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A PARTIAL REVISION OF THE GENUS METABELBA GRANDJEAN (ORIBATEI, ACARI)

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INTRODUCTION

The genus *Metabelba* was created by Grandjean in 1936 for Belbidae of which the solenidions of tibiae II and III are coupled with protective hairs, but of which the solenidion of tibia IV is free, long, and tactile. The genus belongs to the group of rather small species that are never covered with foreign material, but of which the cerotegument is very thick, especially on the moniliform legs, whilst the adults often bear the larval and nymphal skins.

The species have three or four lateral apophyses: one (which is not always present) between leg I and leg II, two between II and III, and one between III and IV. We have been in doubt as to the nomenclature of these apophyses, for although they have generally been regarded as tectopedia, they do not protect the trochanteres. Grandjean (in litt.) recently proposed to us the following notation. The apophysis between I and II is restricted to some members of the Belbidae, and in the present paper it is simply called anterior apophysis (*a.a.*). The two apophyses between II and III occur in several families; they protect the sejugal stigma; here they are called anterior and posterior parastigmatic apophyses (*a.p.a.*, *a.p.p.*). It is obvious that the fourth apophysis is a discidium (*dis;* cf. Grandjean, 1952, p. 31).

There are no spinae adnatae but there is often one pair of protuberances under the anterior border of the notogaster, opposite to a corresponding pair on the propodosoma; sometimes there is even a second pair of protuberances on the propodosoma, also situated in the posterior part.

The type of the genus is *Damaeus papillipes* Nicolet, a species that was insufficiently described, but of which Grandjean discovered specimens at the original locality. Whilst creating the genus, Grandjean did not give a redescription of *M. papillipes,* but in a footnote (1936, p. 56) he wrote that generally the species was considered a synonym of *Nothrus pulverulentus* Koch. In his opinion, however, the species does not correspond with Koch's original description, because the disposition of the notogastral hairs of *pulverulentus* Koch points to *Porobelba spinosa* Sellnick; Grandjean noted therefore that he preferred to use the name *papillipes.*

Last year the one of us (van der Hammen, 1952) found that there are two related species of the genus, one of which is *pulverulentus* auct. non Koch, a species supposed to be synonymous with *papillipes,* whilst the other was described as a new species (*Metabelba cremersi*).

Recently Grandjean had the kindness to give us topotypes of the Oribatids described by Nicolet from the environments of Paris, species of which the redescription is badly needed; among these there are several specimens of *Damaeus papillipes.* We expected that *papillipes* would prove to be identical with *pulverulentus* auct. non Koch, and we were surprised to find that, on the contrary, the species is identical with *cremersi.*

It is evident that the difficulties and errors in the genus are numerous, accordingly we decided to give a partial revision, containing a redescription of the type species, a description of *pulverulentus* auct. non Koch (as *pulverosa* Strenzke nov. spec.), a critical review of the literature, and notes on the remaining species. The redescription of *papillipes* was made by the first author, the description of *pulverosa* by the second, whilst the remaining part has been prepared in co-operation.

We are grateful to Dr. F. Grandjean (Paris) for specimens and for constructive advice; to Dr. G. Owen Evans (London) for the loan of "*Damaeus verticillipes*" from the Michael Collection; and to Dr. F. A. Turk (Camborne, Cornwall) for the loan of his "*Porobelba pulverulenta*".

DESCRIPTIONS

Metabelba papillipes (Nicolet, 1855) (figs. 1-4)

Among the species of Belbidae of the "*pulverulentus*"-group, only two regularly occur in the forests near Paris, where Nicolet collected his material:

one, the commonest, here preliminarily called *papillipes,* and *Porobelba spinosa* (Sellnick). Although Nicolet did not observe the long, curved solenidion on tibia IV, it is not difficult to decide which of the two species is the real *papillipes,* as the author figured a specimen with long notogastral hairs and with a strongly developed apophysis between the first and the second legs, so that *spinosus* is excluded. The description of the species based on the topotypes from Paris is here given.

