

Description of female and male of *Pygmephorus sylvilagus* n.sp. and male of *Pygmephorus erlangensis* KRCZAL, 1959 (Acari, Pygmephoridae)

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(With 18 figures)

Abstract

The female of a new species and males of two species of the genus *Pygmephorus* are described and illustrated. The species are: *P. sylvilagus* n. sp., found phoretic on the Eastern Cottontail, *Sylvilagus floridanus* (ALLEN) (Leporidae) in Iowa/USA, and *P. erlangensis* KRCZAL, 1959 found in the nest of a Garden Dormouse, *Eliomys quercinus* (LINNAEUS) (Gli-ridae) in Holland. It is the first description and illustration of males in the genus *Pygmephorus*.

Pygmephorus sylvilagus n. sp.

Female (Figs. 1-6)

Body of holotype: Length 570 μ m, width 196 μ m.

Gnathosoma directed anteriorly or anteroventrally 48 μ m long, 46 μ m wide, quadrangular in outline with three pairs of setae (Gd₁, Gd₂, pp) on dorsal side and one pair (Gv₂) on ventralside. Setae Gd₂ placed in the middle part of the gnathosoma posteromedially in relation to setae Gd₁. Setae pp rodlike, placed slightly anteriorly in relation to setae Gd₁. All gnathosomal setae (Gd₁, Gd₂, pp, Gv₂) similar in length. Chelicerae styletlike with bases 8 μ m long. Palpi directed anteromedially, slightly longer than half the length of the gnathosoma, with two pairs of setae (Ged, Tid) and two pairs of solenidia, and ending in relatively strong straight claws. Three pharyngeal pumps beyond gnathosoma.

Idiosoma (Figs. 1, 2) with characteristic cuticular ornamentation formed by small regularly dispersed points and larger ones differing in size.

Dorsal side (Fig. 1): Stigmata and peritremes round, located anterolaterally in relation to setae v₁. Cupules (ia, im, ih) visible on tergites D, EF and H respectively. Length of setae in μ m: v₁ 63, v₂ 27, sc₁ 36, sc₂ 78, c₁ 76, c₂ 74, d 82, e 31, f 80, h₁ 80, h₂ 10. Distances between setae in μ m: v₁-v₁ 43, v₂-v₂ 74, sc₁-sc₁ 84, sc₂-sc₂ 97, v₁-v₂ 21, v₂-sc₂ 30, c₂-c₂ 196, c₁-c₁ 99, c₂-c₁ 51, d-d 148, f-f 177, e-f 13, h₁-h₁ 110, h₁-h₂ 11. Setae v₁ barbed, with fine endings. Setae v₂, sc₂, c₁, c₂, d, f and h₁ barbed, stiff, with more thick endings than setae v₁. Sensilli (sc₁) clublike, lemon shape head with fine numerous little spines. Setae e smooth, blade-like, ending sharply. Setae h₂ smooth, needlelike.

Ventral side (Fig. 2): Apodemes strong. Anteromedian apodeme connected with apodemes I, II and sejugal apodeme. Apo-

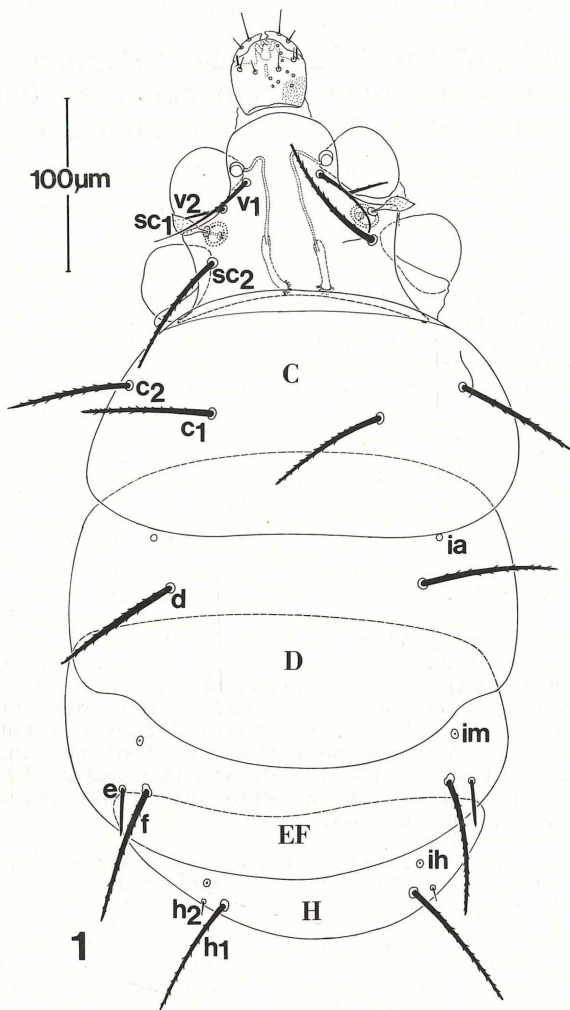


Fig. 1: *Pygmephorus sylvilagus* n. sp., female, holotype, dorsal view. [Nomenclature of segments, setae, cupuli etc. according to LINDQUIST (1977)].

