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I.—*Notes on so-called Acarellus.* By S. J. McINTIRE, F.R.M.S.

(*Read before the ROYAL MICROSCOPICAL SOCIETY, Nov. 5, 1873.*)

## PLATE XLV.

WHILST watching the habits of Poduræ and Pseudo-scorpions I have often been conscious of the presence in the cork cells of uninvited guests in the shape of acari of various species, either collected unintentionally by the camel-hair brush into the test tube together with the desired captures, or migrating from one cork cell to another of their own free will and pleasure. One of these has engaged a good deal of my attention.

The first time I noticed it was in its character as a parasite upon a rather fine specimen of Obisium; six or seven of them clinging firmly to the legs and cephalothorax of the host, and remaining in the position they had taken up for days without causing any apparent inconvenience to the obisium. Indeed, at first I scarcely recognized them as parasites. Afterwards it was by no means uncommon in the locality which was my happy hunting ground (a back-yard with an apology for a garden at the rear of our house) to find under old bits of wood, brickbats, &c., Gamasi and Obisia, infested with these parasites, and once I caught a Gamasus with a perfect load of thirty or so of them on its back and legs, rendering it quite unrecognizable at first sight. By this time I had come to the conclusion that the earth in this particular place swarmed with this acarus, and it was no longer a novelty. I felt quite certain, moreover, that there were two species.

On transferring the infested Obisia, &c., to my cells, I soon found that their little parasites occasionally left the host's back and wandered over the floor and sides of the cork cells; sometimes fixing themselves on the glass cover. Whilst in this position I availed myself of the opportunity of a closer inspection, and occasionally mounted them in balsam.

Up to this point I had not been able to guess what they were, but now I obtained some scanty information. I saw that after they were mounted the two hinder pairs of legs were not so apparent as when the creature was alive. In most cases the position

these legs took up and the refractive character of the medium rendered them nearly undiscoverable, and in this state I afterwards recognized one of them as the Hypopus of the 'Micrographic Dictionary,' and as identical with Topping's preparation of the Parasite of a House-Fly,\* which he always designates as "rare." I read the description in the 'Micrographic Dictionary,' under the heading Hypopus, and had no reason at that time to question the suggestion of Dujardin there alluded to, about the origin of these said Hypopi. In my article in 'Science Gossip' for 1869, p. 243, on Pseudo-scorpions, I mentioned both these parasites, and furnished rough figures of them, but owing to some misunderstanding only one of the illustrations was inserted; the other was omitted from the paper altogether.

About this time also I noticed that my cells were infested with another acarus,† very like a cheese-mite, but distinguishable on account of its dirtier appearance, especially in its earlier stages. A group of half a dozen of them would be seen devouring the decaying malt and other substances—in fact, wallowing in the filthy mess they made like so many tiny pigs; and in some cells all the corners where the pabulum of the Poduræ or their excrement had accumulated were occupied by similar groups of these disagreeable-looking acari. I desired greatly to expel the dirty intruders, but as it generally happened after making a collection of Poduræ, &c., that a few fresh ones were inadvertently introduced, I concluded that the task was hopeless, for the reason that they swarmed in the earth equally with the Hypopi previously mentioned; and so I paid them no more attention.

Two years ago, however, in the month of September, I picked up a decayed potato, which had such a large population of these acari upon it that I was induced to give it some close scrutiny, chiefly with the view to satisfy myself whether these mites were the so-called "cheese-mites" (*Acarus domesticus*) or another species. I soon saw that there was a remarkable change going on in the case of the greater number of them. They were casting their skins; and when this operation was complete they had metamorphosed into my other little friends, the Hypopi.‡ So curious an incident prompted me at once to sweep off all the acari into benzole and mount them in balsam. For some weeks afterwards the slides thus made showed the interrupted stages of the process of ecdysis very well, but time has altered all that now. The slides (or rather, the only one I have left at the present time) exhibits the Hypopi more

\* I speak from memory only, and may be wrong; anyhow it is a very closely-allied species.

† I have since come to the conclusion that these also may be distinguished as two species, one of them much more like a cheese-mite than the other.

‡ I am disposed to consider this Hypopus identical with Mr. Tatem's *Acarellus Pulicis*, to be referred to presently.

or less distinctly, but the cast skins and the specimens in an early stage of the process have shrivelled up beyond the most scanty recognition.