Length 455-515 μ; breadth 310-345 μ (the measurements are sometimes slightly smaller in Dutch and British specimens). Colour reddish brown. The specimens generally bear larval and nymphal skins, and are strongly covered with cerotegument. When observed in air the cerotegument is white and powdery; although it is present nearly everywhere, it is especially thick on the legs, on the sensillus, and at the border between propodosoma and

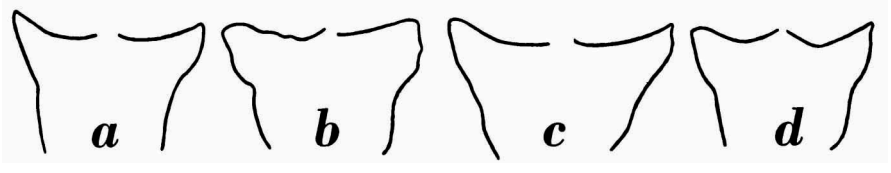

Fig. 1. *Metabelba papillipes* (Nic.), anterior apophyses seen from above. The specimens originate from: a, b, Meyendel (Netherlands); c, Paris; d, Michael Collection. × 412.

hysterosoma. When observed under a high power microscope the cerotegument looks like a mass of thin threads mixed with numerous small granules.

Propodosoma between I and II with a strong anterior apophysis that is directed to the front; the surface of the apophysis is granulate, and the shape is somewhat variable, sometimes slightly worn off (fig. 1).

The disposition of the hairs on the propodosoma is shown in fig. 2; the hairs are almost completely smooth. The bothridium is cup-shaped, the sensillus flagelliform; the exobothridial hairs are curved to the front, the interlamellar hairs directed upwards and backwards. The length of the sensillus is about 110 μ; the interlamellar hairs are slightly variable, but generally their length is about 70 μ.

At the posterior border of the propodosoma there is a pair of distinct, rounded protuberances opposite to a pair of tooth-shaped protuberances at the anterior border of the notogaster. Generally the posterior pair or even both pairs are covered by the upper surface of the notogaster (in fig. 2 they are shown as freely visible). In one specimen we observed a distinct, internal, chitinous connection between the two protuberances on the propodosoma.

The disposition of the notogastral hairs is also shown in fig. 2. The notation is as follows: c_1, c_2, *la*, *lm*, *lp*, h_3, h_2, h_1, ps_1, ps_2, ps_3. The

