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Atomus rhopalicus n. sp., a parasite of *Rhopalicus tutela* Walker (Hymenoptera), from Germany (Trombidiidae: Acarina)¹⁾

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Abstract

A new species known by its parasitic larval stage to belong to the genus *Atomus* is presented here in detail to serve as a basic description for further studies of *Trombidiiformes* and related families of *Trombidiidae*. This species *Atomus rhopalicus*, was collected from a hymenopter, *Rhopalicus tutela* Walker, dwelling in the galleries of a common, burrowing coleopter, *Ips typographus*, Oberbayern (Germany).

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Is *Acarus parasiticus* Geer, 1778 [3] a synonym of *Trombidium holosericeum* (Linneus, 1746)?

In spite of two centuries of sterile discussion this question has remained unanswered [8]. This is the result of poor descriptions in the past—incomplete and often fantastic diagnoses and iconography also incomplete and often inaccurate. Multiple divergences and overlappings, and the intricate and incorrect classification of almost all the species described before the middle of this century, are the result of unsuitable mountings seen through inadequate microscopes by unaccustomed eyes and analyzed by unready minds. Obviously, the discovery of the phase contrast artifice became the turning point in microscopy by permitting the observation of previously unseen details. Most of the type specimens of the past are no longer available, and, if found by chance, prove to be only deceiving debris, faded and difficult to read.

The reasonable solution would be to start at zero by simply ignoring the past ... a drastic solution and one unlikely to be unanimously accepted. Thus, the only remaining alternative is to try to build in the backyard of the past, to build in detail while surrounding the new edifice with cautious question-marks. Such a procedure has, in fact, already been adopted by those authors faced with the difficult problem of correlating larval and adult stages. For example, the genus *Atomus* Latreille, 1795 [4] was described for larvae that probably belonged to the genus *Trombidium* Fabricius, 1775, but this relationship could not be demonstrated by rearings [8].

Recently, an esteemed colleague, Mr. H. Wichmann, 8061 Hebertshausen (Germany), sent a specimen of a larval trombidiid that apparently is similar to *Atomus parasiticus* (Geer, 1778). According to Oudemans [5, 6] the latter species could be related to *Trombidium*

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holosericeum (Linneus, 1746), as are also—again according to Oudemans [7]—*Trombidium* (*Atomus*) *gymnopteronum* Oudemans, 1897 and *Thrombidium poriceps* Oudemans, 1904 [1, 2].

However, from what we have learned about the insufficient classification criteria of the past, these synonymies are largely uncertain and require proper examination in the light of modern taxonomic criteria. Therefore the species in question will be placed provisionally in the genus *Atomus*. Unfortunately, this species is represented by a single specimen, which Mr. Wichmann obtained from a hymenopter, *Rhopalicus tutela* Walker, found in a gallery of common, burrowing coleopter, *Ips typographus*, an insect to which Mr. Wichmann devoted a great part of his studious activities.

Atomus rhopalicus n. sp.

A. Diagnosis

SIF = 7N.S-N-2-2110.1000 *

* SIF = Synthetic Identification Formula; formula commonly used for trombiculids and including:

- a) palpo-tarsus rough formula, fT = 7 N.S, in which seven nude setae are homologous to the barbed or branched setae of trombiculids, and different from the peculiar nude "subterminala", S,
- b) Galeal seta, or galeala, Ga = N (nude),
- c) Palpo-tibial claw, number of prongs, gr = 2,
- d) Number of genualae on the 3 legs and of tibiala on leg 3;
ga = 2, gm = 1, gp = 1 and tp = 0,
- e) Number of mastitarsala (MT = 1), mastitibiala (Mt = 0), mastigenuala (MG = 0) and mastifemorala (MF = 0); mastisetae being long, whiplike setae entirely nude or provided with few basal barbs.
N.B.: in the case of *A. rhopalicus*, mastitarsalae (2) and mastitibiala (1) where observed on the first leg.