I did not then call attention to the curious incident, beyond exhibiting the slides at one of the Wednesday evening conversational meetings of this Society, and it had nearly passed from my memory till I read a short paper by Mr. Tatem, in the 'Monthly Microscopical Journal,' on some new *Acarelli*. In that paper two species are figured, and described as *A. Muscæ* and *A. Pulicis*: the former strongly calling to my mind Topping's "rare" parasite of the house-fly, and the *Hypopus* of the 'Micrographic Dictionary,' while the other, which Mr. Tatem says he found in a dead flea, is, I believe, the same species which I detected in the act of ecdysis, recorded here, and which I am well acquainted with, as parasitic upon various arachnida. As Mr. Tatem says his figures were from the balsam preparations, I could at once understand why the curious rostrum is omitted, and the two hind pairs of legs are figured as they are in the illustration. Had Mr. Tatem seen them in the living state under the microscope suitably illuminated, I feel sure his figures would have been different, and he would have modified what he says in the first paragraph of his communication. For certain all the legs are *free*, and the statement that the two posterior pairs are "neatly packed up in their trunks ready for evolution in the progress of growth" is not correct. The *Hypopus*, or *Acarellus*, walks upon all its eight legs. The two posterior pairs are very short, but each of them is furnished with a very long and delicate bristle (only seen well in life), which materially assists the creature in its small powers of locomotion.\*

With regard to the other important statement about their "obviously imperfect development," I must also venture to differ from him, from the incident I have above recorded.

I communicated with Mr. Tatem on the subject, and forwarded him slides containing specimens, some of which he recognized as very like his own *Acarellus*, and others were not so conclusive. I also sent him cork cells containing living examples of the *Acarellus* in question, and its suspected earlier stages, but ill-health at the time prevented his giving the necessary attention to the subject, and so he returned me the cells with the request that I should pursue the inquiry, courteously admitting (if my recollection is correct) that there was the possibility of a mistake in his conclusions, as the data he had to go upon were so scanty, and the balsam preparations and previous liquor potassæ treatment might have obliterated the view of certain important points. I have to thank

\* This statement has reference more particularly to my supposed *Hypopus* (or *Acarellus*) *Muscæ*. The other *Hypopus* has shorter legs, terminating in single claws.

him for his kind communications, and the courteous manner in which he met my contradictions.

Accordingly I have kept the two cork cells under occasional observation, and though I have not been fortunate enough to meet with another case of ecdysis, I do find that the cell which was tenanted with the cheese-mite-looking acarus I have alluded to has now numerous examples of *Hypopus* (or *Acarellus*) in it, and the cell which contained *Hypopi* or *Acarelli* now contains many of the suspected earlier stages. Of course there is the possibility of migrations of the two creatures from their respective cells; but I incline to the view that the *Acarelline* form is an adult one, generally parasitic on certain of the minute *Arachnida*, and in its early stage or stages a vegetable feeder, and totally unlike the form it ultimately assumes, being, moreover, in this early stage, fully twice the size of the adult form.

I doubt very much the suggestion both in Mr. Tatem's paper and in the 'Micrographic Dictionary' (under the authority of Dujardin), that the *Hypopus* or *Acarellus* is one of the early forms of *Gamasus*; for my cells are very much infested with these creatures. To the best of my belief their young are white and very active. The structure of the mouth also in my opinion indicates a wide difference.

The active little mites which I think are the larvæ of the species of *Gamasus* occurring in my cells, feed chiefly upon the same food as the *Poduræ* (crushed malt); but the adults will attack and devour the young *Poduræ*. I have also seen them seize and carry off, after a struggle, the end joint of the antenna of a full-grown one,—the antenna having been introduced into the hiding-place of the *Gamasus* by its unsuspecting owner bent on exploration. In the open space these *Gamasi* cannot cope with the superior strength of the adult *Podura*, but when one of them dies from old age, the *Gamasi* appear on the scene in force and soon clear away the corpse.

On the other hand, the mite, which in my opinion is the larval form of *Hypopus*, is very sluggish, and seems most at home when absolutely immersed in filth, resulting from the decay of the excrement of the *Poduræ*, &c., and the fungoid growths arising in the cells. I am sorry I cannot figure this creature, as I have never been able to see it under a higher power than a two-thirds and opaque illumination, except at the certain risk of the escape of all the other inhabitants of the cell, and these have been so interesting that I could not entertain the idea of disturbing them. The figures I have given of the *Hypopus Muscæ* are from life. I inverted the cover of the selected cell on which I saw several of the *Hypopi* had settled, and endeavoured by means of water and a fine camel-hair brush to turn them on their backs. But though they might be walking, immediately the brush touched them they clung to the glass by means of the suckers at the posterior extremity so firmly,

that I could not dislodge them except in a rotary fashion, and I was obliged at last to cover with a thin piece of glass and draw them from the dorsal aspect under Powell's  $\frac{1}{8}$ th (immersion front).