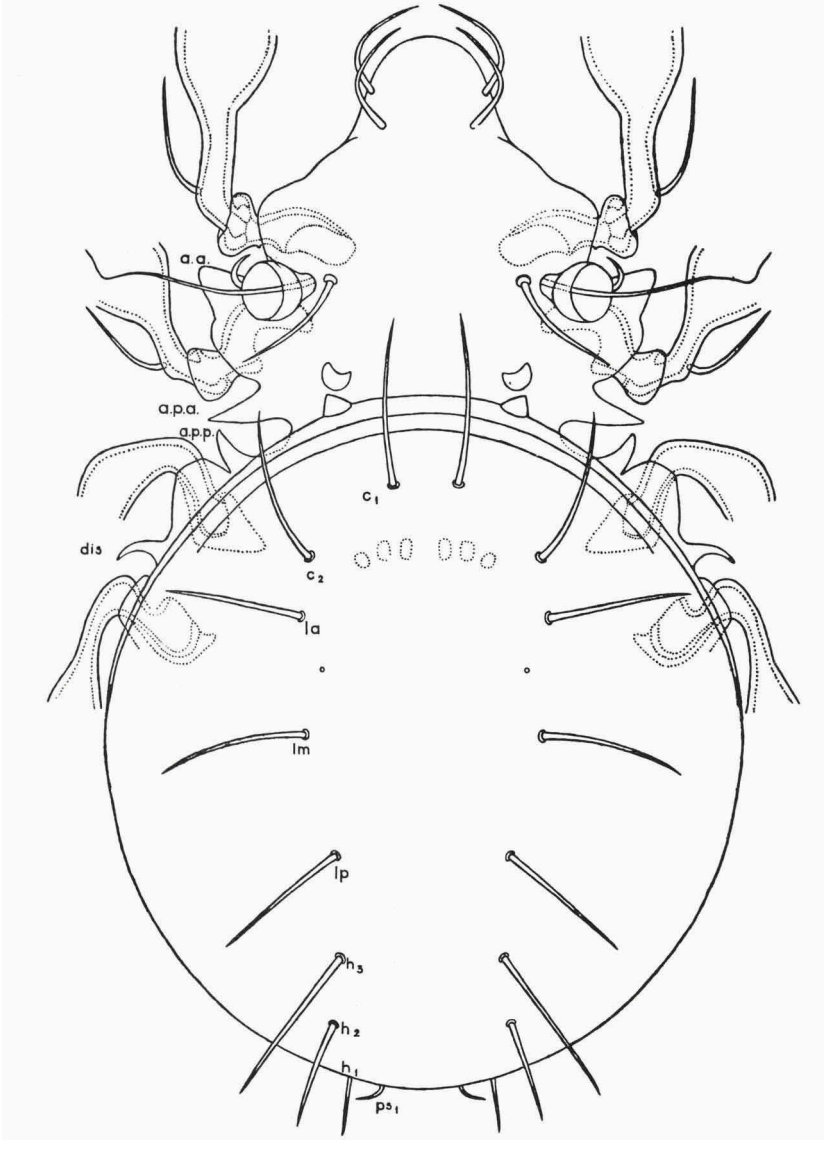

Fig. 2. *Metabelba papillipes* (Nic.), dorsal view; the abbreviations are explained in the text. × 275.

hairs *ps* are much smaller and are inserted at the posterior border. The length of the dorsal hairs is about 80 μ; when strongly enlarged it is visible that they are slightly thickened just above the place of insertion. There are no spinae adnatae.

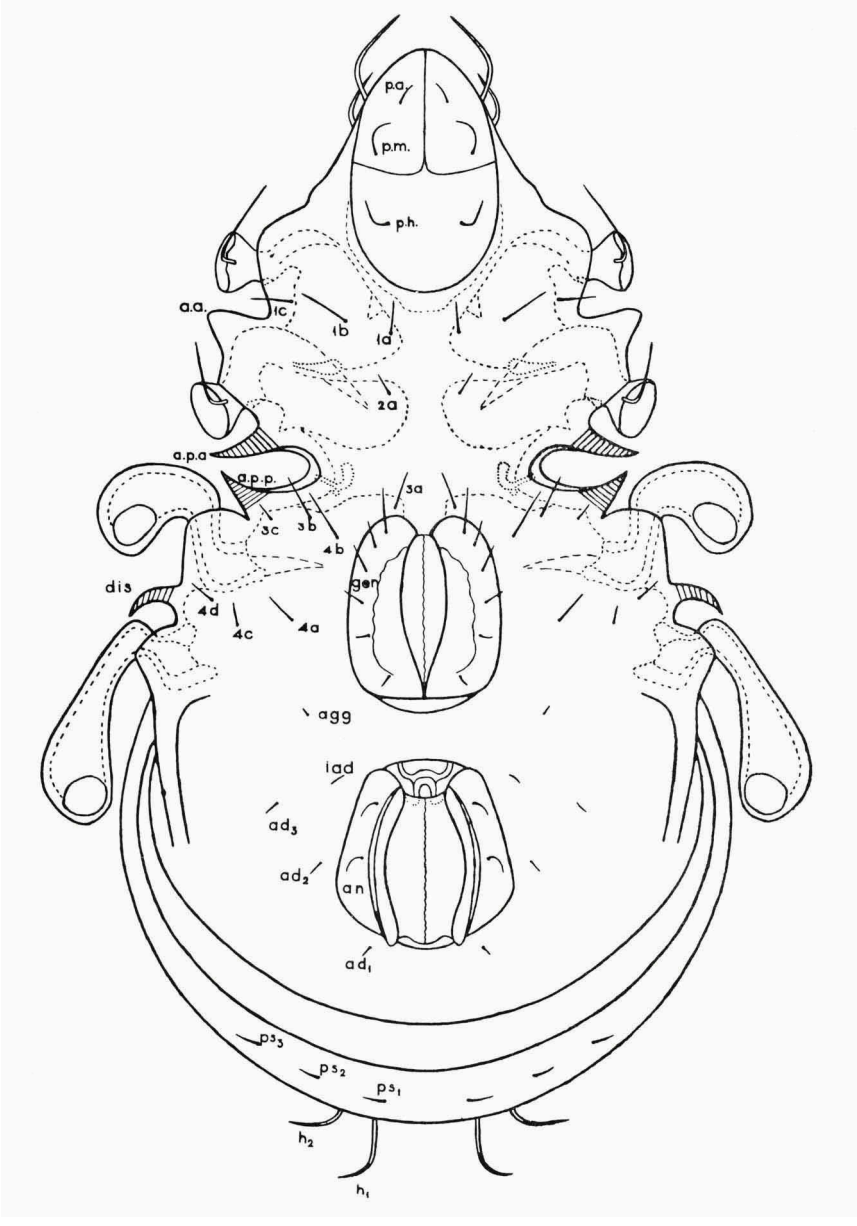

Fig. 3. *Metabelba papillipes* (Nic.), ventral view. × 275.