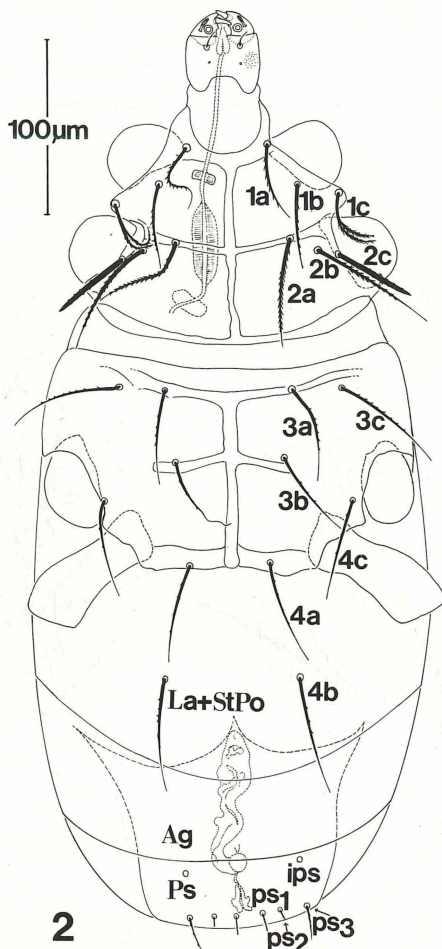
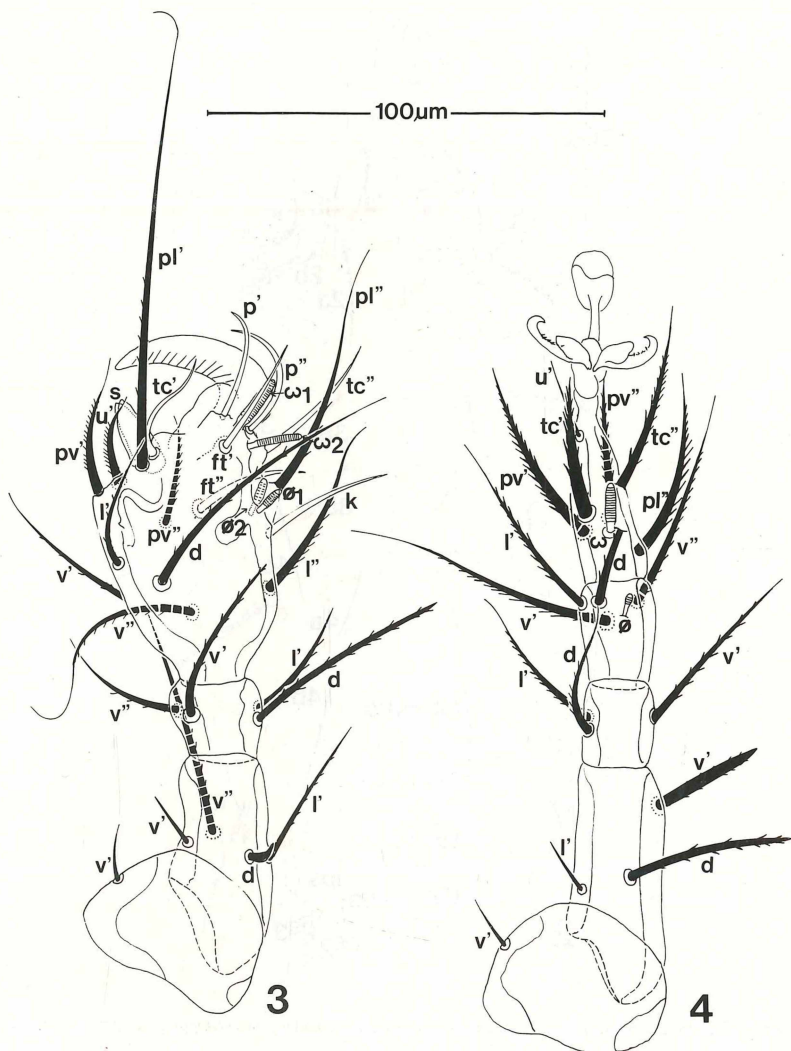
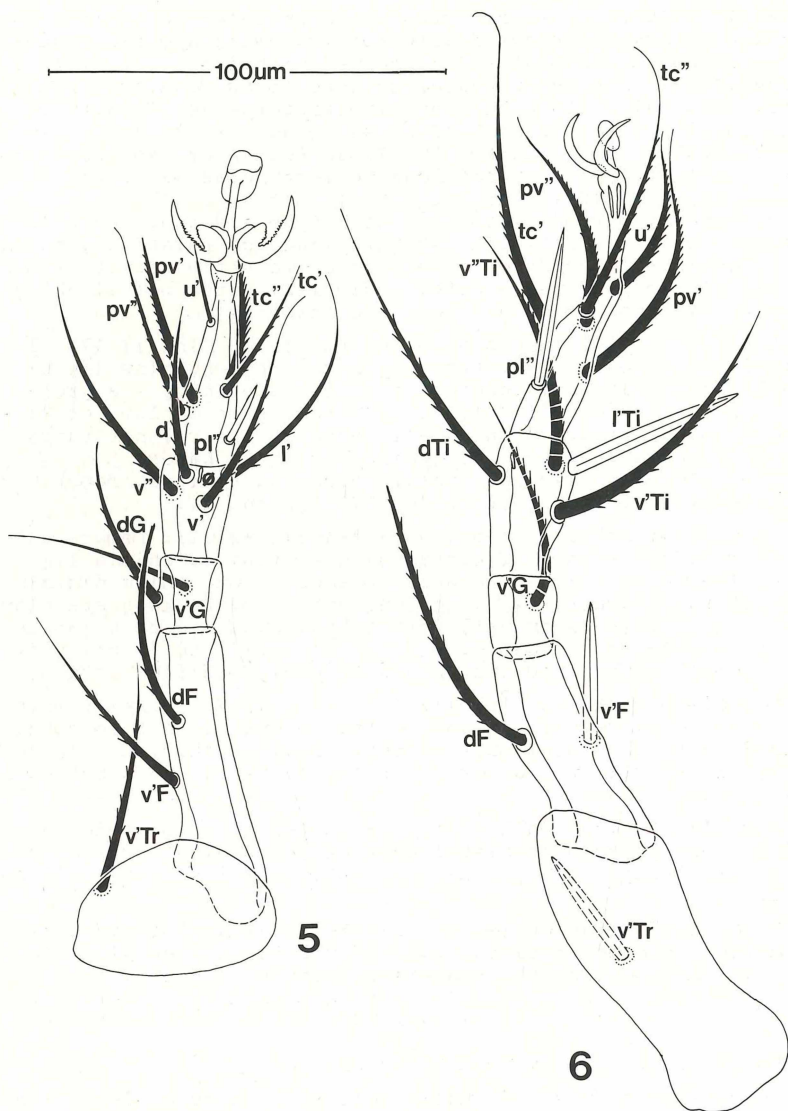


