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Dedicated to Mrs. W.S.S. van Benthem Jutting

Cheletomorpha lepidopterorum (Shaw, 1794)
(= *Ch. venustissima*) (Acari, Cheyletidae) on Lepidoptera

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As long ago as 1839 C. L. KOCH described and pictured a mite which he found on several occasions in stables and hay-barns. As he was impressed by the beauty of the animal, he gave it the name *Cheyletus venustissimus*. But KOCH overlooked the fact that already in 1794 a description of the same mite had been published by SHAW with the name *Acarus lepidopterorum* (lepidopterine mite). Shaw collected it from a "Phalaena"; he found many mites clinging to the underside of the wings.

Since KOCH (1839) many other authors mentioned the mite in literature using the name *venustissimus*. A. C. OUDEMANS also used *venustissimus* in his 1907 paper (p. 144—153, figs. 37—39), but when making the studies for his *Kritisch Historisch Overzicht II* (1929 : 298—300, fig. 84), he discovered Shaw's publication of 1794. Shaw gave an extensive Latin and English description, as well as a drawing which was very accurate in comparison with other figures of those years.

In the course of the years the mite which now bears the name *Cheletomorpha lepidopterorum* (Shaw, 1794) was repeatedly observed, mostly in stables, barns, etc. However, it was not well known that this little animal sometimes makes use of insects in order to be transported to other places. As far as has been observed up to now, such insects are always Lepidoptera of various families, but never butterflies (Rhopalocera). Lepidoptera are mostly free of epizoa. Only now and then larvae of Trombidiformes can be found and still less frequent is the transport of *Cheletomorpha*. It is interesting that *Cheletomorpha* travels as adult; in most other cases it is the deutonymph of mites which is transported.

The second record of such a transport is by BOLD (1844), who found about 30 specimens on the wings (mostly on the underside) of a "small common moth"; the exact name of the moth is not known.

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[53]

OUDEMANS (1937 : 1117) interpreted wrongly a part of Bold's text. The statement "I find that in drying the colour faded considerably. When alive, the body was blood red, with a spot on the disk, and the legs white" does not refer to the moth, but to the mite. It is also my personal experience that after some time the red colour disappears, whereas the larvae of Trombidiformes on the whole remain bright red.

Bold's communication was followed (p. 681) by an extensive reply given by Edward NEWMAN. At that time nobody could of course know that the observation was very important and we find e.g. in Newman's text the laconic words: "Nothing is more common than for insects to be infested with minute Acari".

Subsequently a third and fourth observation was published more or less simultaneously.

HALLER (1881 : 152—154) enumerated some new observations of mites on Lepidoptera, mostly concerning larvae of *Trombidium*, etc., but one case refers to *Cheletomorpha*. It was found by von Linstow, Hameln, Germany, on the Geometrid *Larentia fluctuata* (L.) (now *Xanthorhoë fluctuata*). The number of mites is not mentioned; there were certainly not more than a few.

BERLESE (1881 : 78—79) found three *Cheletomorpha* on the wings of a little moth, *Tinea* sp., at Venezia, Italy, 1879. In his A.M.S. (1886) he does not mention the transport by Lepidoptera.

We can imagine that when discussing *Cheletomorpha lepidopterorum* both OUDEMANS (1937 : 1117) and VITZTHUM (1941 : 574) described this transport as an extremely rare phenomenon. Although it is very rare, it is not quite as rare as they thought. Most Lepidoptera can easily be recognised and determined without using a lens and therefore a number of cases, especially if there are only a few mites clinging to the underside of the wings, will escape from being noticed.

Moreover, after death the red colour of the mites turns slowly to orange and finally disappears completely, so that a whitish mite remains. In collections of Lepidoptera, therefore, these specimens — if present — are inconspicuous and difficult to detect.

