AMORPHACARUS PARVISETOSUS SPEC. NOV. (MYOBIIDAE, TROMBIDIFORMES), FROM NEOMYS FODIENS PENNANT (SORICIDAE)

by

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ABSTRACT

An undescribed species of *Amorphacarus* (Myobiidae), has been found in the head and shoulder region of the water shrew, *Neomys fodiens* Penn. (Soricidae). Remarks on the genus *Amorphacarus* are appended.

On investigating a number of *Neomys fodiens* Pennant, caught near Nijmegen, we found in the head and shoulder regions a number of mites of the family Myobiidae which deviate considerably from species so far described.

The following characteristics: legs of the first pair unequal, one being dwarfed, segment I longer than broad, segment II much broader than long with ventral tubercle, tarsus II with two claws, most of the hairs with very fine spatulate points, some of the dorsal setae slightly inflated, very long and double and coiled penis, all point to the genus *Amorphacarus* Ewing, 1938. The species of this genus are skin parasites of Soricidae (Poppe, 1896; Jameson, 1948; Ewing, 1938; Radford, 1949; Dubinin, 1957; Jameson 1971).

Amorphacarus parvisetosus spec. nov.

Female (holotype). — Body broader than in other species of the genus. Length including gnathosoma 570 μ, in 17 paratypes measured ø 504 μ (431—571), width 356 μ, in the paratypes ø 340 μ (263—364).

Dorsum (Fig. 1). Body transversely striated with exception of the vulvar and genital regions. Pores of dorsal glands (*P*) between vertical internal and vertical external (*v i* and *v e*). Three pairs of long filiform setae, very finely striated lengthwise *v e* (100 μ), scapular external (*sc e*) 200 μ, lateral 1 (*l 1*) 220 μ. Vertical internal (*v i*), scapular internal (*sc i*) and the file of dorsal setae (*d1—d4*) short, cored (Howell & Elzinga, 1962) with fine spatulate point (detail *d 1*). Lateral setae 4 (*l 4*) short, setiform. Laterals 2 and dorsals 5 lacking. Genital opening terminally with five pairs of genital setae (*g1—g5*), *g 4* and *g 5* functionally arranged to copulatory complex. Vulva (*Vu*) surrounded by two weakly sclerotized vulvar valves with genital hooks (*a 3*), which usually cover opening of bursa copulatrix. Anal internal (*a i*) and anal external (*a e*) setae short, almost spine-like (Fig. 2).

Venter (Fig. 3). — Ventral side delicately striated. Back of coxal field I reshaped to tubercles standing caudally, more strongly sclerotized. Setae of coxal regions setiform. Present are *cx I 1, 2, 4, cx II 1, 3, 4, cx III 1, cx IV 1.* Lateral setae 5 (*l 5*) of about 330 μ.

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Fig. 1—8. *Amorphacarus parvisetosus* spec. nov., female (holotype), 1, female dosum; 2, vulva region; 3, female venter; 4, broad lateral seta 1 of a paratype; 5, gnathosoma dorsal; 6, broad lateral seta 5 of a paratype; 7, leg I dorsum; 8, leg I venter

Gnathosoma (Fig. 5). — Gnathosoma specialized, with stinging and sucking apparatus. Chelicerae (*Ch*) with barbed hooks on the outside. Pedipalps and hypostome (*Hyp*) closing mouth opening on lateral and ventral side. Pedipalps of two movable segments, ventral long claw-shaped tibia (*Ti*), surrounding tarsus (*Ta*), both segments carrying one hair each. Gnathosoma with two ventral hairs, rostral anterior (*ra*) and rostral posterior (*rp*). Dorsal to basis of pedipalps rostral dorsal setae (*rd*), directed towards the mouth opening. Stigmata (*sg*) dorsal at the back of gnathosoma, no stigmal hairs.

Legs, ventro-lateral. All legs with five free segments (trochanter (*Tr*), femur (*Fe*), genu (*G*), tibia (*Ti*), tarsus (*Ta*) and two claws (*Kl*). Legs II—IV with pretarsus (*Ptr*), claws situated dorsally (Fig. 14, 16, 18).