Atomus of medium size (Ip — 794) with a large scutum showing a large shrivelled antero-margin, the posterior scutal surface being densely punctate (in *A. parasiticus* no such antero-margin is shown, according to Oudemans' figures). Antero-median setae nude and almost as long as the postero-lateral barbed setae ($PL > 2 AL$) (in *A. parasiticus* the rate is $PL = 3/2 AL$). Parascutal eye-lenses on a large trigonal platelet (not present in *A. parasiticus*), the anterior lens diametrically twice as large as the posterior, (subequal in *A. parasiticus*). "Scutellum"²⁾, or posterior shield, with 2 barbed setae on the middle of the plate (on the anterior fourth in *A. parasiticus*). Two pairs of long, thick and subequal pygosomal barbed setae, the platelets of the two central setae being slightly fused but not unified in one plate, "pygalaspis"³⁾ as in *A. parasiticus*. Peri-oral collarrette fringed but not as in *A. parasiticus*. Palpotibial claw bifid (single prong in Oudemans' figure of *A. parasiticus*). Third leg-tarsus less modified as in *A. parasiticus* (according to Oudemans' figure).

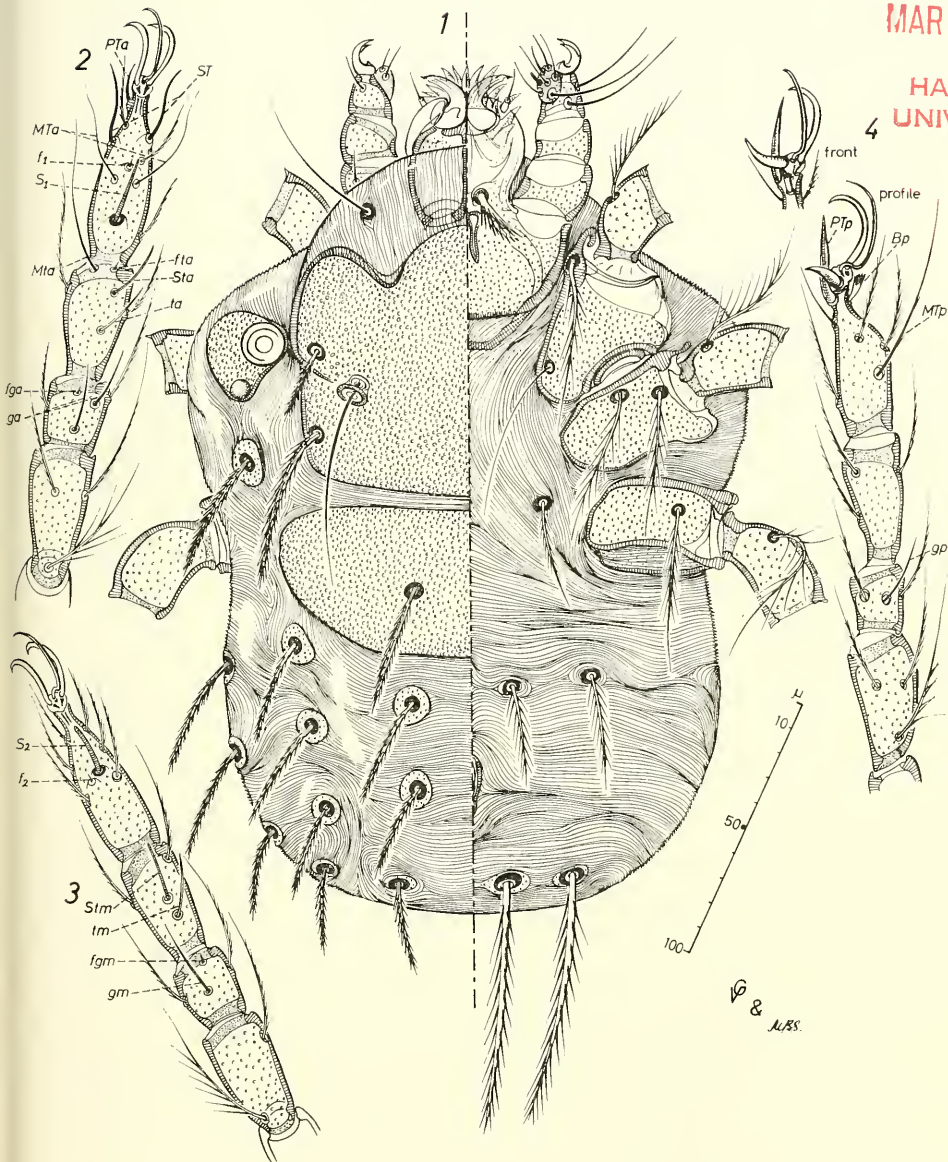
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B. Description

