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Pachyseius friedrichi, spec. nov., a new pachylaelapid mite from Bavarian Prealps Mts., Germany

(Acari, Mesostigmata, Gamasida, Eviphidoidea, Pachylaelapidae)

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Pachyseius friedrichi, spec. nov. is described and illustrated from northern part of Bavarian Prealps Mts. (in the vicinity of Flintsbach am Inn), Southern Germany. It is closely related to *Pachyseius angustus* Hyatt, 1956, based on type material from the British Isles, by the number of preanal setae, fragmentation and arrangement of ventral shields and sclerites in peritrematal-exopodal and metapodal regions, and tarsal chaetotaxy. A key to the females for the species of *Pachyseius* in European region is provided.

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Introduction

Although the genus *Pachyseius* with a number of recognised species belongs to smaller genera of mesostigmatic mites, its free-living representatives dispose wide ecological and behavioural diversity and constitute an important zooedaphon component in all soil microhabitats of the temperate zone of the northern hemisphere. It currently comprises not more than 20 Palearctic species known from Europe, Siberia, China and Japan. Only *Pachyseius humeralis* was introduced into Australia by human activities (Halliday, 2001).

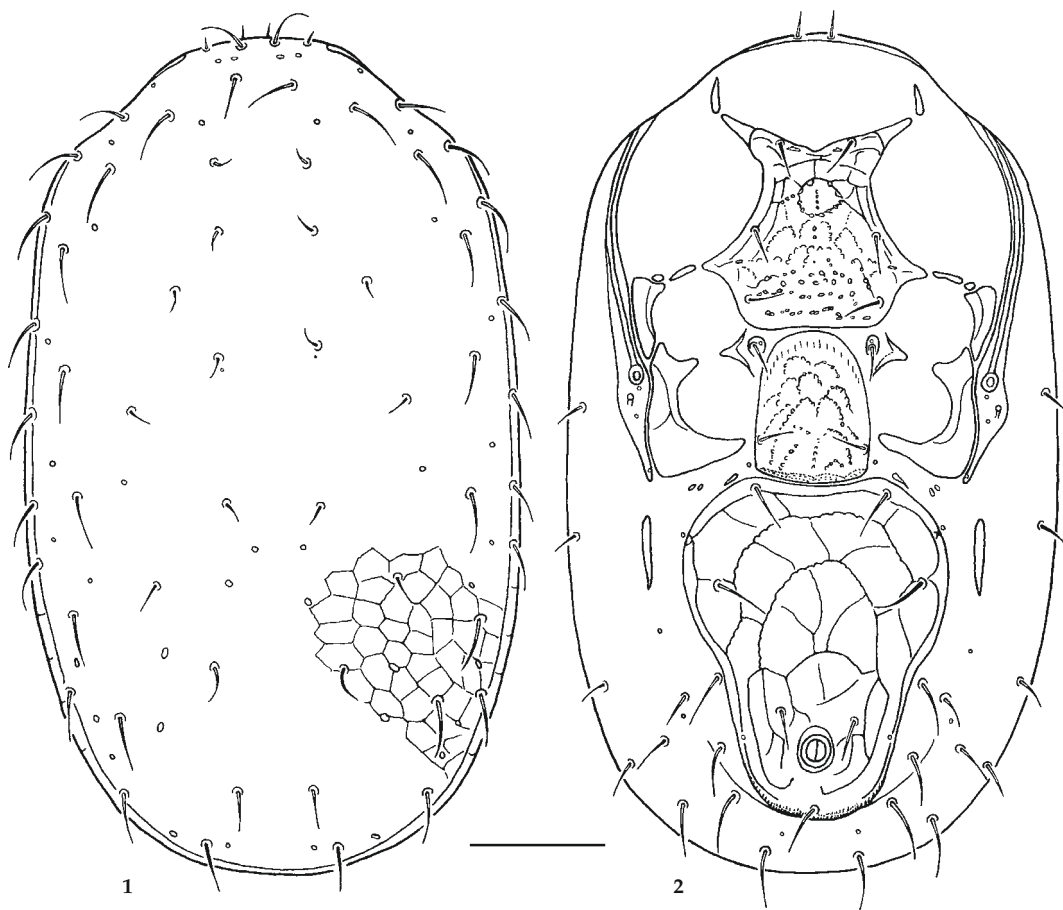
Generally, the genus *Pachyseius* is well defined, morphologically homogeneous (it shows relatively small scale of diversity in the external morphology), but without generally accepted family rank position, because the origin of this genus and its relations to other pachylaelapid genera are less clear. The genus was proposed by Berlese (1910) for *Pachyseius humeralis* as type species, and placed in the family Neoparasitidae Oudemans, 1939. Later Evans & Till (1979) considered this genus congeneric with family

