

IS TROMBIDIUM HOLOSERICEUM THE PARENT OF  
LEPTUS AUTUMNALIS?

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PLATE 28.

(Received for publication, October 11, 1916.)

The question whether *Trombidium holosericeum* Linné, is the parent of *Leptus autumnalis* Latreille, (*Leptus autumnalis* Shaw) does not affect our work on tsutsugamushi directly. But indirectly, in the investigation of the life cycle of the tsutsugamushi, the carrier of tsutsugamushi disease, the question is of importance, because the tsutsugamushi, or akamushi, is almost identical with the European *Leptus autumnalis*. From our observations and from a study of the literature we cannot accept the view that *Trombidium holosericeum* is the parent of *Leptus autumnalis*.

Mégnin (1) first stated that *Trombidium holosericeum* was the parent of *Leptus autumnalis*, the latter having been studied by Latreille, de Geer, Gervais, and others before him. He observed that *Trombidium holosericeum* first appeared on the ground in April and was laden with numerous eggs from the end of May till June. He further succeeded in raising larvæ from these eggs, which according to him were *Leptus autumnalis* or the redbug. Mégnin does not state whether his morphological description of the larvæ is made from the larvæ artificially bred from *holosericeum* eggs. But it seems to us probable that Mégnin described the larva only from *Leptus autumnalis* which he had taken from warm-blooded animals, such as the rabbit, dog, etc., but not the bred *holosericeum* larvæ. In any case a close morphological comparison seems necessary for the identification of the larvæ, for it seems to us possible that Mégnin's artificially bred larva may have belonged to another species of trombidium.

When we first saw the larva of *Trombidium* B<sup>1</sup> bred from eggs we

<sup>1</sup> Nagayo, M., Miyagawa, Y., Mitamura, T., and Imamura, A., On the Nymph and Prosocon of the Tsutsugamushi, *Leptotrombidium akamushi*, N. Sp. (*Trombidium akamushi* Brumpt), Carrier of the Tsutsugamushi Disease, *J. Exp. Med.*, 1917, xxv, 255.

had no doubt that it was the *tsutsugamushi*, and that thus the parent of the latter was established. Later, however, we perceived inconspicuous differences, which nevertheless were essential differentiating characteristics between the two larvæ. The larva of *Trombidium B* is distinguished from the *tsutsugamushi* by the much smaller number of hairs, the localization and arrangement of the latter, the shape of the stigmata and of the mouth apparatus, as well as the length and the number of joints of the legs, etc. Mégnin does not give a detailed comparison but his statement that the *holosericeum* larva is identical with *Leptus autumnalis* has, nevertheless, been frequently cited. As far as we know, this statement has not been confirmed by reinvestigation; that is, by breeding *Leptus autumnalis* from the eggs of *Trombidium holosericeum*. Even Brandis (2), who found *Leptus autumnalis* in great numbers at Nietleben near Halle a. S. and for the first time was able to breed the nymph of the latter, does not mention the mature animal or eggs. Perhaps he did not succeed in finding *Trombidium holosericeum* or its eggs in the place where he had found many larvæ. His successful breeding of the nymph, which according to his sketches and description, closely resembles our *tsutsugamushi* nymph, is of great importance but this is not proof of Mégnin's statement. We have found since April, 1916, fifteen specimens of a trombidium species, which we have provisionally named *Trombidium D*, on the ground in various parts of Yamagata ken. Morphologically and biologically they are identical with *Trombidium holosericeum*. Their color is carmine red and they show the typical silky luster. They are 2.34 to 3.50 mm. long and 1.80 to 2.70 mm. broad. This trombidium is somewhat square, with a sagittal incision in the hind end of the body and with several grooves in the back. The hairs are long and pinnate, with clubbed ends; in the joints of the legs they are a little longer. The legs have two claws, without clinging hairs. The eye has a long peduncle. Since May these animals have laid several heaps of eggs in the vessels. The eggs measure from 0.15 to 0.18 mm., usually 0.176 mm. They are almost spherical, pale yellow, and shining, and gradually assume an orange-yellow color. Several larvæ appeared at the end of 3 weeks in the incubator at 22°C. These larvæ have a mouth apparatus somewhat resembling that of *Leptus autumnalis* and of *tsutsu-*

gamushi (Figs. 1 and 2), but there are also great differences, as the following table shows.

Larva of Trombidium D ( <i>Trombidium holosericeum</i> ).		Tsutsugamushi.	<i>Leptus autumnalis</i> .
Hairs of the body.	Not numerous (about 48); 2 pairs of long hairs at the hind end.	Numerous (about 110 to 120); all about equally long.	Numerous; all about equally long.
Dorsal shield.	Two.	One.	One.
Stigma.	Oval.	Round.	Round.

It is not necessary to go into more detail, as the points mentioned show that the larvæ of *Trombidium* D, *i.e.*, *Trombidium holosericeum*, are different from both *Leptus autumnalis* and *tsutsugamushi*. In Oudemans's classification, the larva of *Trombidium* D belongs to *Allotrombidium*, and the two other larval forms to *Trombidium*, according to the number of dorsal shields.