Fig. 2: *Pygmephorus sylvilagus* n. sp., female, holotype, ventral view.



Figs. 3-4: *Pygmephorus sylvilagus* n. sp., female, holotype, leg I (3) and leg II (4). [Nomenclature of setae according to LINDQUIST (1976)].



Figs. 5-6: *Pygmephorus sylvilagus* n. sp., female, holotype, leg III (5) and leg IV (6).

demes III, IV and V almost transverse in relation to longitudinal body axis, connected with posteromedian apodeme. Lateral opisthosomatic plates (La) joined with posterior sternal plate (StPo), and their posterior edge forms regular curve line. Agenital plate with convex posterior edge. Tergite Ps with cupules (ips). Length of setae in μm : 1a 53, 1b 55, 1c 38, 2a 68, 2b 76, 2c 48, 3a 61, 3b 57, 3c 68, 4a 63, 4b 72, 4c 65, ps₁ 10, ps₂ 6, ps₃ 21. Distances between setae ps in μm : ps₁-ps₁ 16, ps₁-ps₂ 10-11, ps₂-ps₃ 15-17. Setae 1a, 1b, 1c, 2a and 2b distinctly barbed, whiplike, with fine endings. Setae 1c bifurcated. Setae 2c stiff, slightly barbed, relatively thick. Setae on metapodosomatic plate similar to setae 2a but less barbed. Setae ps₁, ps₂ smooth needlelike. Setae ps₃ slightly barbed, with more fine endings than setae ps₁.

Legs (Figs. 3-6): Length in μm : Leg I 163, leg II 179, leg III 184, and leg IV 190. Leg I with very strong claw (44 μm long) with striation, forming together with spine s a prehensile complex. Leg II and III with strong paired claws of 11 μm length, with striation and small teeth on their inner surface and with characteristic thickenings at their bases. Leg IV with paired claws (19 μm long) without thickenings. Membranous empodia on stalks present on leg II, III and IV.

Formula of setae on leg I: 3-1-4-4-8(2)+14(2). Femur with small modified seta d. Tibiotarsus with four solenidia (ϕ_1 10 μm long and ϕ_2 11 μm long are placed in one third distal part of the segment, ω_1 11 μm long and ω_2 17 μm long are placed on the top of the segment), with tibial eupathidium k (36 μm long), six tarsal eupathidia (ft', ft'', tc', tc'', p', p''), 10 "normal" setae, and two spines probably modified seta s.

Formula of setae on leg II: 3-1-3-3-5(1)-7(1). Femur with setae v' relatively thick and stiff. Solenidion ϕ 6 μm long, placed on forth distal part of the tibia. Solenidion ω 13 μm long, placed slightly anterolaterally in relation to setae pl''. Seta u'' absent.

Formula of setae on leg III: 3-1-2-2-5(1)-6. Solenidion ϕ 4 μm long, placed in distal part of the segment. Tarsal seta pl'' relatively short (19 μm), smooth, bladeliike. Seta u'' absent.

Formula of setae on leg IV: 2-1-2-1-5(1)-6. Solenidion ϕ 4 μm long, placed in distal part of the tibia. Tarsal setae pl'' 44 μm long, smooth, bladeliike. Seta u'' absent.

