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**A NEW SPECIES OF *MACRONYSSUS KOLENATI*, 1858 (ACARI: MACRONYSSIDAE)  
FROM LEISLER'S BAT, *NYCTALUS LEISLERI* KUHL, 1818  
(MAMMALIA: CHIROPTERA) IN GERMANY**

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**ABSTRACT** - The bat mite *Macronyssus leislerianus* n. sp. (Acari: Macronyssidae) is described from *Nyctalus leisleri* Kuhl, 1858 (Chiroptera) from Thuringia, Germany. Illustrations are given.

**Key words** - Acari, Macronyssidae, systematics, bat mite, new species, Germany.

### INTRODUCTION

A new bat mite collected from Leisler's bat, *Nyctalus leisleri* Kuhl, in Thuringia, one of the new federal states, Germany is described here. The new mite is common in this region and has been confused with *Macronyssus flavus* Kolenati, also present in this area but apparently confined to *Nyctalus noctula* (Schreber). These two bat species are closely related to each other and live in sympatry in the region we studied. Moreover, both bat species inhabit tree holes throughout the year. Despite both host species often roosting together in the same hollow, both mite species remain very specific to their respective hosts.

The setal nomenclature of the dorsum elaborated by Lindquist and Evans (1965), and the morphological terminology proposed by Evans and Till (1979) are followed in this paper. All measurements are given in micrometers ( $\mu\text{m}$ ).

### MATERIALS AND METHODS

**Bat hosts** - The junior authors examined about 140 bats collected in three groups as given below for ectoparasitic mites during 1999 to 2002. These bats were trapped in several localities of Thuringia (central Germany) in the course of the annual ringing operations.

(1) A group of 29 bats, *N. leisleri* (23 females, 6 males) and 10 of *N. noctula* (1 female, 9 males) were

found infested with *Macronyssus* spp. in Leinefelde, Thuringia (10°21' 04'' E, 51°22'41'' N), trapped in July and August 1999.

(2) A group of 84 bats, all *N. leisleri* (55 females 29 males), in three different places of Thuringia: Leinefelde (10°21'04''E, 51°22'41'' N), Eisenach (10°21'40''E, 50°59'24''N) and one bat in Hundeshagen (10°16'00''E, 51°25'22''N), trapped in July 2000.

(3) A group of 27 bats (6 females, 21 males), *N. noctula*, in Leinefelde (10°21'04''E and 51°22'41''N), trapped in April and May 2001.