The fissures are best visible in a lateral orientation; they have the same disposition as in *M. pulverosa*.

The mentotectum is complete, without incision. The labium presents the usual hairs (*p.a., p.m., p.h.*; cf. fig. 3).

The epimeres show a normal number of hairs (*1a, 1b, 1c, 2a, 3a, 3b, 3c, 4a, 4b, 4c, 4d* in fig. 3; in the original description of *M. cremersi* a fourth hair was erroneously drawn on epimere I).

The genital and anal plates are rather widely separate. The genital plates (*gen*) each bear six hairs, each anal (*an*) three. There are one pair of aggenital hairs (*agg*) and three pairs of adanal hairs (*ad*).

Close to the sejugal stigma are the anterior and the posterior parastigmatic apophyses; they are large and pointed, especially the anterior. The discidium is long and curved.

The legs (fig. 4a, b) are moniliform. The measurements of the joints (in μ) are as follows:

	trochanter	femur	genu	tibia	tarsus
I		136	48	72	130
IV	112	92	48	75	148

The hairs of the legs are partly rough, sometimes beset with distinct hairs. The solenidion of tibia IV is long, and curved backward. The total number of hairs on the joints is as follows:

	trochanter	femur	genu	tibia	tarsus
I	1	10	5	6	22
IV	3	9	4	5	13

There are eupathidia on the first tarsus only, viz., the proral pair (*p'*, *p''*) and the unpaired subunguinal hair(*s*).

The topotypes used for the description of the species originate from Grandjean's collection (15 adults and some nymphs from tube 483, collected near Paris and Versailles); they are now in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, and in Dr. K. Strenzke's collection.

It is not easy to establish the synonymy of the species. We studied two slides from the Michael Collection, labelled *"Damaeus verticillipes"*, one specimen in dorsal view, and one in ventral. The specimen in the dorsal orientation appears to be identical with *M. papillipes,* although the hairs are darker than in the French and Dutch specimens. The second slide, in ventral orientation, contains a specimen with the genital and anal plates rather close to each other, without anterior apophysis, and with an unpaired porose area at the posterior border; it is probably a *Porobelba,* but the specimen has to be remounted for certain identification. In Michael's figure the specimen in dorsal view, although not altogether accurately drawn, indeed corresponds with *papillipes,* whilst the figure in ventral view, with the