Pachylaelapidae. Karg (1971 and 1993) placed *Pachyseius* in the Macrochelidae rather than the Pachylaelapidae. The majority of other authors have placed the genus *Pachyseius* in the family Pachylaelapidae (e.g. Koroleva 1977, Moraza & Johnston 1990, Mašán 2007).

To the present, eleven species of the genus have been described from various European areas: Berlese (1910) described one species from Italy, Willmann (1935) one species from France, Hyatt (1956) one species from the British Isles, Solomon (1982) one species from Romania, Afifi & Nasr (1984) one species from Netherlands, Moraza (1993) two species from Spain, Mašán (2007) one species from Slovakia, and Mašán & Mihál (2007) three species from Bulgaria.

Material and methods

Mites were extracted from sifted detritus by means of a modified Berlese-Tullgren funnel extractor (photo-thermoeclector) provided by a 40-Watt bulb. The extraction lasted 48–72 hours. Before identification,



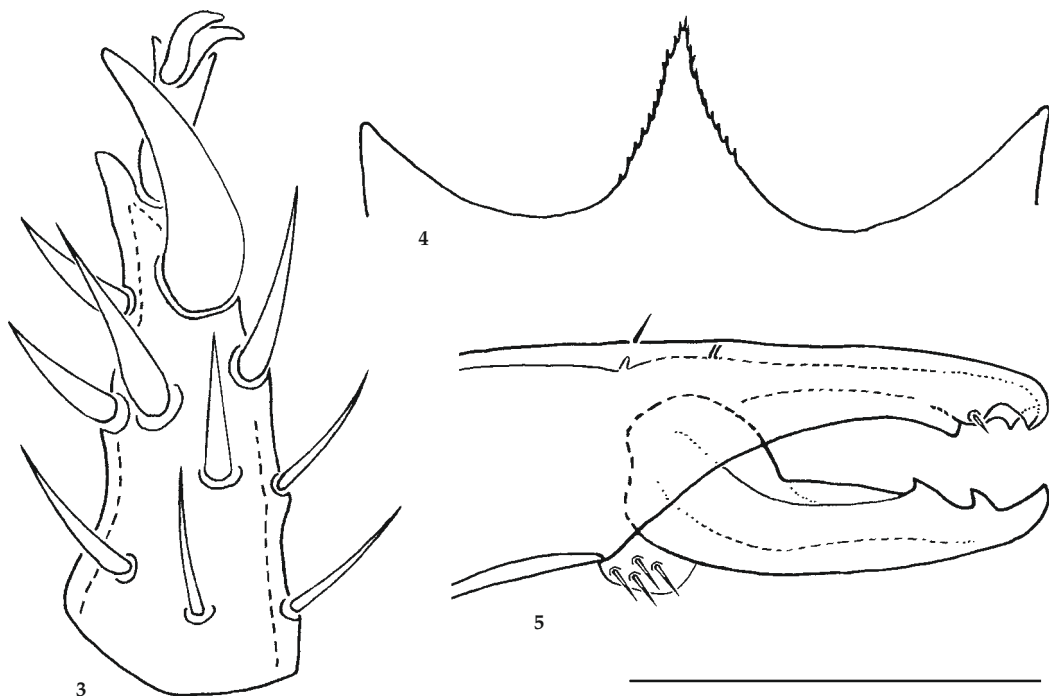
Figs 1-2. *Pachyseius friedrichi*, spec. nov., female. 1. Dorsal idiosoma; 2. Ventral idiosoma. Scale: 100 μ m.