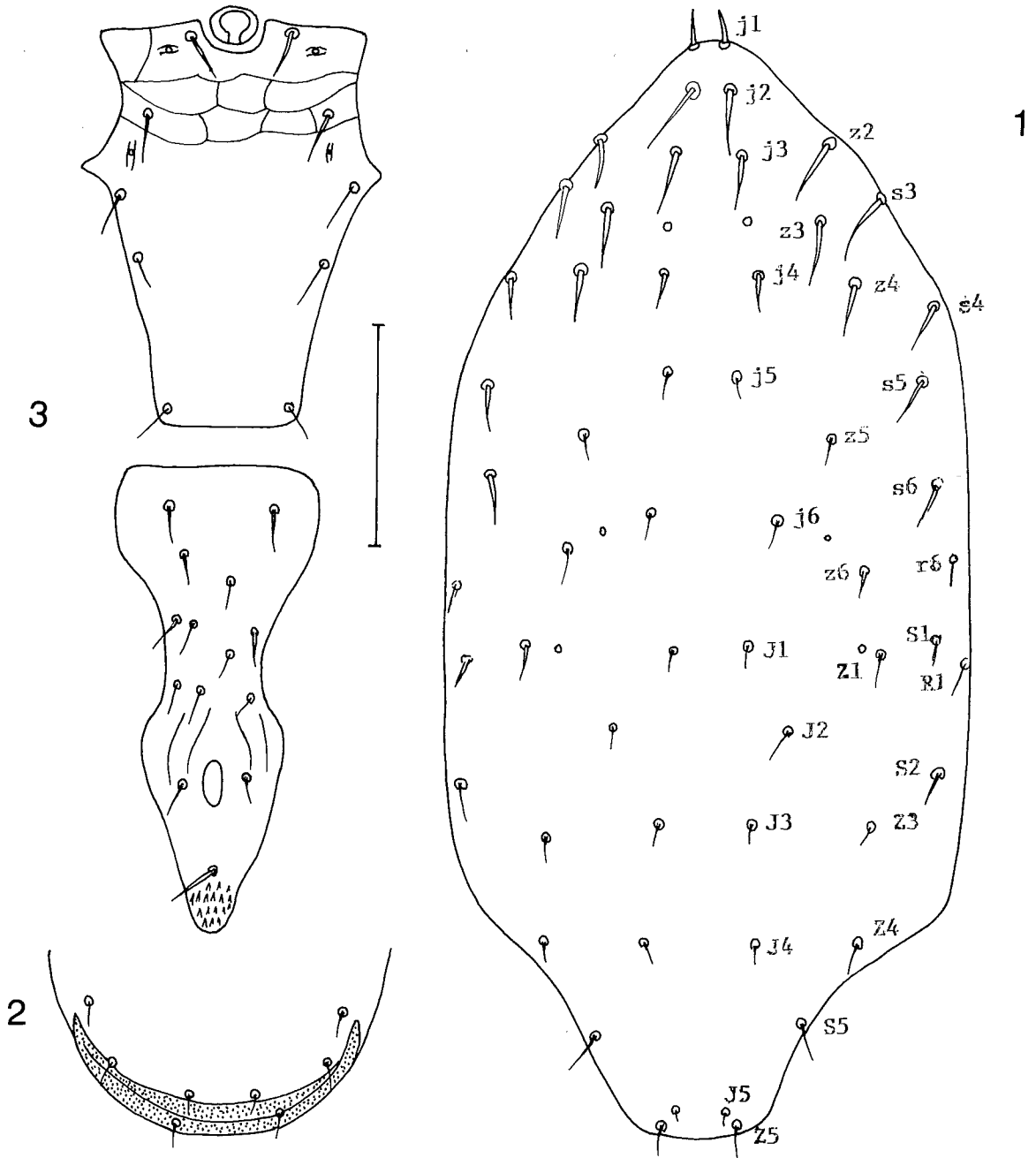
**Mites** - The number of mites of the genus *Macronyssus* collected from 140 bats was 350. Among these 140 belonged to *M. flavus* (125 females, 8 males and 7 protonymphs, all collected from *Nyctalus noctula*) and 210 to *M. leislerianus* n. sp. (152 females, 18 males and 40 protonymphs, all taken from *N. leisleri*).

In addition to *Macronyssus* spp., we also found a small number of mites belonging to the genus *Steatonyssus*, mostly protonymphs, with only few adults.

### Geographical distribution of *Nyctalus* spp. (after Mitchell-Jones *et al.* 1999)

(1) *Nyctalus noctula* (Schreber 1774) - This bat was described from France.

**World distribution** - Most of Europe and Asia to southwestern Siberia, China, northern Vietnam and Taiwan and doubtful in Malaysia. Also recorded from Africa. Assumed to have reached Mozambique on at least one occasion.



Figs. 1-3. *Macronyssus leislerianus* n. sp. - 1. Dorsal shield (in female paratype), 2. Posterior part of dorsal shield in male, 3. Sternogenital and ventrianal shields in female (scale line: 100  $\mu$ m).

**European distribution** - From the Iberian Peninsula to the Urals and Caucasus. In Sweden the northern limit coincides with the latitudes of Norrlandicus (60-61°).

This species is the typical host of *Macronyssus flavus*.

(2) *Nyctalus leisleri* (Kuhl, 1818) - This bat was described from Hanau, Hessen-Nassau, Germany.

**World distribution** - From western Europe to southwestern Asia, east to 79° E in Uttar Pradesh, India. Also northwestern Africa.

**Europe** - Throughout, except Denmark, Iceland, and Norway; most of Estonia, Finland, Sweden and northern Russia.

*Nyctalus leisleri* is distinctly smaller than *N. noctula*. This bat is the typical host of *Macronyssus leislerianus* n. sp.