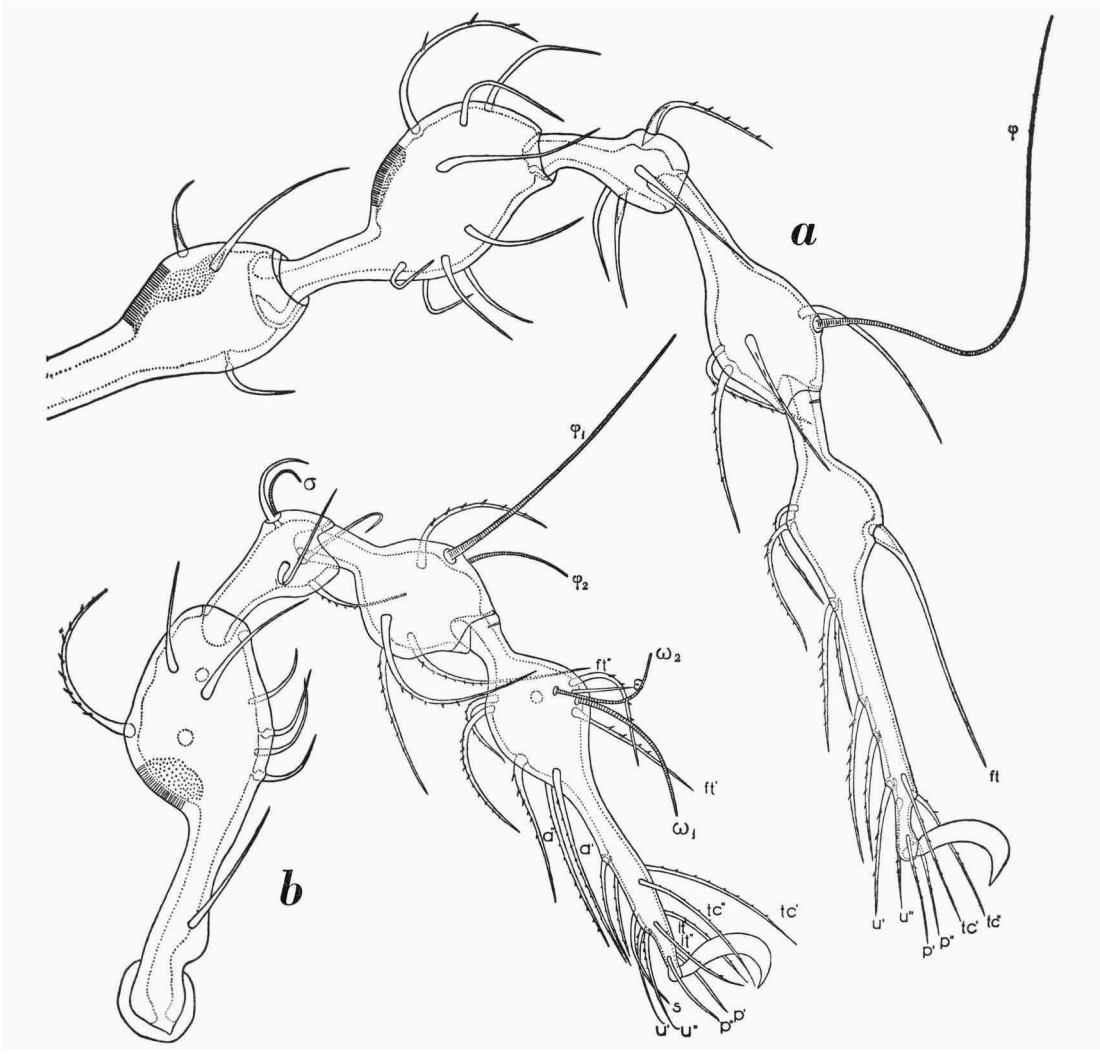

Fig. 4. *Metabelba papillipes* (Nic.). a, left leg IV from the antiaxial side; b, right leg I from the antiaxial side. σ, φ, ω, solenidions; ε, famulus; *ft*, fastigial, *tc*, tectal, *it*, iteral, *p*, proral, *u*, unguinal, *s* subunguinal, *a*, antelateral hairs. × 417.

genital and anal plates drawn close to each other, probably represents the *Porobelba* specimen.

Oudemans (1900) proposed the name *Oribata michaeli* for *Damaeus verticillipes* Michael non Nicolet; it appears now certain that the Dutch specimens in the Oudemans Collection bearing the name *Belba michaeli*,

although severely damaged, indeed belong to *papillipes*. The only other certain record is the description of *M. cremersi* van der Hammen (1952) from the Netherlands.

From the above mentioned facts it appears that up till now the species is only known from France, England, and the Netherlands. In the last named country *M. papillipes* is not rare; it was found to occur in woods, especially in birch woods and in thickets of *Prunus spinosa* and *Crataegus*; the species possibly has preference for the lower litter layers.

Metabelba pulverosa Strenzke nov. spec. (figs. 5, 6)

Length of the idiosoma 425-495 μ; length of the propodosoma 190 μ, of the hysterosoma 305 μ; breadth of the hysterosoma 305 μ. Colour glossy brown. Generally the specimens are strongly covered with cerotegument. Often the adults bear the larval and nymphal skins. Rostral hairs, lamellar hairs, interlamellar hairs, and exobothridial hairs slightly coarse; the remaining hairs and the sensillus are smooth.