Male (Fig. 7-12)

Body: Length 390 μm , width 167 μm .

Gnathosoma reduced to small tubiform structure, 34 μm long, 15 μm wide. With two pairs of solenidia (ϕ_1 10 μm long, ϕ_2 10 μm long, perhaps homolog to palpal solenidia of the female), and three pairs of "normal" setae (Gd₁, Gd₂, Gv₂).

Idiosoma (Figs. 7-8): Covered with smooth or regulary granulated cuticular plates and shields.

Dorsal side (Fig. 7): Propodosoma covered with six granulated shields: first located posteriorly to gnathosoma and anteriorly to setae v_1 , second and third placed between trochanter I and II (they are connected with coxae I), fourth and fifth very small, placed laterally to setae sc_1 , sixth covering medial part of propodosoma (it bears setae v_1, v_2, sc_1, sc_2 , and in its posterior part there is a characteristic sclerotization). Tergite C joined with tergite D. On shield CD characteristic sclerotizations in the medial part between setae c_2 , two pairs of cupuli (ic and ia), characteristic round cuticular thickenings between cupuli ic and ia, and a furrow located posteromedially in relation to setae d. Tergite CD in its posteromedial part, in relation to this furrow, smooth (cuticula without granulation). Tergite EF quadrangular, with cupuli im and with setae e and f placed in its posterolateral part. Tergite H weakly sclerotized, in its posterior part with at least six cavities. Tergites H and Ps form together on ventral side the genital capsule. Length of setae in μm : v_1 15, v_2 40, sc_1 15, sc_2 49, c_1 34, c_2 46, d 42, e 17, f 49, h_1 4, h_2 10. Distances between setae in μm : v_1-v_1 17, v_2-v_2 29, sc_1-sc_1 61, sc_2-sc_2 70, v_1-v_2 13, v_2-sc_1 17, sc_1-sc_2 11, c_2-c_2 167, c_1-c_1 76, d-d 91, c_2-c_1 48, d- c_1 82, d- c_2 79, f-f 44, e-f 6, h_1-h_1 29, h_1-h_2 6. Setae $v_1, v_2, sc_1, sc_2, c_1, c_2, d$ and f barbed, with relatively stiff endings. Setae e smooth, blade-like. Setae h_1 small, needle-shaped, h_2 smooth, rodlike, with rounded ends.

Ventral side (Fig. 8): Apodemes strong. Anteromedian apodeme connected with very short apodemes I, arched apodemes II and sejugal apodeme. Posteromedian apodeme connected with arched apodemes III and almost straight apodemes IV. Under cuticular surface, posteromedian apodeme bifurcated in posterior part. Posterior sternal plate almost quadrangular. Genital capsule (65 μm long, 61 μm wide) subtriangular with rigid pipe, bend in posterior and anterior part, sharply terminated. Penis (40 μm long) connected with capsule (X), this connected with structures (Y and Z). Laterally to the posterior part of the penis bladelike structures (13 μm long), probably homologous to setae ps_1 of the female. Genital capsule rounded posteriorly. Lengths (in μm) of the setae on ventral side: 1a 17, 1b 17, 1c 21, 2a 21, 2b 21, 2c 17, 3a 27, 3b 25, 3c 23, 4a 21, 4b 34, 4c 21, ps_2 16, ps_3 19. Distances between setae ps in μm : ps_2-ps_2 29, ps_2-ps_3 10. Setae 1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 3c, 4a, ps_3 relatively stiff, smooth or slightly barbed, sharply ended. Setae 4b distinctly barbed, sharply ended. Setae ps_2 smooth, with rounded ends.

Legs (Figs. 9-12): Leg II (133 μm long) and leg III (129 μm long) distinctly shorter than leg I (150 μm long) and longer than leg IV (108 μm long). Leg I with single claw of 19 μm length, without empodium. Leg II and III with paired claws (15-16 μm long) and membranous empodia. Leg IV with one curved claw (16 μm long) and a second spinelike claw of 29 μm length, without empodium.

Formula of setae on leg I: 3-1-4-4-8(2)-15(2). Tibial solenidia ϕ_1 10 μm and ϕ_2 11 μm long, placed on third distal part