**List of abbreviations used in the table** - These are:

ASL - Length of anal shield including the cribrum  
 ASW - Width of anal shield at the level of the anus  
 CH - Total length of chelicerae (not including fixed digit)  
 Ch - Length of movable digit of chelicera  
 DSL - Length of dorsal shield in midline  
 DSW - Maximum width of dorsal shield in posterior half  
 GSL - Length of genital shield including anterior membranous part  
 GSW - Width of genital shield at level of genital setae  
 Per - Length of peritreme, including the stigma  
 St1, St2, St3, Sm - Length of sternal and metasternal setae  
 St1-St1 - Distance between bases of first pair of sternal setae  
 St2-St2 - Distance between bases of second pair of sternal setae  
 St3-St3 - Distance between bases of third pair of sternal setae  
 St1-St3 - Distance between the bases of St1 and St3  
 Sm-Sm - Distance between bases of metasternal setae  
 STSL - Length of sternal shield in midline  
 Ta 1 - Length of tarsus 1 (ambulacrum not included)  
 Ta 2 - Length of tarsus 2 (ambulacrum not included)  
 Ti 1 - Length of tibia 1  
 SGSL - Length of sternigenital shield (in male)  
 VASL - Length of ventrianal shield (in male)  
 VASS - Number of setae on ventrianal shield (in male)

### Genus *Macronyssus* Kolenati, 1858

#### *Macronyssus leislerianus* n. sp. (Figs. 1-3, 5, 7, 10)

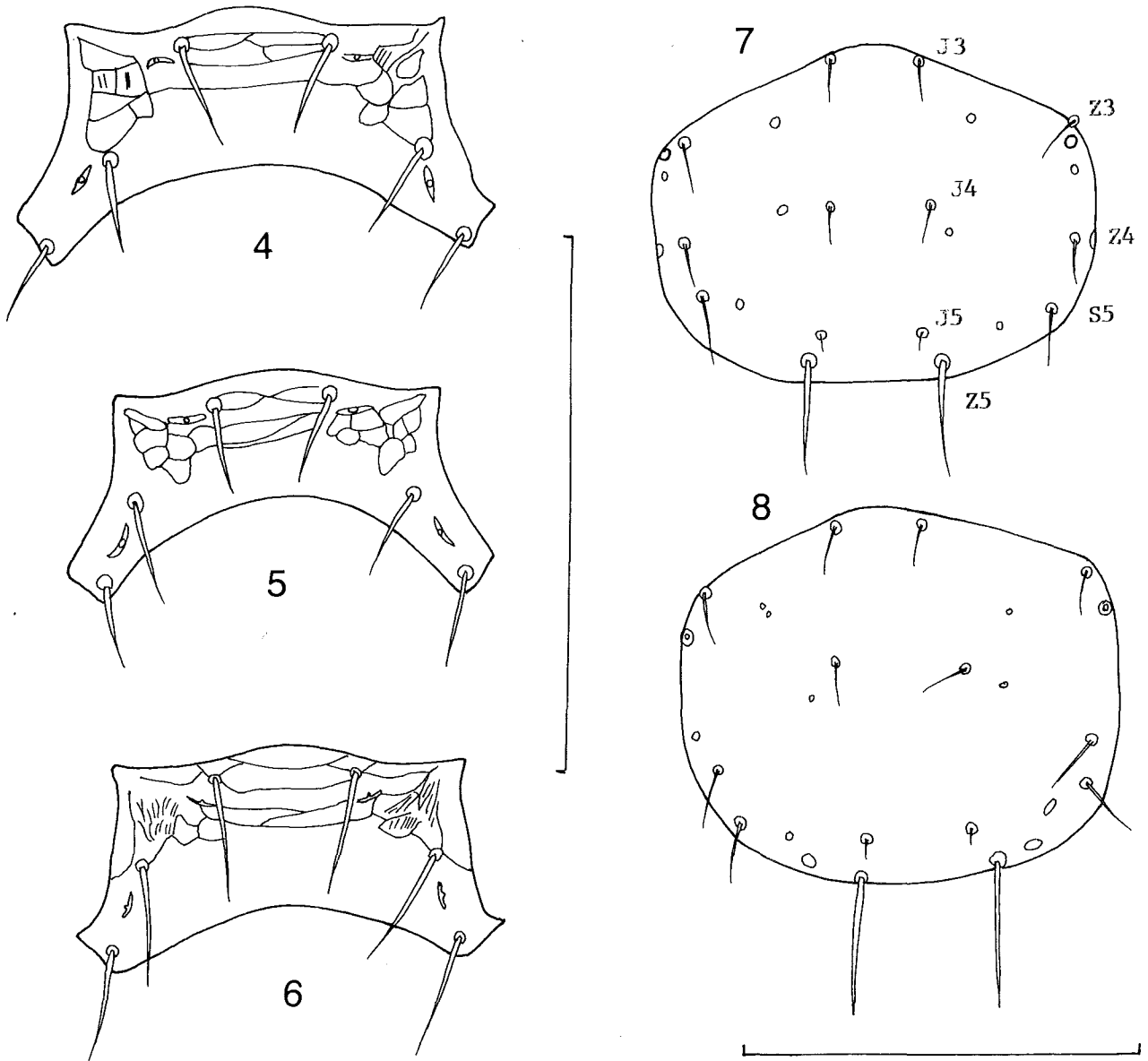
**FEMALE** (Holotype, Figs. 1, 5, Table 2) - Idiosoma 576 long, 396 wide. **Dorsum:** Dorsal shield (in a paratype) reticulate, abruptly narrowed in posterior part, maximum length 518, width 248, with 28 pairs of setae (20 females examined). Length of setae: j2 and j3 28-30, s3 30, z2 28, z3 and z4 20-24. Other setae less than 20 long. Scutum in one female with an additional seta (R1) at one side. Setae Z2 lacking. Soft cuticle with about 45 pairs of setae, 12-30 long. **Venter:** Sternal shield 48 long in midline, with 3 pairs of setae, setae St1, St2 and St3 35, 33 and 33 long, respectively, distance between St1-St1 42, St2-St2 102, St1-St3 81, St3-St3 135. Sm 30, Sm-Sm 150. Anterolateral part of sternal shield with 6 pairs of small irregular cells, all situated behind anterior pair of lyrifissures. Second pair of lyrifissures in posterolateral part of shield. Anteromedian region of shield with 4 poorly distinct transverse lines, posteromedian area devoid of lines. A reticulate pattern wider than long present in front of shield. Sternal glands not distinct. Genital shield 220 long,