Mégnin further observed that *holosericeum* larvæ immediately after hatching parasitized on warm-blooded animals as well as on insects. He states: The larva, which is almost spherical when it emerges, and much less active than that of *Trombidium fuliginosum*, and with shorter claws, is the same as the common redbug, *Leptus autumnalis*, which as soon as it is hatched attaches itself to some animal or insect. If this is the case, Mégnin's *holosericeum* larva cannot be regarded as a genuine *Leptus autumnalis*, because Brandis (2), as well as others, has made different observations. Brandis says that if the mites are shaken by a human being or a warm-blooded animal they immediately attach themselves to it.

There is perhaps no mammal, which comes within their reach, unmolested by them; they have been found on hares, rabbits, various kinds of mice, badgers, hedgehogs, molebat, shrew, dogs, and cats. On birds, reptiles, insects, and spiders, I could, however, not effect any infestation, though on insects and spiders near relations of *Leptus autumnalis* parasitize.

Our *tsutsugamushi* attacks field mice, rabbits, guinea pigs, monkeys, and other mammals, but not insects. They are biologically and morphologically closely related to *Leptus autumnalis*, though recently some minor differences in the form of the dorsal shield, in

the hairs of the palpi, etc., have been emphasized by Hirst (3). The behavior of the two nymphs is also similar, as mentioned above. For these reasons we cannot accept the statement that *Trombidium holosericeum* is the parent of *Leptus autumnalis*. The true parent of *Leptus autumnalis* must be another species, which, as far as we can find in the literature, has not been described as yet. We believe that the prosopon of *Leptus autumnalis* must be similar to that of *tsutsugamushi*.

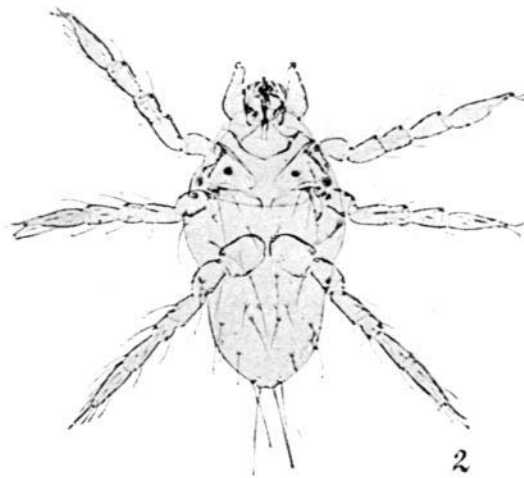
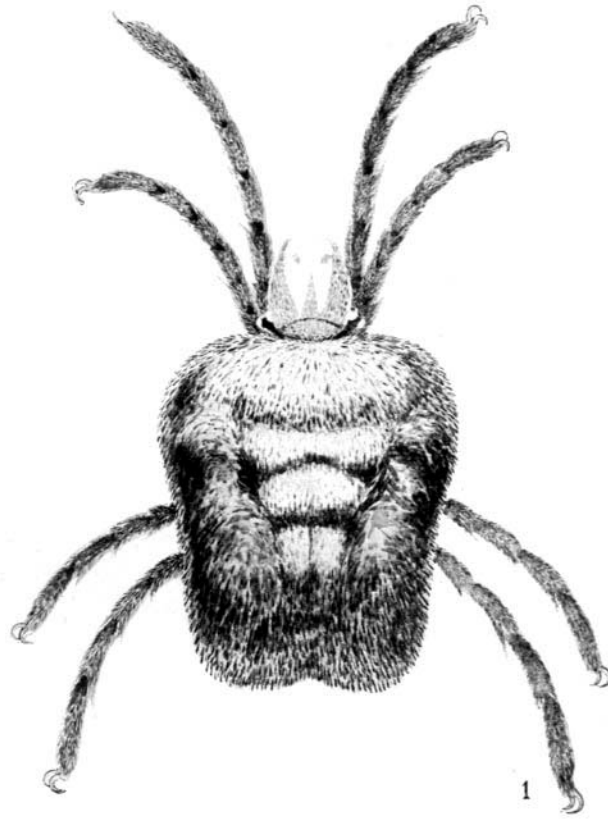
A detailed report on the nymph and the prosopon of the *tsutsugamushi* was given in the preceding paper,<sup>1</sup> to which we may refer the reader.

## BIBLIOGRAPHY.

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3. Hirst, S., On the "Harvest Bug" (*Microtrombidium autumnalis* Shaw), *J. Econ. Biol.*, 1915, x, 73.
4. Hirst, On the *Tsutsugamushi* (*Microtrombidium akamushi* Brumpt), *J. Econ. Biol.*, 1915, x, 79.

## EXPLANATION OF PLATE 28.

- FIG. 1. *Trombidium D* (*Trombidium holosericeum*), adult. × 20.  
 FIG. 2. *Trombidium D*, larva hatched from egg. × 150.



(Nagayo, Miyagawa, Mitamura, and Imamura: *Trombidium holosericeum*.)