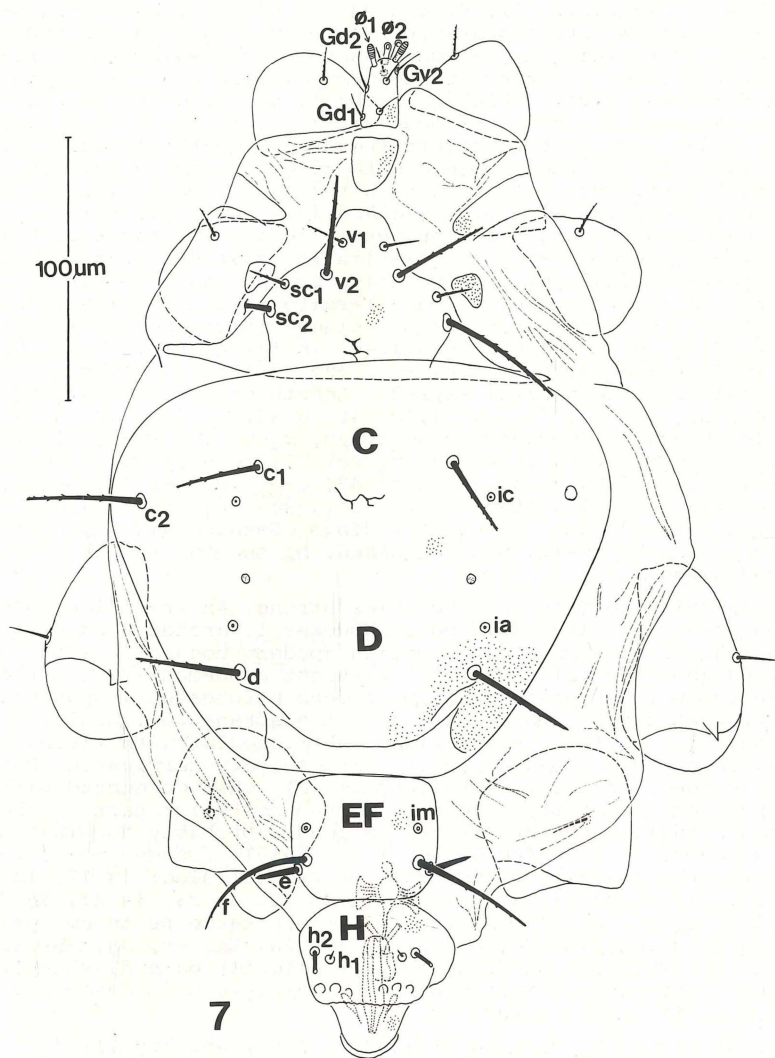


Fig. 7: *Pygmephorus sylvilagus* n. sp., male, paratype, dorsal view.

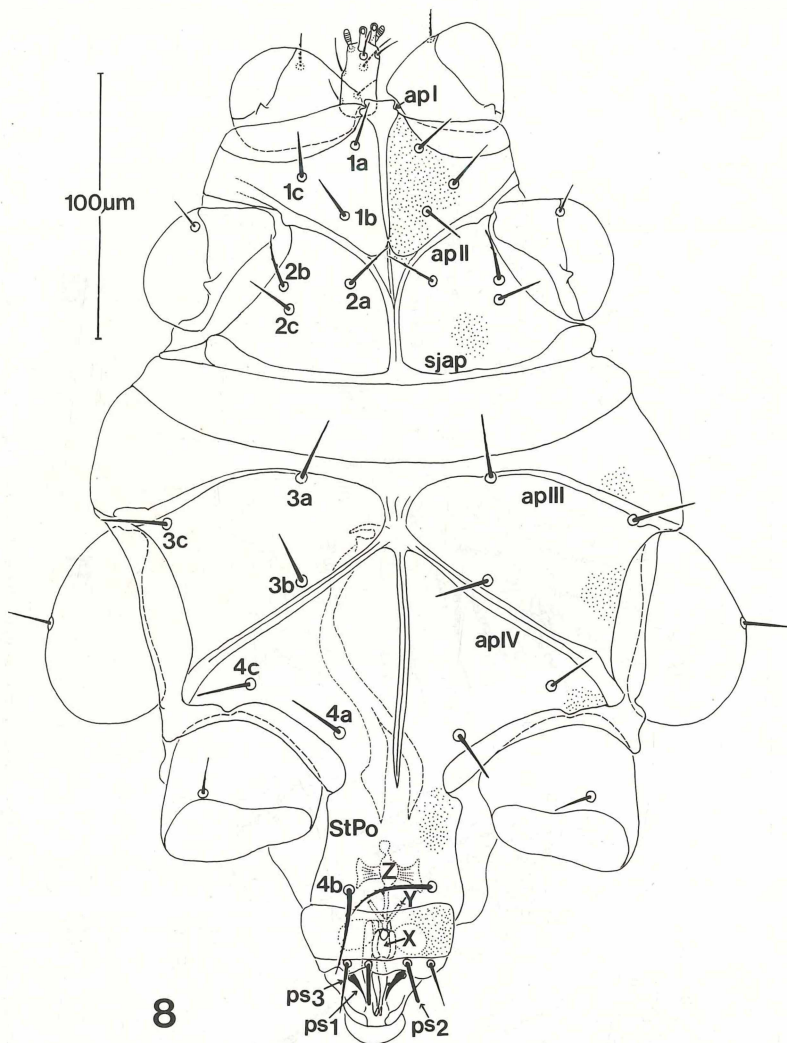


Fig. 8: *Pygmephorus sylvilagus* n. sp., male, paratype, ventral view.



Figs. 9-12: *Pygmephorus sylvilagus* n. sp., male, paratype, leg I (9), leg II (10), leg III (11), and leg IV (12).

of segment. Eupathidium k 44 μm long, placed third proximal part of the tibia. Tarsus with two solenidia (ω_1 17 μm long and ω_2 31 μm long placed in proximal part of the segment), six eupathidia (ft', ft'', tc', tc'', p', p'') and seven "normal" setae.