1) **M e a s u r e m e n t s** : in micra, of the holotype and single specimens.

SCUTUM:

AA	AW	PW	SB	ASB	PSB	SD	AP	AM	AL	PL	S	SW
70	110	110	78	86	42	128	30	54	30	66	76	130

SCUTELLUM:

BODY SETAE:

LEGS:

sW	sL	AS	PS	DB	Dc	H	D	P	V	pa	pm	pp	Ip
140	54	28	26	40	50	50	50/32	90	42	274	254	266	794 ²⁾

2) **S c u t u m** : (fig. 1) bullet-shaped, with a wide antero-marginal band finely shrivelled, the remaining scutal surface being densely punctate; bearing:

- 2 anterior setae, slender, long and nude and designated as antero-median (AM) because of their homology with similar organs in other groups of trombidiforms;
- 2 antero-lateral setae (AL), thick and barbed but short;
- 2 postero-lateral setae (PL), also thick and barbed but more than twice as long as the AL;
- 2 nude, long and slender sensillae, merging from their deep sensillary cavity (diam. 12 μ).

Considered as part of the scutal area:

- 2 pairs of eye-lenses (diam. of anterior-lens, $a_0 = 16 \mu$, posterior-lens, $p_0 = 7 \mu$), inserted on a trigonal platelet (each 3 sides = 30 μ);
- 1 pair of humeral setae on round platelets (dim. 17 μ).

3) **S c u t e l l u m** : (fig. 1) shaped like a loaf of country bread, this sclerotized plate (as densely punctate as the scutum) is the result of

²⁾ Conventions and Abbreviations (except those currently used in trombiculid literature):

“Scutellum”: neologism proposed to designate any large plate or shield situated behind the anterior scutum and bearing one or more pairs of dorsal setae.

“Pygalaspis”: neologism proposed to designate any plate or shield situated on the pygosoma and bearing one or more pairs of differentiated pygosomal setae (pygosomatae).

AA = distance between the 2 nude antero-median (or sub-median) setae (AM).

SW = maximal width of scutum (just before the AL line).

sW = maximal width of scutellum.

sL = maximal length of scutellum.

AS = distance from anterior margin of scutellum to scutellar setae (which are actually in this case the 2 anterior and centro-dorsal setae, Dc).

PS = distance from the 2 scutellar setae (Dc) to the posterior margin of scutellum.

DB = distance between the bases of the 2 Dc.

Dc = length of the 2 scutellar setae.

Ip = sum of the three leg-lengths (pa+pm+pp) or *Index pedibus*; a valuable single number, giving a relative notion of the animal size (more accurate than the variable body measurements).

expansion and fusion of the platelets bearing 2 anterior dorsocentral setae (Dc).³⁾

4) *Idiosoma*: (fig. 1) red to yellowish, oblong to slubbed, depending on the degree of engorgement, with conspicuously pleated epiostracum, after the pattern of most trombidiforms. Considered longitudinally, the dorsal setae follow three pairs of sub-parallel lines: one central with 3 setae (42, 37 & 35 μ), one median with 4 setae (40, 44, 37 & 32 μ), and one lateral with 3 setae (46, 44 & 34 μ); the central line is that of the scutellar seta (Dc) and the median line is on that of the eye-lenses and the humeral seta. Transversally they are formulated classically as follows: $fD = 2 H + 6.6.6.4 = 24$ dorsal setae (the two scutellar setae, Dc, being incorporated in that formula as normal dorsal setae).