the specimens were mounted into permanent microscopic slides, using the Liquido de Swan medium. Illustrations were made by author using a normal optical microscope equipped with a Abbé's drawing tube. The presented metric data for new species are based on all available specimens (holotype and 3 paratypes). Measurements were made from slide-mounted specimens with stage-calibrated ocular micrometers. Lengths of shields were measured along their midlines, and widths at their widest point. Dorsal setae were measured from the bases of their insertions to their tips. Measurements are presented as ranges (minimum to maximum) or as length/width ratios. The terminology of dorsal and ventral chaetotactic pattern used in this paper follows Lindquist & Evans (1965).

***Pachyseius friedrichi*, spec. nov.**
(Figs 1-5)

Types. Holotype: ♀, South Germany, Bavaria, Bavarian Prealps Mts., Flintsbach am Inn (approx. 47°42'N, 12°07'E), April 25, 2007, lgt. P. Mašán (coll. Institute of Zoology, Bratislava). – Paratypes: 3♀♀, the same data as in holotype.

Diagnosis. The new species may be easily recognized from the other congeners especially by the form and chaetotaxy of ventrianal shield (ventrianal shield pear-like and bearing only 2 preanal setae), form and porotaxy of peritrematal shields (poststigmatic section of peritrematals strongly tapered medially, slim posteriorly, and bearing 4 poroid structures of which medial one is distinctly enlarged), and metric data for dorsal and some ventral shields.



Figs 3-5. *Pachyseius friedrichi*, spec. nov., female. 3. Tarsus II; 4. Tectum. 5. Chelicera. Scale: 50 μ m.

Description

Female. Dorsal aspect (Fig. 1). Dorsal shield middle-sized (length: 605-640 μ m, width: 360-380 μ m), regularly oval and oblong (length/width: 1.66-1.71), with simple and delicate reticulate pattern on surface, and 30 pairs of simple needle-like setae. Dorsal setae relatively short, especially those with medial position (setae j5 17-22 μ m, setae J5 29-35 μ m, longest anterolateral setae 47-55 μ m), paravertic setae r1 shortest, and vertical setae j1 with insertions situated ventrally. All dorsal pores normally formed and not conspicuously enlarged.

Ventral aspect (Fig. 2). Presternal shields absent. Sternal shield slightly oblong (length: 130-143 μ m), concave anteriorly, truncate posteriorly, with punctiform reticulate pattern on surface, and 3 pairs of setae and 2 pairs of pores. Metasternal shields small, oval to circular, free, each bearing a metasternal seta and pore, and placed on soft membranous cuticle. Genital shield relatively slim (length: 118-122 μ m) and with a pair of genital setae, genital pores positioned outside the shield. Ventrianal shield pear-like, oblong, slightly longer than wide (length: 234-252 μ m, width: 193-212 μ m, length/width: 1.13-1.27), distinctly reticulated, and bearing 2 pairs of preanal setae and 3 circum-anal setae. Poststigmatic section of peritrematal shields distinctly narrowed in

medial part, with slim to almost worm-like posterior tip and inner margin closely abutting free exopodal platelet IV; it possesses one distinctly enlarged and 3 small poroid structures. Exopodal platelets III free and each abutting the peritrematal shield and exopodal platelet IV. Areas between peritrematal shields and anterolateral corners of ventrianal shield with 3 small suboval sclerites. Longitudinally oriented metapodal shields distinctly elongate, free and well separated from anterolateral margins of ventrianal shield. Lateral and opisthogastric cuticle with 11 pairs of setae.

