

A new genus and species of Nematalycidae (Acari: Endeostigmata)

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(Received 23 April 2013; accepted 12 September 2013)

Osperalycus tenerphagus, a new genus and species of Nematalycidae (Acari: Endeostigmata), is described from Ohio, USA, using light microscopy and low-temperature scanning electron microscopy. Specimens were extracted from two different loam soils. This genus can be readily distinguished from the other genera of Nematalycidae by the simple setae that line the opisthosoma. The mouthparts are especially distinct in possessing three-segmented palps, an unusual vessel-shaped structure, and rutella that overlap at the midline. The discovery of rutella in this genus and in two other genera indicates that the Nematalycidae can be more confidently assigned to the Endeostigmata (Sarcoptiformes).

<http://www.zoobank.org/urn:lsid:zoobank.org:pub:A64A6612-B66C-4814-80A9-3856DEBE8C46>

Keywords: Sarcoptiformes; Endeostigmata; Nematalycidae; low-temperature scanning electron microscopy; rutella

Introduction

The Nematalycidae is an unusual family of soil mites with a vermiform body that can be extended and contracted via a combination of hydraulic pressure and a continuous muscle layer underlying a thin epidermis (Haupt and Coineau 1999). Their unique physiology among mites is almost certainly an adaptation for living in small interstitial spaces in mineral soil and sand (Haupt and Coineau 1999). The Nematalycidae also appear to be exclusively thelytokous (Norton et al. 1993).

This family is readily distinguished from all other Acari by a combination of a highly elongate idiosoma (adults ≥ 6 times width when fully extended), a much greater distance between legs II and III relative to legs I and II, and a genital opening much closer to legs IV than to the anal opening. The prodorsum of this family is also distinct from many others in lacking trichobothria and a naso, with fewer than four pairs of setae; the rostral seta is unpaired if present. The Nematalycidae was originally treated as belonging to the Endeostigmata (Sarcoptiformes) (Strenzke 1954). It was later assigned to the Tydeoidea (Cunliffe 1956; Wainstein 1965; Krantz 1972). Kethley (1982) placed it outside the Tydeoidea but proposed that derived characters suggested a closer relationship with the Tydeoidea than the Endeostigmata. However,

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since the discovery of two families – Micropsammidae (Coineau and Theron 1983) and Proteonematalycidae (Kethley 1989) – that have a transitional morphology between Nematalycidae and other families within the Endeostigmata, the Nematalycidae have been more commonly regarded as belonging to the Endeostigmata (Walter 2009; Walter et al. 2011).

Four genera of Nematalycidae have been described (Walter et al. 2011), all of which are monospecific. *Nematalycus* was described from groundwater from the Algerian coast (Strenzke 1954). Soon afterwards *Cunliffea* was described from pasture soil from the USA (Cunliffe 1956) and has since been collected from sands in Germany (Russell and Alberti 2009). *Gordialycus* was described from fine sands from southern France (Coineau et al. 1967). This genus has a worldwide distribution, having been found in southern Africa, Turkmenistan, Venezuela, Cuba, Mauritania, New Caledonia, Australia, Brazil, Hungary and the USA, (Coineau and Theron 1983; Silva et al. 1989; Thibaud and Coineau 1998; Norton and Kinnear 1999; Norton et al. 2008). *Psammolycus* was described from sandy soils from Brazil (Schubart 1973). This genus may also have been found in the USA (pers. obs.). A published record from Spain (Moraza 2008) was in error and is instead *Gordialycus* (pers. obs.).

A fifth genus and species of Nematalycidae is hereby described. The mites were collected from two different loam soils from relatively disturbed habitats in Ohio – a silty clay loam from a suburban prairie located on a university campus, and a sandy loam from a young chestnut plantation (see Material examined section for more details). Collecting took place throughout 2010 and 2011. As with all other species of Nematalycidae, all adults recovered were female, indicating thelytoky.

Material and methods

For the collection of slide-mounted specimens, soil samples were processed by soil washing in accordance with Kethley (1991). Mites that were recovered using this technique were slide mounted in Hoyer's medium. Live mites were also collected for the purpose of imaging with a low-temperature scanning electron microscope (LT-SEM) at the US Department of Agriculture, Electron & Confocal Microscopy Unit, Beltsville, MD. This was accomplished by directly removing them from floated material that had not yet been sieved. Searching was undertaken with a dissection microscope.