69 wide, with a distinct pattern (scalelike in its anterior third and with elongate cells in posterior two thirds). Anal shield length 108 (including cribrum), maximum width 70. Soft cuticle of opisthogaster with about 60 pairs of setae slightly inflated in basal part, 12-20 long. Peritreme, including stigma, 250 long, reaching middle or anterior third of coxa I. **Gnathosoma:** Total length, including palps, 188, width of base 78. Nine small deutosternal teeth in a single row. Chelicerae 144 long (including fixed digit and posterior short basal part), movable digit 35. Tritosternum with base 30 and laciniae 95 long. **Legs:** Tarsi I and II and tibia I 66, 60 and 45 long, respectively. Coxae I ventrally with 4-5 incomplete transverse lines in basal half or two-thirds, coxae II and III with a posteroventral curved ridge, about 25 long.

**MALE** (Figs. 2, 3, Table 4) (Metric data of figured paratype given here) - Length of idiosoma 510, width 330. **Dorsum:** Dorsal shield 468 long, maximum width 258, ratio length/width 1.8, with 28 pairs of setae, longest measure j2 27, z3 27, z2 22, j3 18, z4 16, s4 18; other setae less than 15 long and very thin. Posterior extremity regularly rounded, reinforced by a thick sclerotized band originating at about 90 from posterior extremity (measured in straight line) (Fig. 2). **Venter:** Sternigenital shield 180 long, maximum width 130, bearing 11 pairs of setae, 15 long. Soft cuticle of opisthogaster with about 25 pairs of setae 12-15 long. Peritreme reaching middle or anterior third of coxa I. Chelicerae 120 long (fixed digit and posterior part included). Movable digit 30 long, thick, strongly bent in anterior third, spermatodactyl cylindrical, thick, 45 long. **Legs:** Coxae as in female.

**PROTONYMPH** (Figs. 7, 9, 10) - This description is based on 4 paratypes collected from 4 bats (*N. leisleri*) in the locality of Leinefelde.