Legs on the first pair (Fig. 7, 8) inequal, eight paratypes measured have a longer right leg, nine a longer left one. Proportion great leg/small leg, ø 1.163 (1.06—1.23). Tarsi with very small claws (*Kl*), ventro-terminally inserted, without noticeable pretarsus. Claws hair-like in adults, but well developed in subadult stages (Fig. 26). When comparing species of Myobiidae one comes to the conclusion that claws are present instead of setae. There is no species with more than six setae and three solenidia on tarsus I. As in *A. parvisetosus* there are six well-shaped setae and three solenidia (*ω 1-3*), the other two very little spine-like forms must be reduced claws. Except long spatulate *p d* all tarsal setae are setiform. Genu postero-lateral with large clasping tubercle. We are not quite sure, whether a very little solenidion sigma is present dorso-mediad near anterior border of genu. Femur with broad tubercle, movable enlarged hair (*p v*) and dorsally a long and thick, lengthwise striated postero-dorsal seta (*pd*), characteristic for many myobiids, and a short *m d*, also striated.

Legs II with strong claws of unequal size, dorsally on the pretarsus (Fig. 14, 15). Solenidia omega 1 postero-lateral and omega 2 antero-dorsal. The medio-dorsal hair of the tarsus is long and setiform in the female (Fig. 1), stout, striated and spatulate at the point in the male (Fig. 14). Ventral hairs seti to filiform and non striated. Solenidion sigma distinct dorso-mediad on genu.

Legs III and IV (Fig. 16—19) with claws of very different size. A part of ventral setae of tarsus, tibia and genu are enlarged and striated lengthwise.

Male (allotype). — Body broader than in other species. Length, including gnathosoma, 319 μ, in 14 paratypes measured ø 328 μ (314—347); width 180 μ, in the paratypes ø 194 μ (179—224).

Dorsum (Fig. 9). — Setae *v e*, *sc e* and *l 1* long, filiform. Setae *v i*, *sc i* and *l 4* very short. The file of dorsals 1—5 is lacking. Genital opening (Fig. 11) at level of legs III. Genital orifice surrounded by four shields: one short and broad with two pairs of setae, two little shields with one seta each, and a middle scutcheon-shaped sclerotization with two large hairs forming a sledge for the penis, a pair of broad, barbed striated hairs and a pair of little setiform ones. The penis begins (also in all paratypes) median above legs IV, bends backwards to the left and then continues with two loopings towards the genital opening.

Venter (Fig. 10). Gnathosoma and hairs in coxal regions as in female.

Leg I (Fig. 12, 13) different from that in female: setae *p d* of tarsi remarkably longer than in female, setae *m d* of genu short, stout and striated lengthwise. Seven paratypes measured have a longer right leg and seven other a longer left leg, proportion great leg/small leg ø 1.23 (1.14—1.31).