The ventral setae are reduced to 4 transversal setae (42 μ) before the uropore, and, behind it, 4 differentiated "pygosomal" setae, fairly long (90 μ), thick and abundantly barbed, of which the platelets of the two central are partly fused (genesis of a small "pygalaspis" as exists on *A. parasiticus*).

5) *Legs*: (figs. 2, 3 & 4) similar to those of trombiculids and indicating, on a trombiculid scale, a mite of medium size ($Ip = 794$). All legs six-segmented, $fsp = 6.6.6$. Tarsi 1 and 2 slightly equal with terminal empodium flanked by a pair of claws, tarsus 3 shorter with terminal empodium and anterior claw similar to that of the other tarsi, but the posterior claw is thick, short and directed backwards, as it curves around a strong, sword-like (pruning-knife, as *Oudemans* say) terminala on the ventral apex of tarsus, whereas on the dorsal opposite side stands a thick brush-like seta.

Leg 1: On tarsus, at the proximal third, a long and slender solenidion ($S_1 = 25 \mu$), at the distal third the famulus ($f_1 = 3 \mu$) and, between these two (S_1 and f_1), 2 whip-like tarsalae (MTa = mastitarsalae); more distal are 2 nude subterminala (ST) and one ventral pre-tarsala (PTa).

On tibia, one apical famulus (fta) with, near it, a whip-like nude seta (Mta = mastitibiala), and about 8 μ behind one solenidion (Sta) followed at the same distance by a proximal tibiala (ta), both 22 μ long.

On genu, one apical famulus (fga = 3 μ) and 2 genualae (ga = 24 μ).

On femur, one outstandingly long and slender seta with 6 long barbs near the dorsal base, B(6).

On trochanter, one long and slender seta with 8—12 long branches, B(8—10).

³⁾ Embryogenically, the formation of protective shields on the idiosoma follows a progressive pattern intimately bound to the family taxonomy. The pioneers of acarology noticed from the very beginning the taxonomical importance of the scutum which is still considered the primary character in identification. The anterior shield or scutum bearing the sensillae seems to be the very initial sclero-formation, after the coxae. Its purpose is to protect the central nervous system or brain of the animal. Ocular and setal platelets seem to have appeared only secondarily. Some of them have expanded and fused in larger shields or scutella. A dramatic illustration of such extreme sclerotization is furnished by *Hoplothrombium quinquescutatum* Ewing, 1925, a species which will be the object of a revision to be published shortly.

On coxa, one branched coxala on apex and one whip-like ($62\ \mu$) near the base; urstigma large between the two fused coxae but attached principally to coxa 1. No sternal setae between the anterior coxae.

Leg 2: On tarsus, no other special seta than the very distal solenidion ($S_2 = 19\ \mu$) accompanied by the usual famulus ($f_2 = 3\ \mu$).

On tibia, the usual solenidion ($Stm = 22\ \mu$) and tibiala ($tm = 22\ \mu$).

On genu, one apical famulus ($fgm = 3\ \mu$) and one genuala ($gm = 26\ \mu$).

On femur, the same kind of seta as on femur 1.

On trochanter, the same kind of seta as on trochantera 1.

On coxa, 2 long branched setae or coxalae ($55\ \mu$).

Leg 3: On tarsus, one mastitarsala with few basal barbs ($MTP = 72\ \mu$).

On tibia, no tibiala ($tp = 0$).

On genu, one genuala ($gp = 26\ \mu$).

On trochanter, one special seta as on legs 1 and 2.

On coxa, only one long branched seta; part of the coxal plate is covered with pleated integument.

Coxal formula, $fCx = 2.2.1$ (or NB-BB-B); sternal formula, $fSt = 0.2$.