Legs. Legs I-IV shorter than idiosoma and bearing spiniform setae. Genu I with 12 setae (2-5/3-2). Genu III and IV with 8 setae (2-4/1-1). Tarsus IV with 18 setae (3-7/5-3). Chaetotaxy of other leg segments standard. Tarsi with ambulacrum and 2 claws, tarsus II with 1 spur-like distal seta (Fig. 3).

Gnathosomal structures (Figs 4, 5). Hypostome relatively narrow; corniculi short and horn-like. Palptibia without outgrowths. Palp apotele 3-tined. Tectum subtriangular, widened basally, tapered toward the apex, pointed apically, and delicately denticulated on anterior margin (Fig. 4). Cheliceral digits relatively slender: movable digit with 2 sub-medial teeth, fixed digit also bidentate (Fig. 5).

Male and developmental stages. Unknown.

Collecting circumstances. Known only from the type locality in Bavarian Prealps Mts., in vicinity of St. Peter's Abbey on the Madron ("Peterskirchlein"), close to Flintsbach am Inn village, approximately at 600 m a.s.l. The type locality stand is a small streamlet valley in broadleaved deciduous forest predominated by *Fagus sylvatica* (found under deep layer of leaf-fall). Most probably the new species is an edaphic element with affinity for litter of various forest habitats predominated by beech (*Fagus* spp.) like majority of other species of the genus occurring in Europe.

Material examined (4). Only the holotype and the paratypes.

Etymology. The name is an acronym in honour of Dipl.-Biol. Stefan Friedrich, Bavarian State Collection of Zoology in Munich (Germany), who has, in various ways, helped me in my study of Willmann's mites and contributed to the collections of this new species during our field trip in Bavarian Prealps Mts.

Relationships and recognition. *Pachyseius friedrichi*, spec. nov. is most related to *P. angustus*, *P. angustiventris* and *P. morenoi* by the presence of two pairs of preanal setae on ventrianal shield, absence of presternal shields, and separate position of metapodal shields (these shields are not fused with anterolateral margins of ventrianal shield as in *P. strandtmanni*). On the basis of the general appearance of ventral shields, especially mutual arrangement of shields of peritrematal-exopodal complex, the new species is the most similar to *P. angustus* described from Great Britain by Hyatt (1956). These two species may be separated by the characters described in thesis and antithesis 9, as a part of the identification key included (see below).

Key to the females for the European species of the genus *Pachyseius*

1. Ventrianal shield with 3 pairs of preanal setae 2
 - Ventrianal shield with 2 pairs of preanal setae 6
2. Posterior section of peritrematal shield and exopodal shield IV mutually fused 3
 - Posterior section of peritrematal shield and exopodal shield IV with separate position 4
3. Metapodal shields excessively developed, subtriangular, very large and with reticulate-punctate sculpture; presternal shields absent; exopodal shields III and IV well separated; length of dorsal shield 523 µm *Pachyseius pachylaelapoides* Mašán et Mihál, 2007