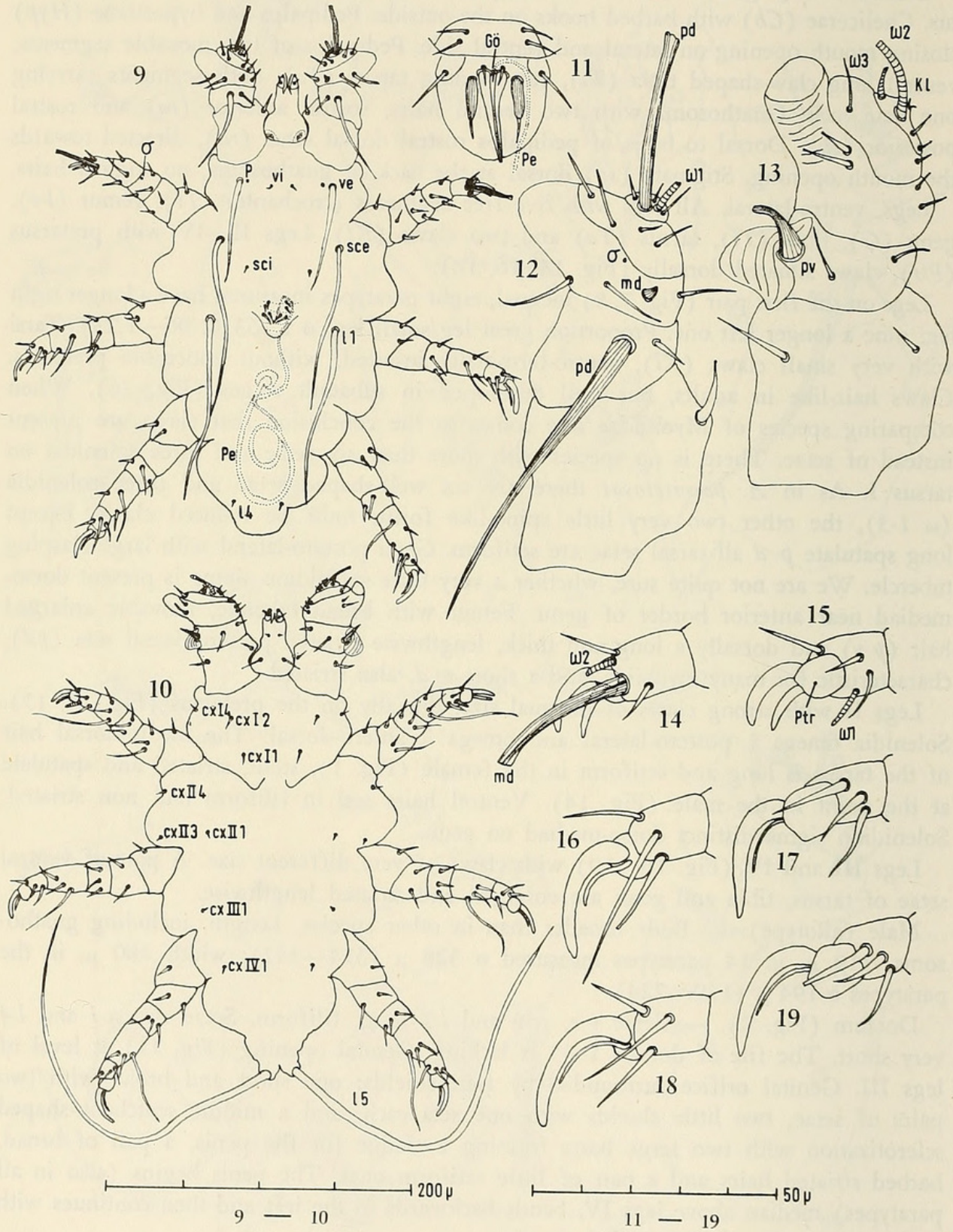


Fig. 9—19. *Amorphacarus parvisetosus* spec. nov., male (allotype). 9, male dorsum; 10, male venter; 11, genital region; 12, leg I dorsum; 13, leg I venter; 14, tarsus II dorsum; 15, tarsus II venter; 16, tarsus III dorsum; 17, tarsus III venter; 18, tarsus IV dorsum; 19, tarsus IV venter

Chaetotaxy

legs	I	II	III	IV	
tarsus	6 + (3)	6 + (2)	6	6	solenidia in ()
claws	2	2	2	2	
tibia	6	6	6	6	
genu	8 + (1?)	6 + (1)	6	6	
femur	5	5	2	2	
trochanter	3	2	3	3	

IMMATURE DEVELOPMENTAL STAGES

As hitherto neither the larval nor the nymphal stages of *Amorphacarus* species have been described nor drawn, nor their chaetotaxy, we present detailed figures for *A. parvisetosus.*

Eggs. — Fully developed eggs within eight females (Fig. 3), length ø 89 μ (83—95). Eggs attached lice-like to basis of hairs.

Common to all developmental stages are legs with four free segments. Presence of solenidion sigma on genu II indicates fusion of genu and femur. Legs I with two big claws ventrally without pretarsus. Tarsus I with one dorsal and one ventral big clasping tubercle. Legs II—IV with pretarsus and one claw, only leg II in the tritonymph with two claws. Gnathosoma long, cylindrical and split at the end. Dorsal pore (*P*) situated far above vertical external. Body transversely finely striated, with exception of ventral side of legs II, where cross-striation bulges caudally.

Larva. — Length including legs I, 210 μ, width 110 μ.

Dorsum (Fig. 21) demonstrates the primitive phylogenetical pattern present in all genera from insectivores of the third evolutionary branch of Myobiidae (Dusbabek, 1969). Present are *v e, sc i, sc e, l 1, l 3, l 5, d 1, d 2, d 3, d 5.* The hairs are blade-like, barbed and striated similar to the description of dorsals 1—3 of females from *A. elongatus,* called "schuppenförmig, zweigliedrig" by Poppe (1896). Vulva medio-subterminal.