Formula of setae on leg II: 3-1-3-3-5(1)-8(1). Solenidion ϕ 6 μm long, placed in the middle part of the tibia. Solenidion ω 15 μm and spine pl'' 13 μm long, placed on the segment base. Spine tc' 17 μm long, placed distally in relation to solenidion ω in the middle of the tarsus.

Formula of setae on leg III: 3-1-2-2-5(1)-7. Solenidion ϕ 10 μm long, placed in the middle part of the tibia. On the tarsus base are placed two spines: tc' 17 μm and pl'' 21 μm long.

Formula of setae on leg IV: 2-1-2-1-5(1)-6. Femur with strong, barbed seta d 38 μm , and smooth seta v' 13 μm long. Tibia with solenidion ϕ 13 μm , spinelike seta l' 21 μm long, and three "normal" setae (dT_i, v'T_i, v''T_i). Tarsus with seta tc' spinelike (15 μm long), short (10 μm) seta tc'' and four setiform setae (u', u'', pv', pl''), similar in length.

Larva unknown

Type material: Female, holotype (slide No. A125/84) and two paratypes (male slide No. A126/84, female slide No. A127/84) were found on March 18th 1975 phoretic on *Sylvilagus floridanus* (ALLEN) (Leporidae) in Terre Haute, Iowa, USA by E. SPICKA, F. S. LUKOSCHUS ded. All types in the collection of Zoologisches Institut und Zoologisches Museum der Universität Hamburg.

Diagnosis: The female of *Pygmephorus sylvilagus* n. sp. is similar to *Pygmephorus designatus* MAHUNKA, 1973, and differs from it by following features:

P. sylvilagus ♀

1. Setae h₂ needlelike, three times shorter than bladelike setae e
2. Setae ps₁ and ps₂ smooth, distinctly shorter than barbed setae ps₃
3. Setae v' on genu II thinner than seta v' on femur II, with much more fine endings.

P. designatus ♀

1. Setae h₂ bladelike, slightly longer than 3/4 of setae e, similar in structure
2. Setae ps₁, ps₂, ps₃ barbed, similar in length
3. Seta v' on genu II thicker than seta v' on femur II, both with very fine endings.

The male of *P. sylvilagus* can be compared with the second *Pygmephorus* male, described in this paper, *P. erlangensis* KRCZAL, 1959. The males of these two species can be distinguished, among others, by the following features:

P. sylvilagus ♂

1. Setae e on tergite EF smooth, bladelike, sharply ended (Fig. 7)
2. Apodemes IV straight (Fig. 8)
3. On leg II spine pl'' approximately equal 3/4 length of spine tc'
4. On leg III spine tc' shorter than spine pl''
5. Femur IV with smooth seta v' shorter than 1/2 of length of seta dF
6. Tibia IV shorter than its width.

P. erlangensis ♂

1. Setae e on tergite EF barbed, bluntly ended (Fig. 13)
2. Apodemes IV bend in characteristic way (Fig. 14)
3. On leg II spine pl'' approximately equal 1/2 length of spine tc'
4. On leg III spine tc' longer than spine pl''
5. Femur IV with barbed seta v' longer than 1/2 length of seta dF
6. Tibia IV longer than its width.

Pygmephorus erlangensis KRCZAL, 1959

Male (Figs. 13-18)

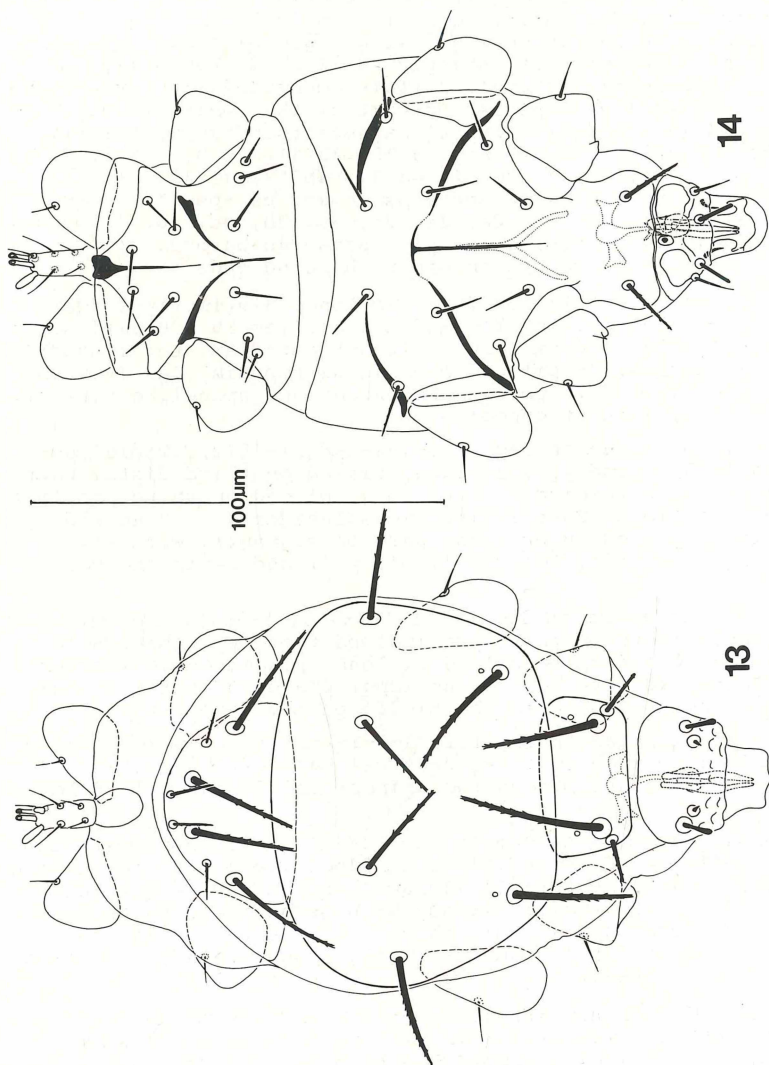
Body length 186 μ m, width 86 μ m.