Length and width of idiosoma: 450 x 280, 432 x 258, 390 x 256, 339, 210. Length and width of podonotal shield 186 x 152, 195 x 160, 198 x 150, 198 x 148. Length and width of pygidial shield: 75 x 98, 78 x 105, 81 x 102, 77 x 99. Length and width of sternal shield 123 x 87, 120 x 87, 126 x 92, 127 x 98. Anal shield 45 x 42, 45 x 44, 48 x 42, 45 x 44. Podonotal shield with 10 pairs of setae, median setae very short (4-9 long), laterals 8-20 long. Pygidial shield rectangular, with lateral margins very slightly rounded, posterior margin almost straight, anterior border slightly protruded in its median part, bears 7 pairs of setae: J3 10, J4 10, J5 are microsetae, Z3 15, z4 16, Z5 25, S5 15 (Fig. 8). Soft cuticle of dorsum with 12 pairs of setae, 9-20 long, one of these pairs (9 long) situated in front of shield. Sternal shield 45 long, 42 wide, with 3 pairs of setae, 30-33 long. Soft cuticle of venter with 5 pairs of setae, 15-27 long. Peritremes 45 long. **Legs:** Tarsus I 45, tibia I 33. Coxae I with ventral transverse lines, coxae II with an indistinct curved very short ridge, other coxae without ridges.



Figs. 4-8. Sternal shield in the females of - 4. *Macronyssus flavus* Kolenati, 5. *M. leislerianus* n. sp. and 6. *M. crosbyi* Ewing and Stover. Figs. 7-8. Pygidial shield in the protonymphs of - 7. *Macronyssus leislerianus* n. sp. and 8. *M. flavus* (scale lines: Figs. 4-6 - 200  $\mu$ m; Figs. 7-8 - 100  $\mu$ m) (Fig. 6. reproduced from Radovsky, 1967).

#### DEUTONYMPH AND LARVA - Unknown.

REMARKS - *Macronyssus leislerianus* is closely related to *M. flavus*. The females differ from those of the latter by the much smaller size of the body and most of the structures. These differences are shown in Tables 1 and 2. The males of these species differ from each other

by the same characters as for the females except, however, for one character. In the male of *M. flavus* the posterior border of the dorsal shield is slightly sclerotized while in the male of *M. leislerianus* this border is thicker and distinctly more sclerotized. Chelicerae, in both sexes, are similar in shape to those of *M. flavus*, but smaller (see

Figs. 9-10. Protonymph of *Macronyssus leislerianus* n. sp. - 9. Ventral view, 10. Dorsal view (scale line: 100  $\mu$ m). Figs. 11-12. Protonymph of *Macronyssus flavus* Kolenati (opisthosomal region) - 11. Ventral view, 12. Dorsal view (scale line: 100  $\mu$ m).