Venter (Fig. 20). Present are only *cx I 1.* Legs I unequal (quotient 1.18). Femur I with remarkably long, setiform *p d.*

Protonymph. — Length including gnathosoma 219 μ, width 163 μ. Dorsum (Fig. 23). Less setae than in the larva, hairs relatively small and only partly slightly barbed. Present are *v e, sc i, sc e, l 1* and *l 4.* Like in protonymphs of genera of third evolutionary branch the file of dorsal setae and *l 3* are lacking; *p d* seta on femur I stout, conical, striated. Trochanteres II—IV without setae.

Venter (Fig. 22). Added are peg-shaped and striated second seta in coxal field I and setiform first setae in coxal fields II and III.

Deutonymph. — Length including gnathosoma 255 μ, width 175 μ.

Dorsum (Fig. 25). Chaetotaxy as in the protonymph. Trochanteres II—III with one seta each. Legs I unequal (quotient 1.10).

Venter (Fig. 24). Setation as in the protonymph, additional *cx IV 1.*

Tritonymph. — Length including gnathosoma ø 354 μ (275—431), width ø 223 μ (179—258).

Dorsum (Fig. 29). Setation like deutonymph, additional dorsal 5, vertical internal and trochanter seta on leg IV.

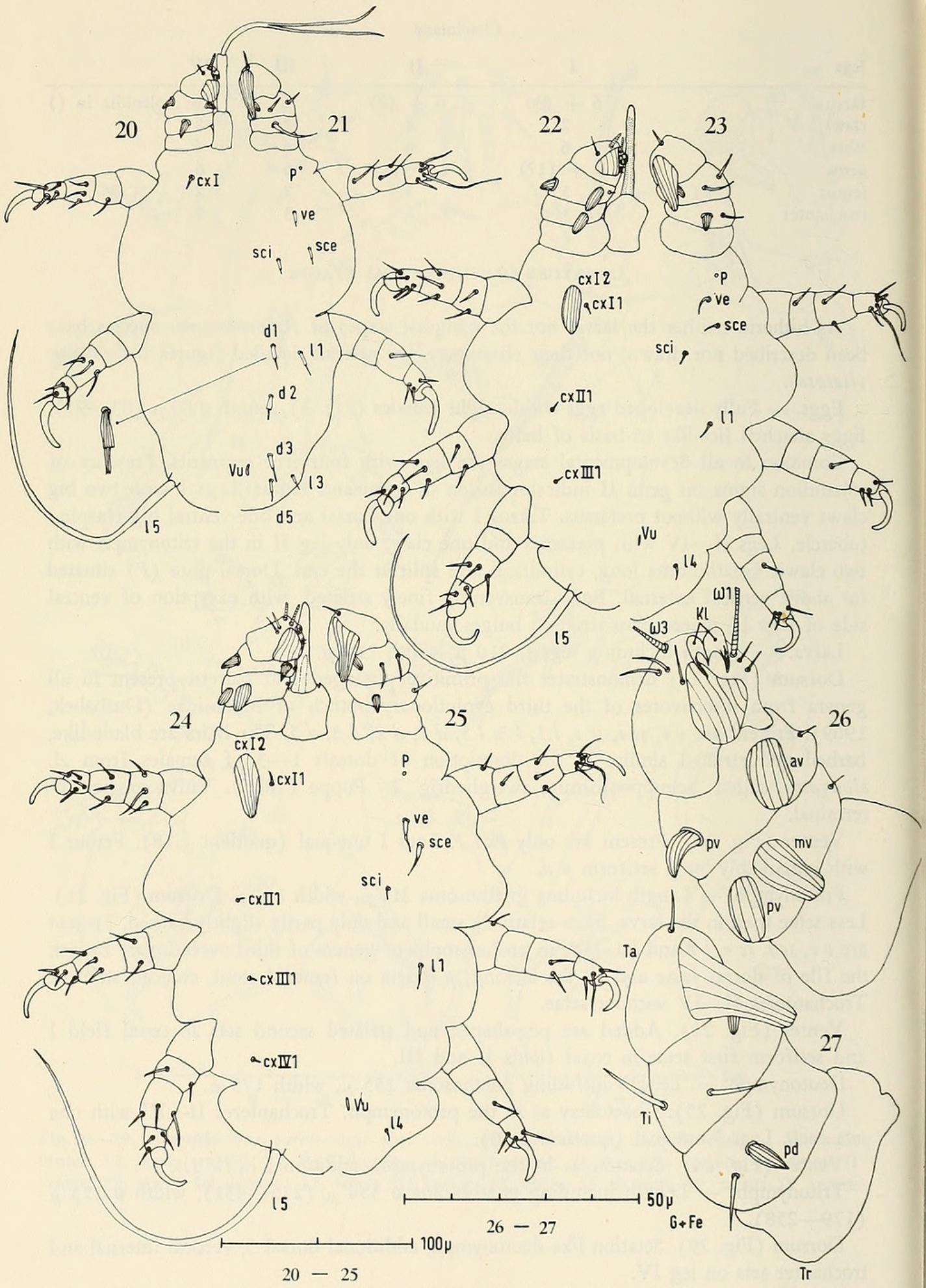


Fig. 20—27. *Amorphacarus parvisetosus* spec. nov., 20, larva venter; 21, larva dorsum; 22, protonymph venter; 23, protonymph dorsum; 24, deutonymph venter; 25, deutonymph dorsum; 26, tritonymph leg I venter; 27, tritonymph leg I dorsum