Propodosoma between the first and the second legs with a strong anterior apophysis that is directed to the front, and that is distally truncate or sometimes slightly excavated; the surface of the apophysis is granulate (*a.a.* in figs. 5, 6a). Anterior parastigmatic apophysis (*a.p.a.*) slender and conical, directed sideways and upward. A similar, but shorter apophysis in front of acetabulum III (posterior parastigmatic apophysis, *a.p.p.*) and in front of acetabulum IV (discidium, *dis*).

Posterior border of the propodosoma without protuberances. In front of the bothridium, at each side, at first a round, light spot, then an area of smaller irregular spots. A similar, unpaired group occurs just between the bothridia. Medially and anally of the bothridia at each side a single light spot, posteriorly of which the chitin is slightly thickened, without, however, forming a protuberance as in related species. The disposition of the propodosomatal hairs is shown in figs. 5a, 6a. The sensillus (length about 120 μ) is flagelliform; it is directed obliquely backward. The interlamellar hairs (length about 80 μ) are also directed obliquely backward; they stand close to the bothridia. Bothridium cup-shaped. Exobothridial hairs close to the antiaxial side of the bothridia; they are strongly curved, and are directed frontward and upward.

Notogastral hairs in two rows, each of 8 curved hairs, which are inserted rather close to each other. The two anterior pairs (c_1 and c_2) are directed to the front, the remaining hairs backward (figs. 5a, 6a). Three pairs of hairs occur at the posterior border of the notogaster (ps_1, ps_2, ps_3 in figs. 5b,

6a). The hairs of the two longitudinal rows possess wing-like expansions that begin just above the base; these are especially striking in the hairs c_1 and c_2 (fig. 6b). In balsam these features become less distinct. Length of the hairs c_1 and c_2 80 μ; the remaining notogastral hairs are about 60 μ

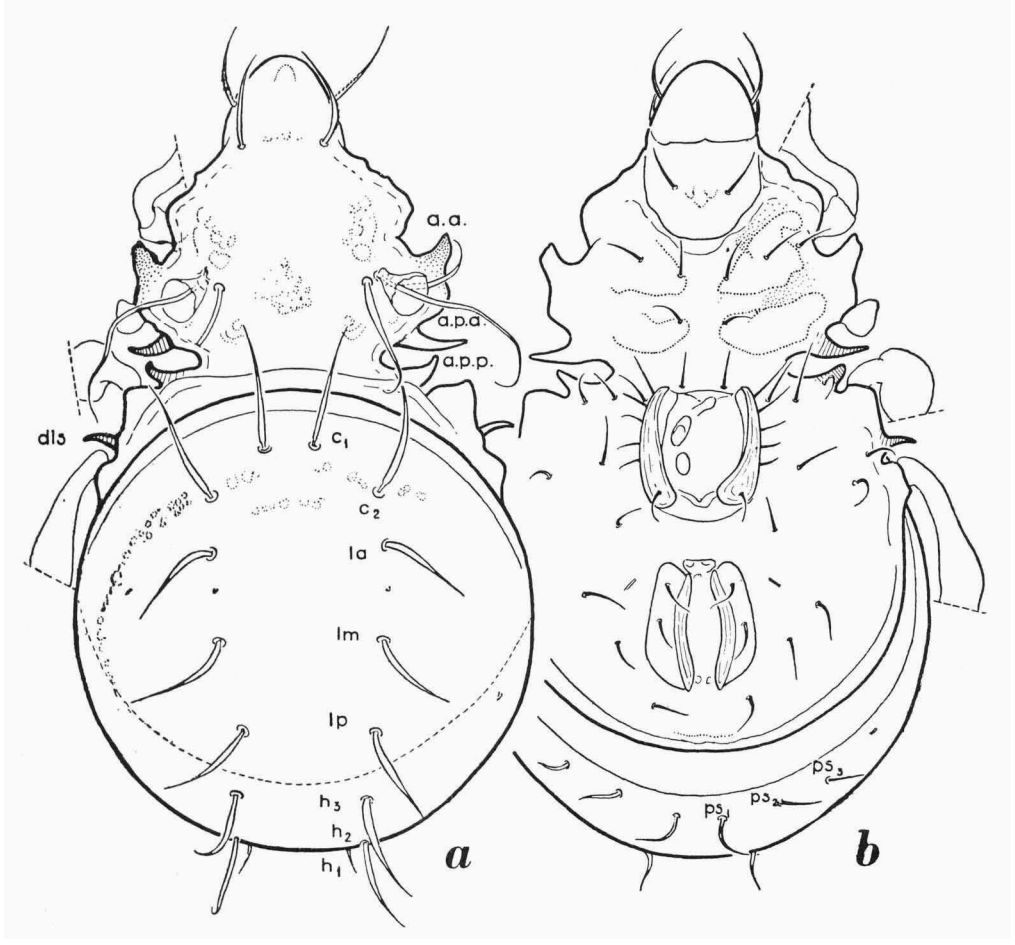

Fig. 5. *Metabelba pulverosa* Strenzke nov. spec. a, dorsal view; b, ventral view. × 240.