This can be concluded from the following notes:

The fifth record is given after 65 years by COOREMAN (1946) who received a number of mites found on Lepidoptera. Amongst them was a single specimen of *Cheletomorpha lepidopterorum* which had been discovered on the underside of the wing of a Noctuid, *Miselia bicruris* Hufn. [= *Hadena bicruris*]. The moth had been collected by Mr. Vandergucht at Namur, Belgium, 31.V.1945, and had been handed to him by Mr. F. Richard.

The attention having been drawn to this phenomenon, Cooreman added in a footnote, just before publication, a sixth observation: one specimen of *Cheletomorpha* from the Geometrid *Thalera fimbrialis* Scop., collected at Aye, Belgium, 30.VI.1946, and equally handed to him by Mr. Richard.

My own special attention was drawn to this mite because of a very interesting moth collected by Mr. C. H. TER LAAG. In the late evening of the 2nd September 1960 this lepidopterologist captured on light in his garden

Aug.-Sept. 1963, leg. L. W. Siggs, abt. 16 specimens in a tube.

On wings of *Caradrina morpheus* Hufn., 9.VIII.1944, leg. John E. Nowers, No. 1950.4.11.101-110, abt. 6 specimens in a tube.

On *Scotogramma trifolii* Rott. [= *Discestra trifolii* Hufn.], Wood Walton Fen, Hants., 6.VI.1937, leg. H. M. Edelston, No. 1938.5.23.15-20, abt. 12 specimens in a tube.

On moth, England, 3 specimens on two microscopical slides.

All other butterflies and moths I saw in the collections of colleagues in The Netherlands had only larvae of trombidiform mites, viz.:

1 <i>Erebia euryale</i> Esp.	H. van Oorschot	Switzerland
6 <i>Zygaena exulans</i> Hochenw. & Reiner	C. A. W. Jeekel	Switzerland
1 <i>Chamaesphracia triannuliformis</i> Frr.	J. A. W. Lucas	Yugoslavia
1 <i>Scopula marginepunctata</i> Goeze	J. A. W. Lucas	Yugoslavia
1 <i>Glossotrophia confinaria</i> H.S.	J. A. W. Lucas	Yugoslavia
1 <i>Glossotrophia confinaria</i> H.S.	J. A. W. Lucas	Switzerland
1 <i>Schoenobius gigantellus</i> Schiff.	D. van Katwijk	The Netherlands
12 undetermined Microlepidoptera	J. G. van der Made	The Netherlands

These observations show that Lepidoptera are much more frequently infested by various species of trombidiform larvae than by *Cheletomorpha*. COOREMAN (1946) reached the same conclusion. A typical difference is that *Cheletomorpha* occurs almost exclusively on the wings whereas the larvae of trombidiform mites normally are to be found on the body and the legs, where they find the possibilities they need for their feeding.

The mites have marked preferences for a certain position on the wings. On both upperside and underside of the wings of the various moths all the mites are positioned with the head directed outward and with the body axis parallel to the longitudinal veins.

The question has been posed, also recently by COOREMAN (1946), whether the presence of a carnivorous mite on Lepidoptera might have anything to do with parasitism. BOLD (1844) says that "the moth had a ragged and unhealthy appearance, and was denuded of scales to a considerable extent". The moths I have seen, however, were all in perfect condition and the mites were attached to the surface of the scales. There was no sign of any damage.

The text of VITZTHUM (1941 : 574) is not correct. He writes: "Shaw (1794) hat zahlreiche, Bold (1844) ungefähr 43 Exemplare dieser Art mit den Palpen ganz fest am Rande der Flügel eines Lepidopteron hängen sehen." Both authors found the mites on the wings; they do not say anything of mites using their palps to adhere to the border of the wings. And indeed, it would have been quite unusual, for they always have the position I indicated already. Moreover, Bold found only about 30 specimens and not 43, as indicated by Vitzthum.

I think that VITZTHUM (1941 : 574) is right when he considers this to

be “phoresy”. This word means that the mites are accidentally transported without having a special relation to the transporting animal. The word “symphorism”, as interpreted by DEEGENER (1917: 6, 15; 1918: 113, 408) and VITZTHUM requires the existence of such a relationship between the transporting animal and its passenger.