Venter (Fig. 28). Additional to setation of deutonymph are rostral posterior, enlarged *cx I 3* and setiform *cx II 3*. Legs I unequal (quotient 1.10). Tarsus I ventrally (Fig. 26) with two big claws and a clasping tubercle. Enlarged hairs on tibia and genu-femur with probably clasping function. Tarsus I dorsal (Fig. 27) with large clasping tubercle, *p d* of femur I short and stout.

Chaetotaxy of subadult stages

	larva			protonymph				deutonymph				tritonymph			
legs	I	II	III	I	II	III	IV	I	II	III	IV	I	II	III	IV
claws	2	1	1	2	1	1	1	2	1	1	1	2	1	1	1
tarsus	2	6	6	4	6	6	6	5	6	6	6	6	6	6	6
solenidia	1	2	—	2	2	—	—	2	2	—	—	2	2	—	—
tibia	5	5	4	6	5	4	4	6	6	5	4	6	6	5	5
genu-femur	2	2	—	3	3	2	—	5	4	2	2	5	4	2	2
trochanter	—	—	—	—	—	—	—	—	1	1	—	—	1	1	1

Type host: *Neomys fodiens* Pennant.

Type locality: Nijmegen, the Netherlands, 15.IX.1967, leg. F. Lukoschus. On the same host and locality: 24.IX.1964, 12.V.1967, 12.IX.1967. Isle of Texel, The Netherlands, 26.IX.1968. Gmünd, Austria, 16.VII.1966, 16.X.1966, Wien, Austria, 1967 (hosts preserved in alcohol, in Naturhistorisches Museum Wien, by courtesy of Dr. K. Bauer).

Miss M. Kolebinova, Zoological Institute, Academy of Sciences, Sofia, found the species on the same host near Witescha, Bulgaria, 23.VIII.1966. Probably the mite is specific for the host throughout its range.