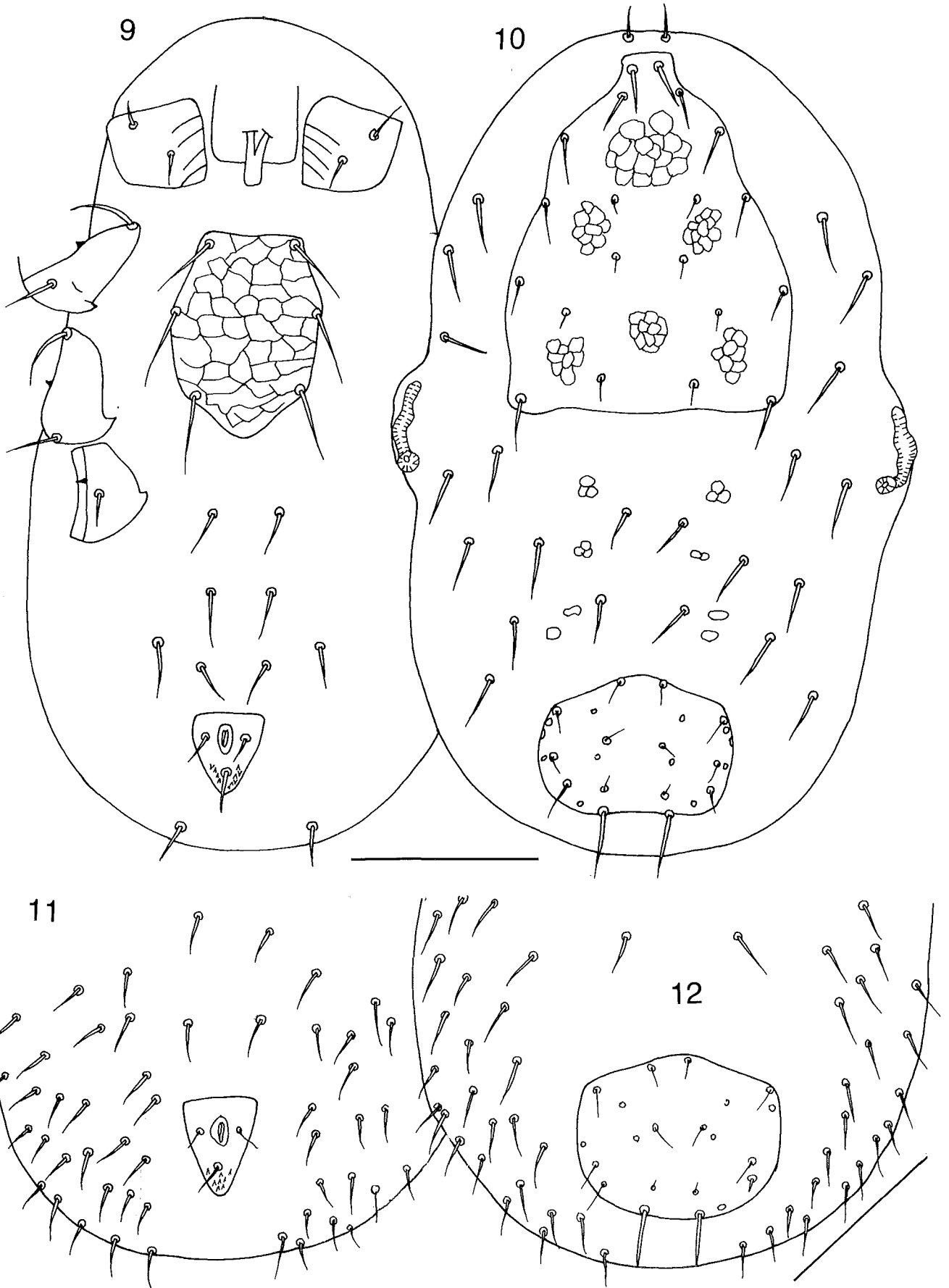


Table 1. Metric data for 20 females of *Macronyssus flavus* collected from 20 females of *Nyctalus noctula* in Germany.

Characters	Range	Mean	Characters	Range	Mean
ASL	114-138	125	St2-St2	120-150	129
ASW	87-105	93	St3-St3	120-168	157
CH	160-182	174	Sm-Sm	150-195	175
Ch	37-44	41	St1	30-39	36
DSL	564-625	607	St2	30-42	36
DSW	270-306	286	St3	30-40	35
GSL	248-288	264	Sm	27-34	30
GSW	72-90	78	STSL	48-60	57
Per	255-305	286	Ta1	87-94	90
St1-St1	51-60	56	Ta2	66-85	78
St1-St3	81-93	89	Ti1	60-70	64

Table 2. Metric data for 20 females of *Macronyssus leislerianus* collected from 20 females of *Nyctalus leisleri* in Germany.

Characters	Range	Mean	Characters	Range	Mean
ASL	90-108	100	St2-St2	9-108	99
ASW	78-81	76	St3-St3	121-150	132
CH	135-150	144	Sm-Sm	138-165	148
Ch	33-39	36	St1	25-36	29
DSL	498-552	516	St2	29-36	30
DSW	228-252	242	St3	27-34	30
GSL	216-282	226	Sm	25-30	27
GSW	60-68	63	STSL	45-51	48
Per	249-275	257	Ta1	60-74	67
St1-St1	39-45	41	Ta2	60-74	63
St1-St3	75-84	77	Ti1	47-51	49

Table 3. Metric data for 4 males of *Macronyssus flavus* from *Nyctalus noctula* in Germany.