It seems probable to me that in most cases the mites have been able to attach themselves to the moth at some moment when it was at rest close to their biotope. On the 7th July 1964 I had the occasion to observe the species alive in the experimental hay-stack of Dr. D. A. Griffiths at the Pest Infestation Laboratory, Slough, Bucks., England, where they were quite numerous and very active. It certainly would have been very easy for them to come into contact with a moth at rest at this locality.

Catocala nupta likes to settle on walls, roof-gutters, etc., and frequently enters houses when a light is burning. It is known that *Charanyca clavipalpis* can develop in human dwellings and in stored material. The *Tinea* sp. of Berlese also may have been a species connected with man.

MORPHOLOGY

After the various descriptions given by previous authors, especially OUDEMANS (1907), there is no reason to repeat all characters. So I shall only give a few supplementary notes, as well as some figures.

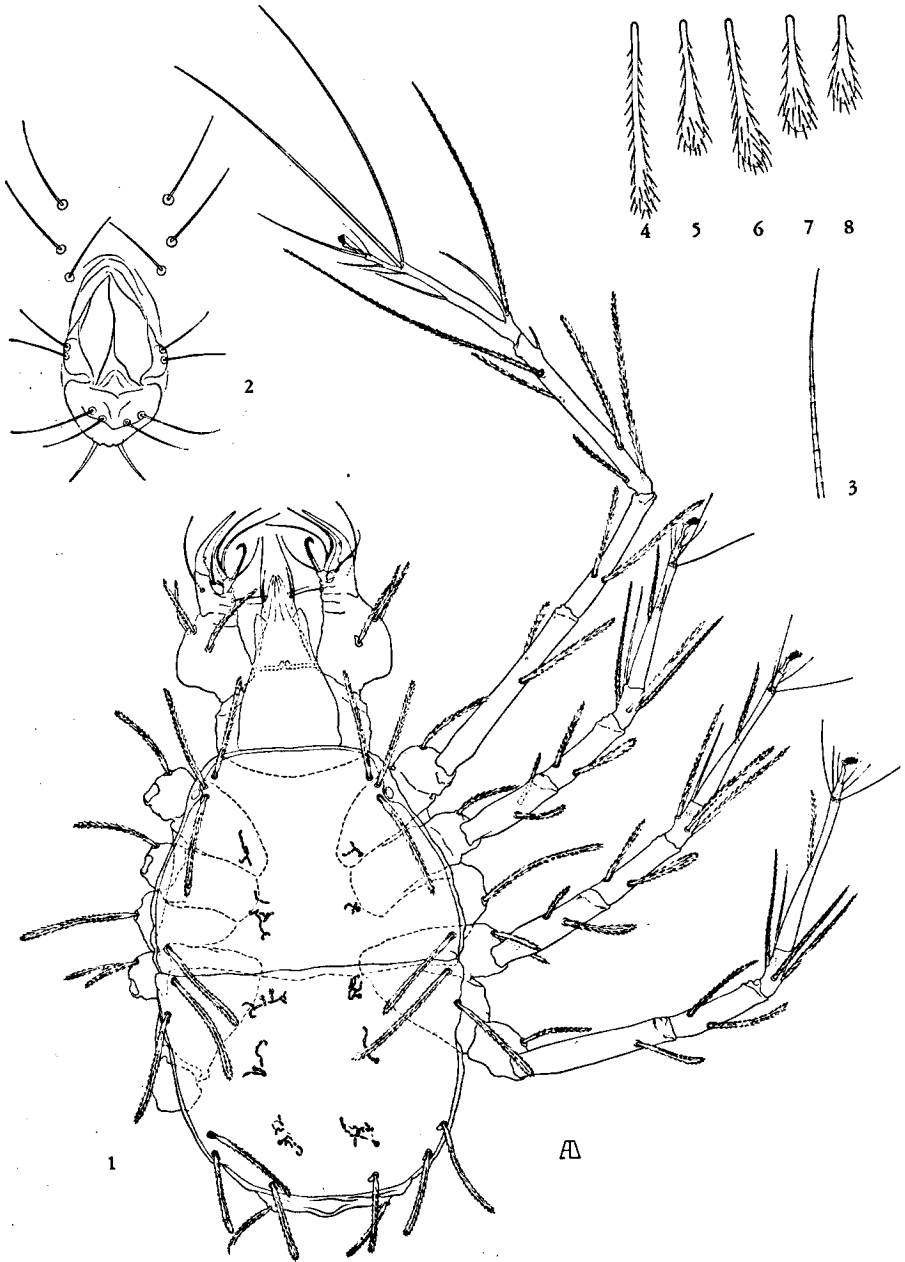
FEMALE (fig. 1—2)