long. The disposition of the fissures on the notogaster is shown in fig. 6a. There are no spinae adnatae.

Genital and anal plates separated by a large interval. The chaetotaxy of the ventral surface is shown in fig. 5b.

The shape and the chaetotaxy of the legs is shown in figs. 6c, d. The number of hairs is as follows:

Fig. 6. *Metabelba pulverosa* Strenzke nov. spec. a, lateral view; b, hair c_2; c, left leg IV from the antiaxial side; d, left leg I from the antiaxial side. a, × 240; b, × 830; c, d, × 335.

	trochanter	femur	genu	tibia	tarsus
I	1	10	5	6	22
IV	3	9	4	5	14

On femur I dorsally a strong, serrate hair that is curved to the front close above the base. On leg IV similar hairs on trochanter, femur, and genu. The remaining hairs of the legs partly with similar expansions as the notogastral hairs. Solenidion of tibia IV free, and strongly curved in the middle. The length (in μ) of the joints of the legs is as follows:

	trochanter	femur	genu	tibia	tarsus
I		128	46	60	122
IV	103	82	50	72	130

Holotype: from the soil of a forest meadow at the Keller See, Holstein, 18.V.1940 (sample 239, cf. Strenzke, 1952, p. 48), as slide in Strenzke's collection. Paratypes from the same sample, in alcohol, in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, and in Strenzke's collection.

It is difficult to establish the synonymy of the species because of the absence of reliable figures. An essential part of the records of *M. pulverulenta* from Central Europe may refer to *M. pulverosa*. According to the description and figure reproduced by Oudemans (1937, p. 2595, fig. 1117) it is, anyhow, impossible to identify Koch's species with certainty, because at present it is evident that the genus *Metabelba* consists of a rather large number of species that are difficult to distinguish. As Koch's species is characterized by the absence of an anterior apophysis between I and II, and by the occurrence of laterally inserted notogastral hairs that surpass the border of the notogaster ("Hinterleib ... mit einer Reihe kurzer, gekrümmter, spitzer Borsten über den Seiten und über dem Hinterrande"), the identity of *pulverulenta* and *pulverosa* is not probable. As far as concerns the possibility of Koch's species being a *Porobelba*, cf. Grandjean (1936, p. 67), van der Hammen (1952, p. 41), Strenzke (1952, p. 101).

It is difficult to identify Kulczynski's *Oribata pulverulentus* (1902, p. 35). Habitus and measurements (legs!), as well as the absence of protuberances on the propodosoma, point to the identity with *pulverosa*. There are, however, important differences in the chaetotaxy of the legs, in the number of hairs (according to Kulczynski there is only one hair on trochanter IV), as well as in their shape (Kulczynski does not figure strongly serrate dorsal hairs on the proximal joints) (cf. Kulczynski, 1902, pl. 4 figs. 60, 61).

Turk's *Porobelba pulverulenta* (Turk and Turk, 1952) appears to be a species of *Metabelba*; the slide is, however, too damaged to be identified

with certainty; possibly it concerns a species not dealt with in the present revision [1]).

It is impossible to draw conclusions concerning the geographical distribution of *M. pulverosa*. For a certainty the species is up till now only known from Germany (Holstein, Pomerania, Westphalia). Probably Willmann's records (1931, p. 120) also refer to the species. In northern Germany *M. pulverosa* prefers localities with a strongly developed litter layer; the species is not rare in forest meadows, alder marshes, coniferous and deciduous woods, but it also occurs under Ericaceae in moorlands; it avoids, however, bogs (Sphagneta) (cf. Strenzke, 1952, p. 102 sub *pulverulenta*).

