which line another row of black spots on each side, two on each segment, *united* in their lower extremities,

* *Filipendulæ* is widely distributed, and its larva feeds on many plants; *the larva is very variable*. *Zygæna* (No. 1) is very local, and its larva feeds, so far as I know, on one plant only; *its larva is very constant*. Are these facts coincidental or explanatory? I forgot to observe, as a further proof of distinctness between this species and the early *Trifolii*, that some larva I tried to feed on Birds'-foot Trefoil, *wasted away, and died*.—T. H. B.

in which is placed the black spiracles, *the posterior spot emitting a small transverse spot towards the pro-legs* (the 'little tail' of Mr. Buckler); below which the lower *narrow* lateral line, below which a row of dusky patches of a lunate form, sometimes bearing a small transverse lunule; another dusky patch on the base of the feet; pro-legs and underside pale, but often irregularly suffused with dusky markings, the upper part of the anterior segment is narrowly margined with blackish.

Described in June, 1866, from some larvæ sent me from Tarrington. Found on Tarrington Common, feeding on Birds'-foot Trefoil.

This larva seems to have a certain range of variation, as is evidenced by the two varieties described by Mr. Buckler. The latter of which varieties *agrees exactly with the above description* (see Ent. Mo. Mag. iv. 253); it will be observed that this variety that agrees so exactly well with my description, *was found feeding on the same food-plant, Lotus corniculatus.* The question naturally suggests itself, does the variation in the larva depend on the food plant. It is *odd* that the caterpillar of the late *Trifolii* always found on the same plant should be so constant.

As to the *very different* larvæ, resembling the early *Trifolii* before mentioned, as I only bred one moth (*rest died in pupa*), it is useless to attempt an opinion; *the moth may be a mimic.*

No. 3. Larva of a *Zygæna*, supposed to be the ordinary *Trifolii.*

Body with short white hairs scattered over it, with a *very few* black hairs on the back; head and pro-legs black; head with transverse upper-lip, and membrane at base of antennæ, white; ground-colour pale yellowish, arranged in five lines, one dorsal and two lateral on either side; on each side of the dorsal line, a row of large black spots, two on each segment, confluent or nearly so, but each coming to a point on the back, *which makes the dorsal line look like a row of transverse lozenge-shaped spots on the middle of the back of each segment,* preceded and followed by semi-lozenge-shaped spots, which unite (or

nearly so) with those of the following and preceding segments; the anterior spot terminates lower down the side than the other; in the three segments immediately following the head, the dorsal line is so narrow and dusky as to be hardly perceptible; below which row of black spots, a pale yellowish line on each side with a bright yellow spot in the fold formed by the hind margin of each segment, below which line a row of black spots on each side, two on each segment confluent, or nearly so in their lower extremities, when confluent, making together a spot of a horse-shoe shape, in which the spiracles are placed, below which, and in the succeeding pale line, are two black dots on each segment; one on the anterior, one on the posterior fold, the anterior dot being placed rather lower than the other, the space between this line and the feet is nearly filled up with blackish and dusky markings, some segments being more suffused than others; pro-legs and underside pale, with a row of dusky dots down the middle of the belly.

Described June, 1866, from a larva sent from Barnwell Wold, which died; *supposed to be the Trifolii found there,* subsequently compared with two larvæ from Shotover Hill, which agreed with this description, except in the less confluency of the spots.

This larva seems as variable as *Filipendulæ,* but with a brighter and generally paler ground-colour.

Obs. M. Boisduval's "petit point noir," Mr. Hellin's "× -like black spots," and Mr. Buckler's "figures with the lateral spots united," all agree more or less with the above description, and are in total opposition to the description of the caterpillar of the late *Trifolii.*