According to the descriptions the larva, nymph and male have two submedian rows of dorsal hairs. The female is described with marginal hairs only. However, in the female I have found some pores from which a little rod-like structure emerges which in many cases ramifies into some branches reminiscent of a string of small sausages. At first sight they look like some mould.

BAKER (1949) is the only one who mentions four pairs of “short simple” setae. In my specimens there are two pairs on the propodosomatic shield and three pairs on the hysterosomal shield (Baker: two) and all hairs ramify in usually three branches each reminiscent of a string of small sausages. All specimens of my three hosts show them and they are also present in the old material of Oudemans, although he, when publishing his 1907 paper, had not discovered them. They are also present in the Belgian material of Cooreman.

Similar curious hairs exist in a number of Cheyletid mites. BAKER (1949) has described them from some species of other genera and calls them “staghornlike setae”. Their exact nature seems to be unknown. They show various types and the enlarged figure of Baker (Pl. 10, fig. 63) has e.g. an entirely different aspect than the hairs observed by me (fig. 1).

LEGS. Of the first leg the trochanter, femur and genu are transversely ringed. The tibia has the same aspect but at the distal end it changes into a longitudinal structure which is continued in the tarsus. Legs II, III and IV have the trochanter, femur and genu ringed in the same way; the very short



FIGS. 1—8. *Cheletomorpha lepidopterorum*. fig. 1, female, dorsal view; fig. 2, female, genital and anal area; fig. 3, female, top of articulated hairs on tarsus I; fig. 4—8, male, the five dorsal submedian setae. J. A. van Dreveldt del.

tibia has some rings at the basis and the remaining part, as well as the tarsus, shows the longitudinal structure.

Several authors have recognised the long distal setae of tarsus I to be articulated. For the longest hair I count about 70 joints. These hairs end in an extremely fine, not articulated tip, of about 7 joints length (fig. 3).

Trochanter I, II and IV bear one serrate hair; trochanter III has two setae. These hairs are rather variable on comparing different specimens.

MALE.

The five dorsal submedian setae of my only male specimen are of different length (fig. 4—8). The first pair is 40 μ , the fifth pair only 20 μ long. OUDEMANS (1907, fig. 39) depicted them all of about equal length; he made his drawing after a specimen of MICHAEL (Oudemans 1907: 151). BAKER (1949, pl. 14 fig. 110, 112) describes the male with five pairs of short dorsal submedian setae.

ADDENDUM

The following observations can be added:

1. As I had gathered three records in all from *Charanyca clavipalpis*, I examined the 245 specimens of this moth in the collection of the Zoölogisch Museum, Amsterdam. Three of them proved to carry hitherto undiscovered *Cheletomorpha*, viz.:

Weesp	18.VIII.1930	Wijde	forewing upperside left 6, right 11 forewing underside left 4, right 4 hindwing underside left 4, right 8
Apeldoorn	16.VIII.1951	Leffef	hindwing underside left 1, right 0
Wiessel	1.IX.1958	Leffef	hindwing underside left 1, right 1

2. The mites are well attached to the scales of the wing by their anal region. For this purpose they obviously secrete an adhesive substance sticking together a small number of scales. As in dead mites only the anal region sticks to the scales, it appears that the long legs with their long hairs have no function during the air transport.

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