Gnathosoma reduced to small tubiform structure, 19 μ m long, 8 μ m wide, with two pairs of solenidia (ϕ_1 6 μ m, ϕ_2 8 μ m long), and with three pairs of "normal" setae (Gd₁, Gd₂, Gv₂) (On examined specimen seta Gv₂ on the left side of the gnathosoma undeveloped or broken, solenidion ϕ_1 on the right side of gnathosoma much shorter than on the right side - undeveloped or broken).

Idiosoma (Figs. 13-14) covered with smooth or regulary granulated cuticular plates and shields.

Dorsal side (Fig. 13): Propodosoma covered with two plates: first small located posteriorly to gnathosoma and anteriorly in relation to setae v₁, second covering most of the propodosoma with setae v₁, v₂, sc₁, sc₂. Tergite C joined with tergite D, with cupules ia. Tergite EF quadrangular with cupuli im. Tergite H weakly sclerotized, in its posterior part with cavities. Tergites H and Ps form together on ventral side the genital capsule. Lengths of the setae in μ m: v₁ 11, v₂ 28, sc₁ 10, sc₂ 30, c₁ 29, c₂ 29, d 30, e 11, f 31-38, h₁ 2, h₂ 8. Distances between setae in μ m: v₁-v₁ 8, v₂-v₂ 13, sc₁-sc₁ 30, sc₂-sc₂ 39, v₁-v₂ 6, v₂-sc₁ 9, sc₁-sc₂ 10, c₂-c₂ 86, c₁-c₁ 38, d-d 54, d-c₁ 36, d-c₂ 35, f-f 26, e-f 5, h₁-h₁ 17, h₁-h₂ 5. Setae v₁, v₂, sc₁, sc₂, c₁, c₂, d, e and f barbed, stift, relatively bluntly ended. Setae h₁ in form of small, sharp thorns. Setae h₂ smooth, with rounded ends.

Ventral side (Fig. 14): Apodemes moderately strong. Antero-median apodeme broken in its medial part, connected with short



Figs. 13-14: *Pygmephorus erlangensis* KRCZAL, 1959, male, dorsal (13) and ventral (14) view. Designation of setae see figs. 7-8.

apodemes I; arched apodemes II not connected with sejugal apodeme. Apodemes III arched, not connected with posteromedian apodeme. Apodemes IV bend in characteristic way, connected with posteromedian apodeme. Posteromedian apodeme bifurcated under cuticular surface in its posterior part. Posterior sternal plate subquadrangular. Genital capsule 36 μm long, 38 μm wide, subtriangular in outline, with rigid pipe, bend in posterior and anterior part, sharply terminated. Penis (25 μm long) connected with capsula X. This connected with structures Y and Z. Laterally to posterior part of the penis blade-like structures (7 μm long). Genital capsula rounded posteriorly. Lengths (in μm) of the setae: 1a 10, 1b 11, 1c 9, 2a 12, 2b 11, 2c 8, 3a 13, 3b 13, 3c 14, 4a 11, 4b 19, 4c 12, ps₂ 10, ps₃ 10. Distances between setae ps in μm : ps₂-ps₂ 11, ps₂-ps₃ 8. Setae 1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4c, and ps₃ smooth, stiff, ending sharply. Setae 4b barbed, stiff, ending sharply. Setae ps₂ smooth with round ends.

Legs (Figs. 15-18): Leg I (87 μm long) distinctly longer than leg II (72 μm), leg III (72 μm) and leg IV (70 μm). Leg I with single claw (10 μm long), without empodium. Leg II and III with paired claws (6 μm) and membranous empodia. Leg IV with one curved claw of 10 μm , and second arched spinelike claw of 19 μm length, without empodium.

Formula of setae on leg I: 3-1-4-4-8(2)-15(2). Tibial solenidia ϕ_1 8 μm and ϕ_2 7 μm long, placed on third distal part of segment. Eupathidium k 23 μm long, placed on third proximal part of the tibia. Tarsus with two solenidia (ω_1 10 μm and ω_2 21 μm long, placed in proximal part on segment), with six eupathidia (ft', ft'', tc', tc'', p', p'') and seven "normal" setae.