Characters	Range	Mean	Characters	Range	Mean
CH	135-189	152	St1	27-33	30
Ch	42-51	47	St2	25-30	28
DSL	540-618	584	St3	27-31	28
DSW	300-340	310	Ta1	90	90
Per	255-270	261	Ti1	64-67	66
St1-St1	60	60	SGSL	225-249	235
St2-St2	99-111	104	VASL	230-285	259
St3-St3	120-126	122	VASS	12-14	13

Table 4. Metric data for 5 males of *Macronyssus leislerianus* from *Nyctalus leisleri* in Germany.

Characters	Range	Mean	Characters	Range	Mean
CH	110-133	121	St1	24-27	26
Ch	40-42	41	St2	21-27	23
DSL	432-510	462	St3	24-30	27
DSW	249-278	260	Ta1	66-75	69
Per	240-265	247	Ti1	48-51	44
St1-St1	36-54	44	SGSL	117-210	192
St2-St2	78-90	81	VASL	185-215	199
St3-St3	102-108	105	VASS	10-15	12

Tables 1-4). It is in the protonymphs that the differences between these two species are the most marked. In all the protonymphs collected from *M. leislerianus* (about 50 specimens) the soft cuticle of the opisthogaster bears only 5 pairs of setae (Figs. 5, 9, 10) while in the protonymphs of *M. flavus* this region bears 25 to 35 pairs of setae (Figs. 11, 12). Hypertrichy is also present on the soft cuticle of the dorsum which in *M. flavus* bears 40 to 50 pairs of setae and only 12 pairs in *M. leislerianus*. Other characters that differ in these species are the size and shape of the pygidial shield of the protonymph. In *M. flavus* (7 specimens) the length ranges from 87-90 (mean 89.5) and width from 96-120 (mean 108.4), the ratio L/W is 0.825 (Fig. 8). In *M. leislerianus* (6 specimens) the length ranges from 75-80 (mean 76), width from 99-105 (mean 98.6) and L/W is 0.771 (Fig. 7).

Another species that resembles *M. leislerianus* is *Macronyssus crosbyi* Ewing and Stover, 1915. The systematic status of this species is very confusing. According to Radovsky (1967), "*M. crosbyi* may represent a complex of two or more closely related species and much more material may be necessary in order to determine the limits of the component species." The heterogeneity of this species is attested by the very large variability in the shape and size of most of the characters observed in the mites originating from different geographical areas. By some characters *M. crosbyi* resembles *M. leislerianus* superficially but a more careful study reveals important differences. The sternal shield in the female of *M. crosbyi* (Fig. 6) is less excavated posteriorly and the posterolateral arms are less divergent and shorter than in *M. leislerianus* (Fig. 5). Moreover, in the former the anterolateral corners of this shield bear a pair of small organs (sternal glands), each consisting of a small group of about 10 to 15 very thin and short lines. Such organs are lacking in *M. leislerianus*. In addition, the three pairs of sternal setae are relatively shorter in the latter. Another important character is the length of the anterior and anterolateral setae of the scutum. These setae are much longer (in both sexes) in *M. crosbyi* than in *M. leislerianus*. This is true also for the "longest caudal setae" which are much shorter in the latter. The length/width ratio of the dorsal shield in *M. leislerianus* is 2.13 while it is 2.28 in *M. crosbyi* (calculated from figure no. 4, plate 9, in Radovsky, 1967). The pygidial shield in the protonymph of *M. crosbyi* presents a large protrusion in its anterior part while in *M. leislerianus*, the anterior border of this shield is only slightly produced in its median part. Finally, the ridges present on coxae II and III of *M. crosbyi* protonymphs are vestigial on coxa II and completely lacking on coxa III of *M. leislerianus*.

TYPE MATERIAL - From 113 bats of the species *Nyctalus leisleri* (78 females and 35 males), trapped in

several places in Thuringia (Germany), G.W. and M. H. collected 220 specimens of this new species (152 females, 18 males and 50 protonymphs) (see above).

Holotype female from bat no. 353 (female), trapped in Leinefelde, Breites Holz, on 22.07.00. Paratypes: 60 females, 18 males, 30 protonymphs, all with same data as holotype but from different bat specimens.

Holotype and 10 paratype females, 2 males and 10 protonymphs are deposited in the Zoologische Staatssammlung, Münchhausenstrasse 21, München, Germany. Other paratypes or specimens are in the collections of the authors.

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