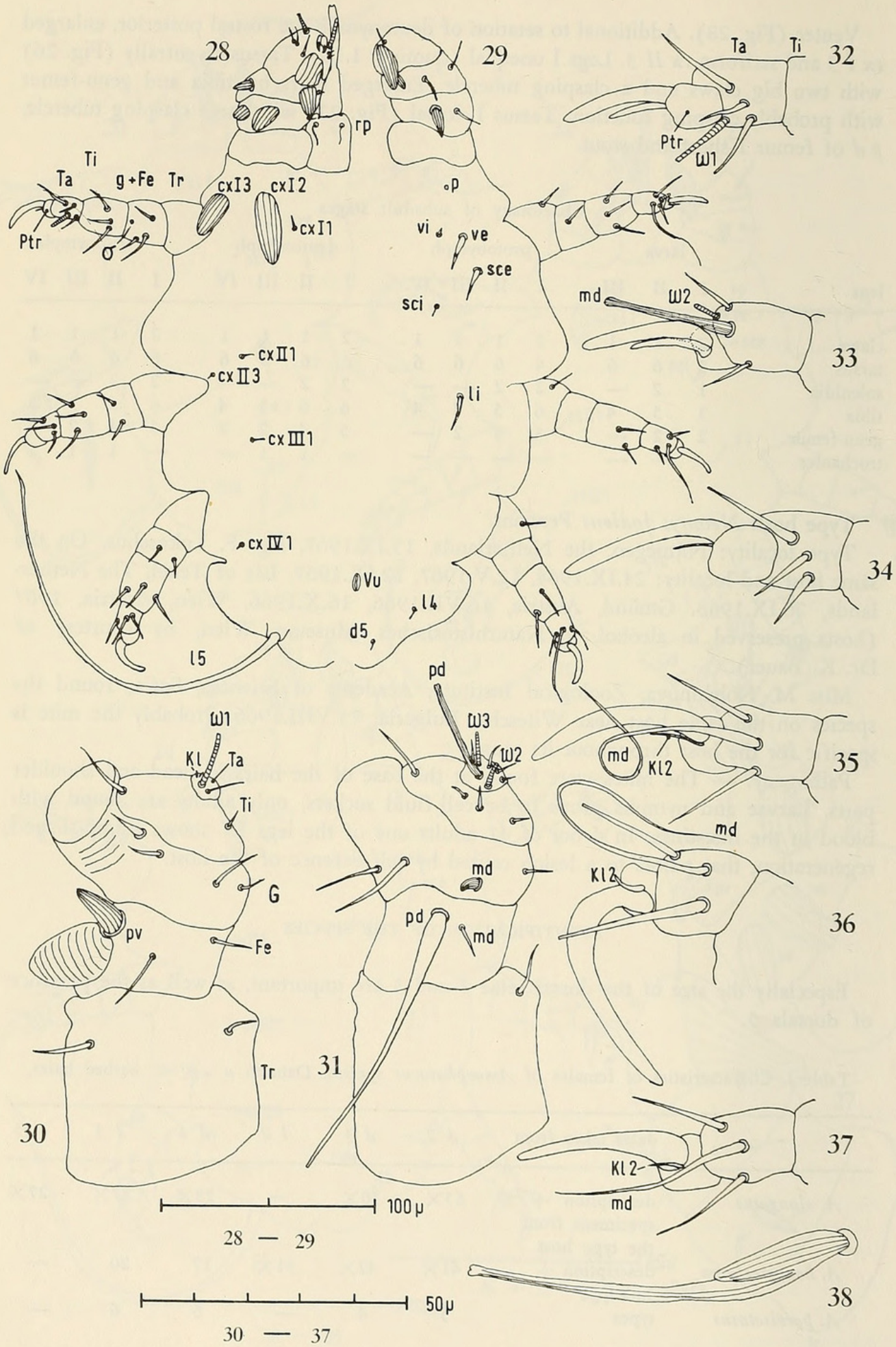
Pathogeny. — The mites were found at the base of the hairs in head and shoulder parts. Larvae and nymphs prove to be cell-fluid suckers, only adults are found with blood in the intestines. In 4 out of 41 adults one of the legs IV shows stump-shaped regeneration, that points to a lesion caused by self-defence of the host.

IDENTIFICATION OF THE SPECIES

Especially the size of the dorsal setae 2 and 3 are important, as well as the presence of dorsals 5.

Table I. Characteristics of females of *Amorphacarus* species. Data in μ •× = barbed hairs.

	dates taken from	*d 2*	*d 3*	*l 2*	*d 4*	*l 3*	*d 5*
A. elongatus	description + specimens from the type host	65×	70×	—	28×	27×	27×
A. hengererorum	description + holotype	41×	42×	31×	17	20	—
A. parvisetosus	types	5	4	—	6	6	—



28 — 29

30 — 37

Fig. 28—29. *Amorphacarus parvisetosus* spec. nov. 28, tritonymph venter; 29, tritonymph dorsum; 30—38. *Amorphacarus elongatus* (Poppe, 1896), 30, leg I venter; 31, leg I dorsum; 32, tarsus II venter; 33, tarsus II dorsum; 34, tarsus III venter; 35, tarsus III dorsum; 37, tarsus IV dorsum; 38, dorsal seta 1; 36, *Amorphacarus hengererorum* Jameson, 1948 (holotype), tarsus IV dorsum

REMARKS ON THE CHARACTERISTICS OF *Amorphacarus*

Genus *Amorphacarus* has been erected by Ewing (1938) for *A. elongatus* Poppe, 1896, and was considered monotypic at that time. The description was valid only for females. Males were not available for study. The following characteristics were given:

"Legs of the first pair unequal, one being dwarfed; segment I longer than broad, inner margin concave; segment II much broader than long, with dorsal tubercle; segment III distinct from IV, bearing large clasping tubercle; segment IV broader than long, rounded distally. Capitulum asymmetrical. Tarsus II with two claws; tarsi III and IV each with one claw. Some of dorsal setae inflated or foliaceous."