It is with some hesitation I record these notes in opposition to the opinions of such accurate observers as Dujardin, Professor Westwood, and Mr. Tatem. It is only from reading Mr. Tatem's paper that I gather that his *Acarelline* forms are similar to Professor Westwood's, and in both the examples he gives I doubt the four-legged characteristics. Also, the prominence of what seem to me to be the reproductive organs conveys to my mind the notion that the *Acarellus* or *Hypopus* is an adult, not a larval, form. Having been unable, however, to see these parts in life to my satisfaction, I cannot make a drawing of them; and the structure of the tubular mouth, with the two terminal setæ, prevents my associating it in any degree with the nippers of *Gamasus*. In one mounted specimen of *Hypopus*, I observed lately a curious distension of the end of the rostrum, reminding one of the lips of the blow-fly, as if this organ were used for suction.

Perhaps these notes may induce others to communicate facts in their experience in support or otherwise of my theory, and this shall be my apology for intruding my remarks on the subject.

When drawing the living *Hypopus* (*Muscæ*) under the microscope ( $\frac{1}{8}$ th objective), I could not help noticing the beauty of the anterior pair of legs, and the remarkable spoon-shaped tenent hair at the extremities. Its delicacy would I think quite render this hair (or pulvillus) invisible in a mounted specimen. I could only see one claw on each foot, but from the position of that member in the anterior pair of legs, desperately holding on to the glass by means of the tenent hair, a second claw might have been hidden from view.

Having seen Mr. Tatem's slides within the last few days, I have altered my opinions as to the identity of the respective creatures somewhat. His *A. Muscæ* is different from mine, and is probably a new species. His *A. Pulicis* confirms me in the suspicion expressed in a preceding note that it is an old acquaintance of mine, and the bleached appearance of both specimens makes me think more than ever that the potash treatment has had a very injurious effect, and hidden delicate structure from view. In the present state of the specimens I willingly lend my testimony to the accuracy of Mr. Tatem's figures of them.

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#### Additional Note.

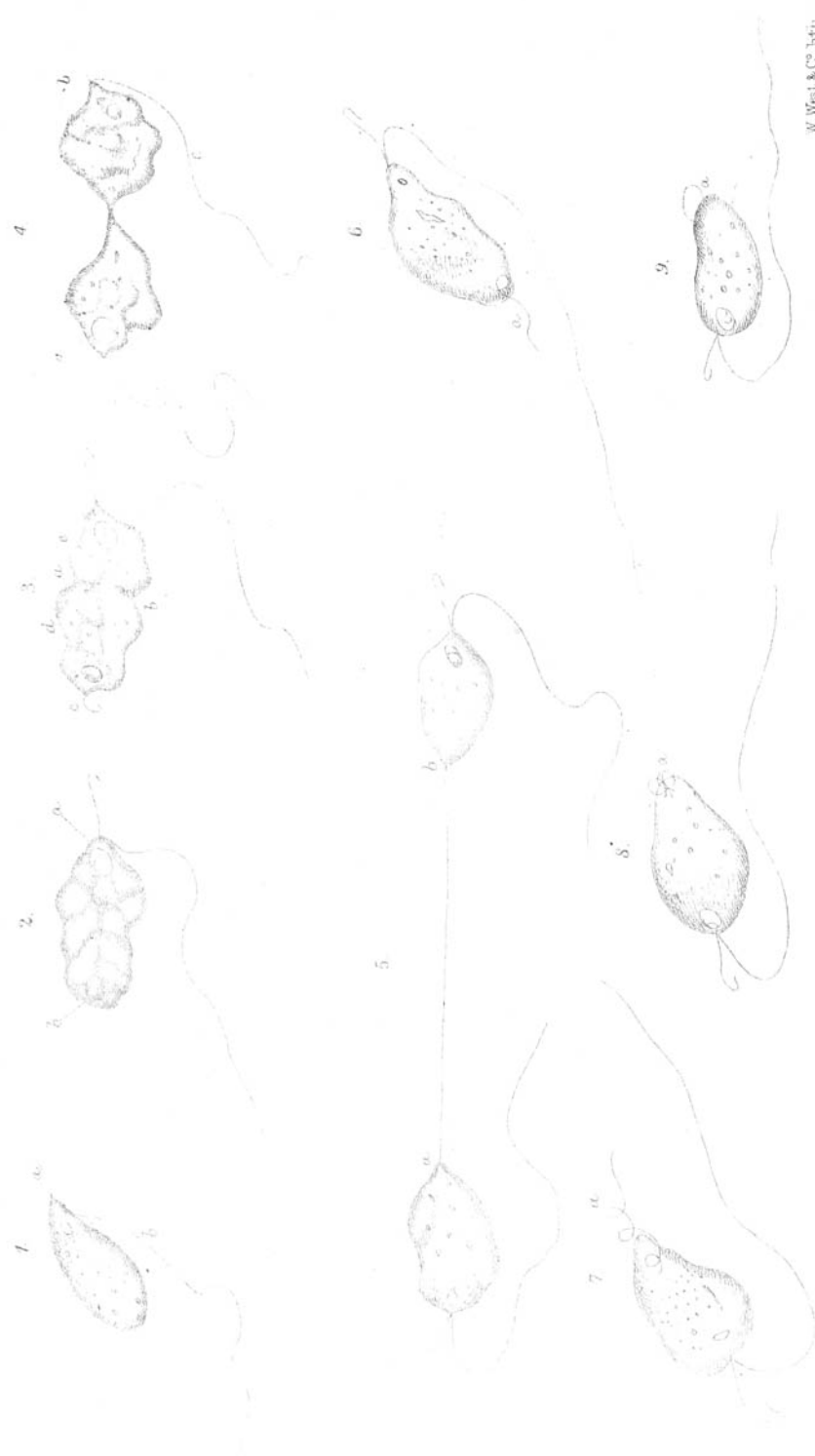
November 13, 1873.