Formula of setae on leg II: 3-1-3-3-5(1)-8(1). Solenidion ϕ 5 μm long, placed on third proximal part of the tibia. Solenidion ω 8 μm and spine pl'' 6 μm long, placed on the tarsus base. Spinelike seta tc' (13 μm long) placed distally in relation to solenidion ω in the middle part of the tarsus.

Formula of setae on leg III: 3-1-2-2-5(1)-7. Solenidion ϕ 3 μm long, placed on third proximal part of the tibia. At the tarsus base are placed two spines: tc' 10 and pl'' 8 μm long.

Formula of setae on leg IV: 2-1-2-1-5(1)-6. Femur with two barbed setae: d 16 μm and v' 11 μm long. Tibia with solenidion ϕ (4 μm), spinelike seta L' (10 μm long) and three "normal" setae (dT_i, v'T_i, v''T_i). Tarsus with spinelike seta tc' (8 μm), short seta tc'' (5 μm), three almost equal in length setae u', u'', and pv', and distinctly longer seta pl'', placed on the tarsus base.

Material: Three females (slides No. A128/84 till A130/84) and one male (slide No. A131/84) were found April 4th, 1978 in the nest of a Garden Dormouse, *Eliomys quercinus* (LINNAEUS) (Gliridae), in St. Geertruid, Holland, by A. G. W. WOELTJES; F. S. LUKOSCHUS ded. All slides in the collection of Zoologisches Institut und Zoologisches Museum der Universität Hamburg.

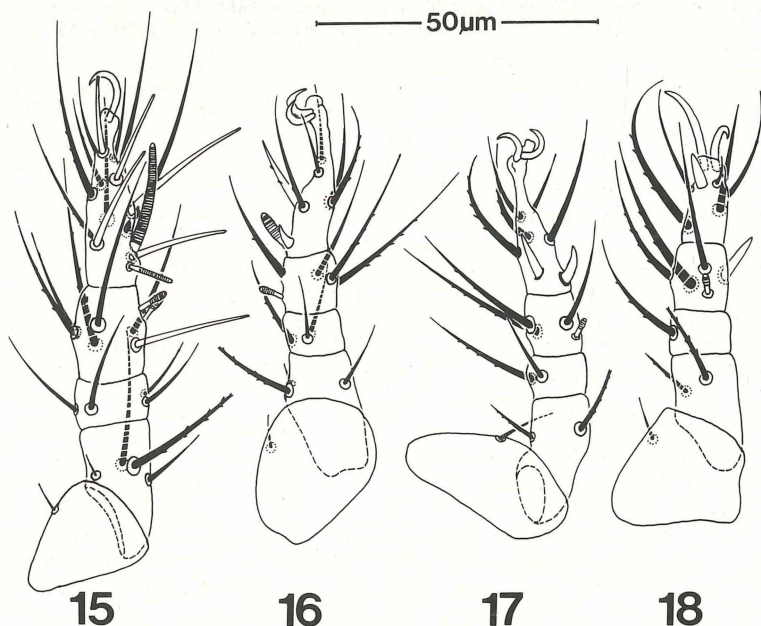
Discussion: It is difficult to find a proper place for the genus *Pygmephorus* based only on phoretic females, because this group, together with closely related groups, shows many plesiomorphic features and only a few apomorphic characteristics. In most cases these apomorphic features are adaptations to phoresy, which is a common phenomenon in many evolutionary lines of Tarsonemina (KALISZEWSKI in press), and are connected with convergent adaptations or autapomorphic characteristic.

However, based on cladistic analysis of phoretic females of Pygmephoridae (KALISZEWSKI in prep.), the genus *Pygmephorus* appears to be a sister group to the evolutionary line containing such groups as *Luciaphorus* MAHUNKA, 1981, *Mahunkania* RACK, 1972, the *Pediculaster*-complex and part of *Siteroptes* AMERLING, 1861, all of which have three setae on the genu II [This is also the case for the genus *Triroptes* KALISZEWSKI and *Lindquistiroptes* KALISZEWSKI (in prep.)].

Females of *Pygmephorus* can be distinguished from those of their sister group through two autapomorphic features: the characteristic ornamentation of the cuticula and the enlargement of the tibiotarsus I (The width of the tibiotarsus is two or more times greater than the width of the base of the tibia I).

Males of *Pygmephorus* have such autapomorphic features as: a penis distally curved, and on leg IV curved claw, which is only half as long as the enlarged spine-like or slightly bend second claw.

Males from the sister group of *Pygmephorus* (*Triroptes*, *Luciaphorus*, *Pediculaster*) have following synapomorphic features distinguishing them from *Pygmephorus*:



Figs. 15-18: *Pygmephorus erlangensis* KRCZAL, 1959, male, leg I (15), leg II (16), leg III (17) and leg IV (18). Designation of setae see figs. 9-12.

1. Cavities present on more than half the surface of the tergite H.
2. Penis completely covered from ventral side by tergite Ps.
3. Setae ps₂ and ps₃ placed on the posterior end of the genital capsule.
4. Setae ps₁ absent.

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