6) **Gnathosome**: (fig. 1) partly hidden behind the scutal antero-margin. Gnathobase in one piece with no apparent mark of central suture, its brush-like setae inserted on the base of the galea. Galeala (galeal seta) nude and on a small tubiform peduncle, $Ga = N$. Mouth-lip or hypostome as a fringed collarette. Chelostyle (cheliceral blade) sharply curved and powerful, with a small apical tricuspid cap; chelobase short and strong. Palpus short and powerful, no seta on genu; palpal formula, $fPp = N/-/NNN$, the tibio-dorsal short, the two others fairly long. Palpo-tarsus short and nearly hemispherical, with 7 nude setae (homologous to branched setae in trombiculids), one nude subterminala and one thick and short basal solenidion, always present in trombidiforms. Palpo-tarsal rough formula, $fT = 7N.S$.

7) **Synthetic Identification Formula**: $SIF = 7N.S-N-2-2110.1000$.

C. Host & Parasitope

One single specimen from a hymenopter, *Rhopalicus tutela* Walker (*Chalcididae*). This chalcid-fly deposits its eggs close by or directly on the larvae or pupae of bark-burrowing beetles (*Scolytidae*), using a tiny ovipositor. The larva of *Rhopalicus tutela* hatches 1 or 2 days after egg-laying and parasitizes the host. 2—3 weeks later the larva pupates inside the lateral tunnels of the beetle next to the chitinous remainders (heads skeleton) of the devoured scolytid larva. The pupa rests for 2—3 weeks. Depending on the weather conditions (temperature mainly) there are 1—2 generations of the parasite for each generation of the host. *Rhopalicus tutela* parasitizes e. g. about 20—40 % of all populations of *Ips typographus*, the species from which the mite-infected hymenopter was collected, and prefers those beetles that dwell in thin-barked pole-timber, where egg-laying with ovipositor is more successful. *R. tutela* comes in question for biological control of wood-destructing scolytids. Parasitized by larvae of the mite *Atomus rhopalicus*, the forestial utility of this hymenopter

Leg Table

LEG	COXA	TROCHANTER		FEMUR		GENU		TIBIA		TARSUS		PRETARSUS	
N	μ	N	μ	N	μ	N	μ	N	μ	N	μ	N	μ
1	Length Width 1 B (dist.) 1 N (proxim.)	62 45 66 60	Length 1 B (8—10)	36 54 4	Length 1 B (6) O. B. S.	50 55 2 ga. 4 O. B. S.	Length 1 fga. 24 O. B. S.	Length 1 fta. 1 Mta. 1 Sta. 1 ta. O. B. S.	28 3 24 1 4	Length S ₁ (proxim.) 2 MTa 1 f ₁ (distal) 2 ST 1 PTa O. B. S.	62 25 42 3 28 14	Length empodium claws	8 28 23
2	Length Width 2 B.	60 34 55	Length 1 B (10—12)	40 56 4	Length 1 B (6) O. B. S.	44 64 1 gm. 4 O. B. S.	Length 1 fgm. 1 gm. O. B. S.	Length 1 Stim. 1 tm. O. B. S.	30 3 26 5	Length S ₂ (distal) f ₂ O. B. S.	62 19 3 4	Length empodium claws	8 28 23
3	Length Width 1 B.	50 35 58	Length 1 B (10—12)	40 62 3	Length 1 B (6) O. B. S.	45 64 1 gp. 3 O. B. S.	Length 1 gp. O. B. S.	Length O. B. S.	24 26 3	Length MTp (barbs) PTp Brush O. B. S.	55 72 32 11 9	Length empodium claw claw (modified)	10 33 27 18

O. B. S. = Ordinary Barbed Setae.

could be limited, for impaired individuals will then have only a very short ovipositor unfitted for penetrating the bark.

Rhopalicus tutela is distributed throughout Europe and the USA (New Hampshire, Connecticut; parasitizing *Pissodes notatus* Fabr. and *P. strobi* Peck). Nothing is known about its parasites.

D. Locality & Date

The hymenopter was collected by H. Wichmann in a spruce stand near Ottershausen (Oberbayern — W. Germany), July 1966.

E. Type material

Holotype in the Zoologische Staatssammlung, 8 München 19 — ZSM-Nr. P — 1254 a.

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