- Metapodal shields normal in size, slim and elongated; presternal shields well developed and sclerotized; exopodal shields III and IV abutting each other; length of dorsal shield 565-575 µm *Pachyseius cicaki* Mašán et Mihál, 2007
- 4. Presternal shields absent; peritrematal shields close to stigma and anterior margin of dorsal shield (between setae z1 and z2) with normal pores; dorsal setae modified, spatulated; femur I and genu II with 12 setae (2-5/3-2), tarsus IV with 18 setae (3-7/5-3); lateral and ventral cuticle with 12-13 pairs of setae; length of dorsal shield 805 µm *Pachyseius iraola* Moraza, 1993
 - Presternal shields weakly sclerotized, with fine net-like ornamentation, and connected with anterior margin of sternal shield; peritrematal shield close to stigma and anterior margin of dorsal shield (between setae z1 and z2) with hypertrophied poroid structure; dorsal setae simple, needle-like; femur I with 13 setae (2-5/4-2), genu II with 11 setae (2-5/2-2), tarsus IV with 17 setae (3-6/5-3); lateral and ventral soft cuticle with 6-9 pairs of setae 5
- 5. Ventrianal shield enlarged laterally (width: 255-300 µm), subequal in length and width (length/width: 0.96-1.07); metapodal shield closely abutting to lateral margin of ventrianal shield; lateral and ventral soft cuticle with 9 pairs of setae; length of dorsal shield 640-760 µm *Pachyseius wideventris* Afifi et Nasr, 1984
 - Ventrianal shield oblong (not exceeding 240 µm in width), longer than wide (width: 165-235 µm, length/width: 1.08-1.28); metapodal shield and lateral margin of ventrianal shield well separated; lateral and ventral soft cuticle with 8 pairs of setae; length of dorsal shield 530-665 µm *Pachyseius humeralis* Berlese, 1910
- 6. Separate metapodal shields absent (metapodals fully fused with anterolateral margins of ventrianal shield); marginal region of dorsal shield with 3 pairs of hypertrophied poroid structures; lateral and ventral soft cuticle with 12 pairs of setae; length of dorsal shield 600-715 µm *Pachyseius strandtmanni* Solomon, 1982
 - Separate metapodal shields present; marginal region of dorsal shield with at most a pair of hypertrophied poroid structures (between setae z1 and z2) 7
- 7. Presternal shields well developed and sclerotized; peritrematal shield and exopodal IV mutually fused; metasternal shields fully connected with sternal shield; metapodal shield closely

- abutting to lateral margin of ventrianal shield; length of dorsal shield 790-845 µm.....
.....*Pachyseius morazae* Mašán et Mihál, 2007
- Presternal shields absent; exopodals IV and metasternals free; metapodals and lateral margins of ventrianal shield well separated..... 8
 - 8. Posterior tip of peritrematal shields exceeding the posterior margin of coxae IV, exopodal shields III and IV abutting each other..... 9
 - Posterior tip of peritrematal shields not reaching the posterior margin of coxae IV, exopodal shields III and IV with more separate position and divided by inner promontory of peritrematal shield 10
 - 9. Gland infundibula gdj3 situated on anterolateral dorsal margins (between dorsal setae z1 and z2) conspicuously enlarged, hypertrophied, cavity-like and strongly sclerotized; poststigmatic section of peritrematal shields regularly tapered and with widely rounded tip; ventrianal shield slim, with anterior part only slightly widened, suboval (length 187 µm, width 126 µm, length/width 1.48); dorsal shield conspicuously elongated (length/width 1.94); tectum truncate on anterior margin; smaller species: sternal shield 111 µm long, length of dorsal shield 512-600 µm.....*Pachyseius angustus* Hyatt, 1956
 - Anterolateral gland infundibula gdj3 situated between setae z1 and z2 normal in shape and size, poroid; poststigmatic section of peritrematal shields strongly narrowed medially and with angustate tip; ventrianal shield stout, with distinct anterior expansion, pear-like (length 234-252 µm, width 193-212 µm, length/width 1.13-1.27); dorsal shield moderately elongated (length/width 1.66-1.71); tectum pointed anteriorly; larger species: sternal shield 130-143 µm long, length of dorsal shield 605-640 µm.....
.....*Pachyseius friedrichi*, spec. nov.
 - 10. Ventrianal shield oblong, with almost parallel lateral margins (slightly wider in the anterior part); length of dorsal shield 821 µm
.....*Pachyseius morenoi* Moraza, 1993
 - Ventrianal shield suboval, widest in its middle part; length of dorsal shield 750 µm
.....*Pachyseius angustiventris* Willmann, 1935

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