It is a striking fact that *M. papillipes*, evidently not rare in the Netherlands, was not yet discovered in Germany, whilst on the other hand *M. pulverosa* was not yet found in the Netherlands.

THE OTHER SPECIES OF THE GENUS

The greater part of the Belbidae have originally been described as *Belba*, *Damaeus*, or *Oribata* species, and because most authors did not pay attention to the chaetotaxy of the legs, especially to the presence of protective hairs near the solenidion of tibia IV, it is not easy to decide to what genus the species in reality belong. As late as 1952, Hammer described five new Belbidae from arctic Canada as species of *Belba*; although it is evident that none of these is a real *Belba*, her descriptions do not allow of definite conclusions concerning the real generic position.

In 1902 Kulczynski described as *Oribata comptus* a species that in its general appearance shows a close resemblance to representatives of the genus *Metabelba*. Nevertheless the presence of a protective hair near φ IV points to the genus *Belba*, as already stated by Forsslund (1945) and Strenzke (1952). A detailed investigation of the specimens shows some more characters that correspond with the genus *Belba*, such as the very short distance between the genital and anal plates; a detailed redescription of *B. compta* might prove interesting, as there are also striking differences from *B. corynopus* (Hermann), the type of the genus *Belba*. We draw, for instance,

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1) The diagnosis of the specimen is as follows. Length 625 μ; colour light brown; the cerotegument is thin and slightly granulate. Notogastral hairs coarse and rather short; apart from one or two anterior pairs they are strongly curved. The measurements of the legs correspond exactly with those of the *montana* specimen studied by us. Possibly Turk's specimen is indeed identical with *montana;* the light colour and the different cerotegument may be due to the fact that at the date of its capture it had just become adult.

attention to the normal number of hairs on the epimeres, and to the *Metabelba*-like shape of ♀ IV.

The species of *Metabelba,* known up till now, can be arranged in groups. The first group, possessing a distinct anterior apophysis, contains *papillipes* (Nicolet, 1855), *pulverosa* Strenzke nov. spec., and *propexus* (Kulczynski, 1902). The remaining groups have no anterior apophysis, and at first it seemed necessary to create a new subgenus for these; after studying *Metabelba montana,* however, we concluded that such a subgenus would be too heterogeneous. For the moment we prefer to distinguish three groups beside the first: a second group containing *sphagni* Strenzke (1950) and *italica* (Sellnick, 1931), a third group containing *lanceolata* van der Hammen (1952), and a fourth group containing *montana* (Kulczynski, 1902).

The last named species has some special characters that give it a peculiar position; we mention the rough notogastral hairs and the presence of a particular, very coarsely granulate cerotegument.

The species of the genus can be identified with the following key. In this key *Damaeus romandiolae* and *D. propinquus* Sellnick (1943), species that probably belong to *Metabelba,* are not included. *Oribata ursina,* insufficiently described by Sig Thor (1930), may be related to *Metabelba montana*; it differs from the latter species by its yellow colour and by the presence of four small protuberances on the propodosoma.

Key to the species of *Metabelba*

1. Between the first and the second legs a distinct apophysis 2
— Propodosoma between I and II rounded 4
2. No distinct protuberances at the posterior border of the propodosoma, and no protuberances under the anterior border af the notogaster . . *pulverosa* Strenzke.
— Propodosoma posteriorly and notogaster anteriorly with protuberances . . 3
3. One pair of protuberances at the posterior border of the propodosoma . . . *papillipes* (Nicolet).
— Two pairs of posterior protuberances on the propodosoma *propexus* (Kulczynski).
4. Notogastral hairs very broad and lanceolate, inserted on distinct elevations . . *lanceolata* v. d. Hammen.
— Notogastral hairs not strikingly broadened 5
5. Notogastral hairs dark, stiff, radiating bristles 6
— Notogastral hairs lighter; the first pair directed to the front, the remaining pairs strongly curved and directed backward *montana* (Kulczynski) (cf. also *ursina* Sig Thor).
6. Opposite to the pair of posterior protuberances on the propodosoma there is a corresponding pair under the anterior border of the notogaster; trochanter IV longer than femur IV . . . . . *sphagni* Strenzke.
— No corresponding protuberances under the anterior border of the notogaster; trochanter IV shorter than femur IV . . . . . *italica* (Sellnick).

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