I find, on comparing notes with Dr. Gray and others, that the *Acarelline* form, called by Mr. Tatem *A. Muscæ*, is by no means un-

common on house-flies ; and the specimens which have been shown me in illustration of the fact are identical with that kindly sent for exhibition by Mr. Tatem on Nov. 5. So that the species which I have alluded to in my paper as *A. Muscæ*, and which I at first thought was the same as Mr. Tatem's, must receive another name ; but the task of giving it a name I leave to some one better qualified than myself. As I have stated in the paper, I first found it on an *Obisium*, and afterwards on *Gamasi*, and have strong reason for thinking the early stages of those now in my possession were passed in my cells in the character of a vegetable-feeding mite of very unprepossessing habits and exterior. Although in the three examples of this genus of the minute *Arachnida* recorded in Mr. Tatem's paper and mine, I am sure that the four-legged theory is a mistake, I am not in a position to say the theory may not hold good in the case of other mites which I have not met with. It is necessary I should clearly explain myself on this point, as it appears from conversation with certain Fellows of the Society, who heard the paper read, that I have left it doubtful whether I have not been trying to upset well-authenticated facts in regard to the imperfect development of the legs in the *Arthropoda*, a position which I have not the least intention to assume. I have just succeeded in mounting the mite in question in balsam, and, as I expected from analogy, the hind legs quite vanish from view unless they happen to take a position in which they can be seen clear of the creature's body.

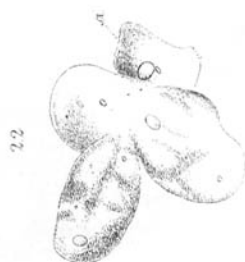
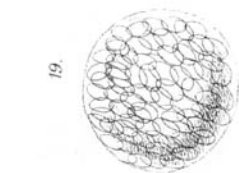
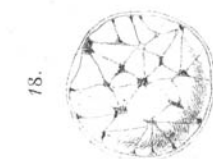
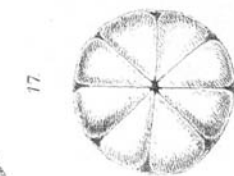
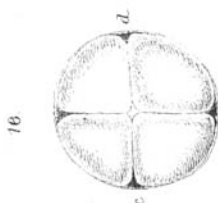
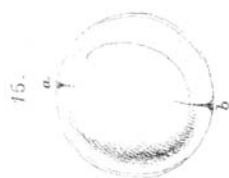
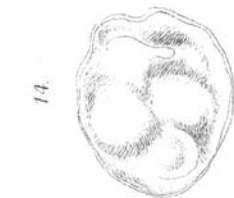
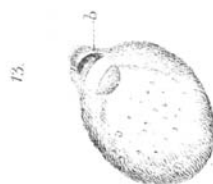
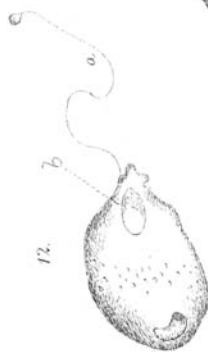
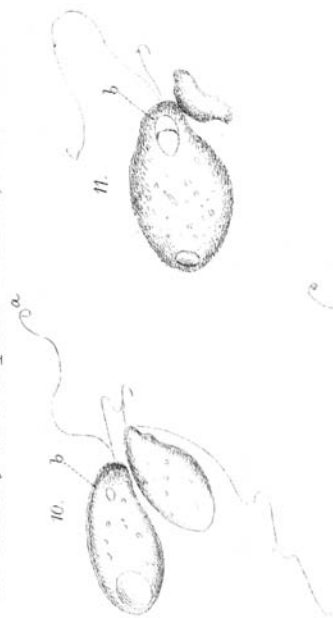
S. J. McINTIRE.

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W. West & Co. Lith.

Researches in the Life History of the Monads.



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