Jameson, describing the second species, *A. hengererorum* (1948), gives the following characteristics (1955): "Leg I apparently of three segments, the fourth sometimes concealed beneath the third; one pair of terminal claws; the first pair of legs markedly unequal in size. Leg II with a pair of claws; legs III and IV with a single claw. Dorsal setae slightly inflated, non-striated. Body shape rather slender. Penis very long and double coiled. From shrews (Soricidae)."

Radford (1948, 1949): "Capitulum and leg I asymmetrical; tarsus II with two claws in the female, one in the male; tarsi III and IV with one claw. Leg I with three or four segments without tarsal claws".

The characteristics mentioned above for *A. parvisetosus* make extension of the diagnosis of the genus *Amorphacarus* necessary.

In view of the differences given by the various authors, it appears worth while to look for more details in *A. elongatus* with more modern optical tools.

We are able to state, that:

1) Leg I of *A.elongatus* from the type-host *Sorex araneus* (Fig. 30, 31) has five segments and a pair of very little claws. Though the last three segments are compressed, their existence is furthermore demonstrated by the complete chaetotaxy, as in the more primitive genera *Protomyobia* Ewing, 1938, *Eadiea* Jameson, 1948, *Pteracarus* Jameson & Chow, 1952. Compare also Jameson (1955), fig. 2, *Eadiea desmanae* Lukoschus 1969 and *Eadiea multisetosa* Lukoschus & Driessen (1969).

2) The legs II-IV (Fig. 32—35, 37) have two claws. These are very difficult to distinguish in the legs III and IV, the posterior claw being even smaller than in the species described above and in *Archemyobia inexpectata* Jameson, 1955.

3) All the body hairs show slight spatulate points, as already reported by Poppe (1896): "Eine besonders langgestreckte Art, deren Borstenbesatz der Dorsalseite des ♀ dadurch ausgezeichnet ist, dass sämtliche Borsten an ihrem distalen Ende abgestumpft sind" (Fig. 38).

4) In the type-specimens of *A. hengererorum* Jameson, 1948, the body hairs have also a slightly spatulate point. In the female (holotype) leg IV has also a small second claw, very difficult to distinguish (Fig. 36).

New generic characteristics proposed are as follows: Leg I with five segments. Segments III-V compressed. First pair of legs asymmetrical in size. Body setae with slightly spatulate points. Penis very long and double-coiled. Claws very variable. Legs I with two very small or without claws. On leg II the claws are subequal-unequal or there is only one claw. Legs III and IV with very unequal claws or with only one claw. From shrews (Soricidae). Genotype *Amorphacarus elongatus* Poppe, 1896 (syn. *Myobia elongata* Poppe, 1896).

When regarding the very long and double-coiled penis, the setae with slightly spatulate points, and the asymmetrical size of legs I as most important characteristics, and not the number and the size of the claws, it may be possible to include into the genus *Amorphacarus* species from Soricidae in America and Asia, to be described in the near future by E. W. Jameson, jr., Davis, California, as well as *Blarinobia* species.

Types. — Holotype ♀ and allotype ♂: Rijksmuseum van Natuurlijke Historie, Leiden. Paratypes ♀ and ♂: British Museum (Natural History), Londen; U.S. National Museum, Washington; Zoologische Staatssammlung, München; Department of Zoology, University of California, Davis (U.S.A.); Zoological Institute, Academy of Sciences, Leningrad; Muséum National d'Histoire Naturelle, Paris; Instituut voor Tropische Geneeskunde Prins Leopold, Antwerpen; Bulgarische Akademie der Wissenschaften, Zoologisches Institut, Sofia; Zoölogisch Laboratorium der Katholieke Universiteit, Nijmegen[1]).

The institutes mentioned above will also be provided with specimens of *A. elongatus* (Poppe, 1896) from the type-host *Sorex araneus,* with well visible claws on the tarsi III and IV.

Acknowledgement. — We are indebted to Prof. Dr. E. W. Jameson, Davis, U.S.A., for his discussions and for reading the manscript.

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[1]) The coll. nos. received are:

	A. parvisetosus	*A. elongatus*
Leiden	P 1208-8	P 1210
Paris	55 J 1,55 J 12	55 J 2
Hamburg	A 43 / 69	
München	P 495 / 1-2	P 494 / 1