Live specimens, for LT-SEM, were secured to 15 × 30-cm copper plates, using ultrasmooth round (12-mm diameter), carbon adhesive tabs (Electron Microscopy Sciences, Inc., Hatfield, PA, USA). The specimens were frozen conductively, in a Styrofoam box, by placing the plates on the surface of a pre-cooled (−196°C) brass bar whose lower half was submerged in liquid nitrogen. After 20–30 s, the holders containing the frozen samples were transferred to the Quorum PP2000 cryo-prep chamber (Quorum Technologies, East Sussex, UK) attached to an S-4700 field emission scanning electron microscope (Hitachi High Technologies America, Inc., Pleasanton, CA, USA). The specimens were etched inside the cryotransfer system to remove any surface contamination (condensed water vapour) by raising the temperature of the stage to −90°C for 10–15 min. Following etching, the temperature inside the chamber was lowered below −130°C, and the specimens were coated with a 10-nm layer of platinum using a magnetron sputter head equipped with a platinum target. The specimens were transferred to a pre-cooled (−130°C) cryostage in the SEM for observation. An accelerating voltage of 5 kV was used to view the specimens. Images

were captured using a 4pi Analysis System (Durham, NC, USA). Images were sized and placed together to produce a single figure using Adobe® Photoshop CS 5.0.

With the exception of the pre-larva – which, if existing, was not recovered – the different instars were carefully studied for ontogenetic variation. Slide-mounted mites were drawn using a compound microscope (Zeiss Axioscope™) equipped with a camera lucida as well as phase-contrast and differential interference contrast optical systems. Many detailed features of this mite were not readily distinguishable without LT-SEM. For example, the very small size of the mouthparts made it impossible to discern their true shape and structure without LT-SEM. For this reason, LT-SEM was used to make modifications and corrections to drawings where the light microscope provided insufficient detail.

Although the prodorsal, opisthosomal and genital setae tend to project straight out (as revealed by LT-SEM), they are typically pushed into a flat two-dimensional orientation by slide mounting. These setae were drawn as though slide mounted (with vertically oriented setae on the dorsum and ventrum projecting to the side) to reveal their actual lengths. The LT-SEM also revealed minute barbs near the base of many setae. These setae are treated as simple because it is impossible to determine which setae do not have them (being out of view in many LT-SEM images).

Measurements were made using an ocular micrometer and are given to the nearest micrometer. Legs were measured from the base of the trochanter to the tip of the empodium (adjusting for legs in which the empodium was not fully extended). All of the prodorsal and opisthosomal setae were measured (including setae from the genital region). Setae were measured from the centre of the base to the tip. All setal length measurements in the main text are presented as ranges in parentheses with the symbol “µm” omitted.

In the adult female section, reference is occasionally made to images of nymphal instars to illustrate structures in which there is no apparent difference between instars (e.g. integument, ventral furrow and solenidial grooves). Tables pertaining to the ontogeny section give abbreviations for instars: Larva = La; Protonymph = PN; Deutonymph = DN; Tritonymph = TN; Female = F.

Osperalycus tenerphagus Bolton and Klompen gen. nov., sp. nov.

Figures 1–8

Diagnosis

Osperalycus is readily distinguished from other genera of Nematalycidae by the presence of simple setae of similar size along the opisthosoma (Figure 1A, B); the simple setae next to the anal opening of *Gordialycus* and *Nematalycus* are at least three times as long as those along the rest of the opisthosoma, although the opisthosoma of *Gordialycus* and *Nematalycus* is often almost completely nude. *Cunliffea* and *Psammolycus* have bifurcate or trifurcate setae along the opisthosoma. *Osperalycus* is also readily distinguished from *Gordialycus* and *Nematalycus* by the baculiform solenidion on tarsus II – this solenidion has a distinctly swollen or bulbous tip in *Gordialycus* and *Nematalycus*. The most distinct characters of *Osperalycus* are to be found in the mouthparts (Figure 2A, B). The vessel (Ve) – modified from the lateral lips – is a very unusual structure that appears to be unique to this genus (Figure 2A).

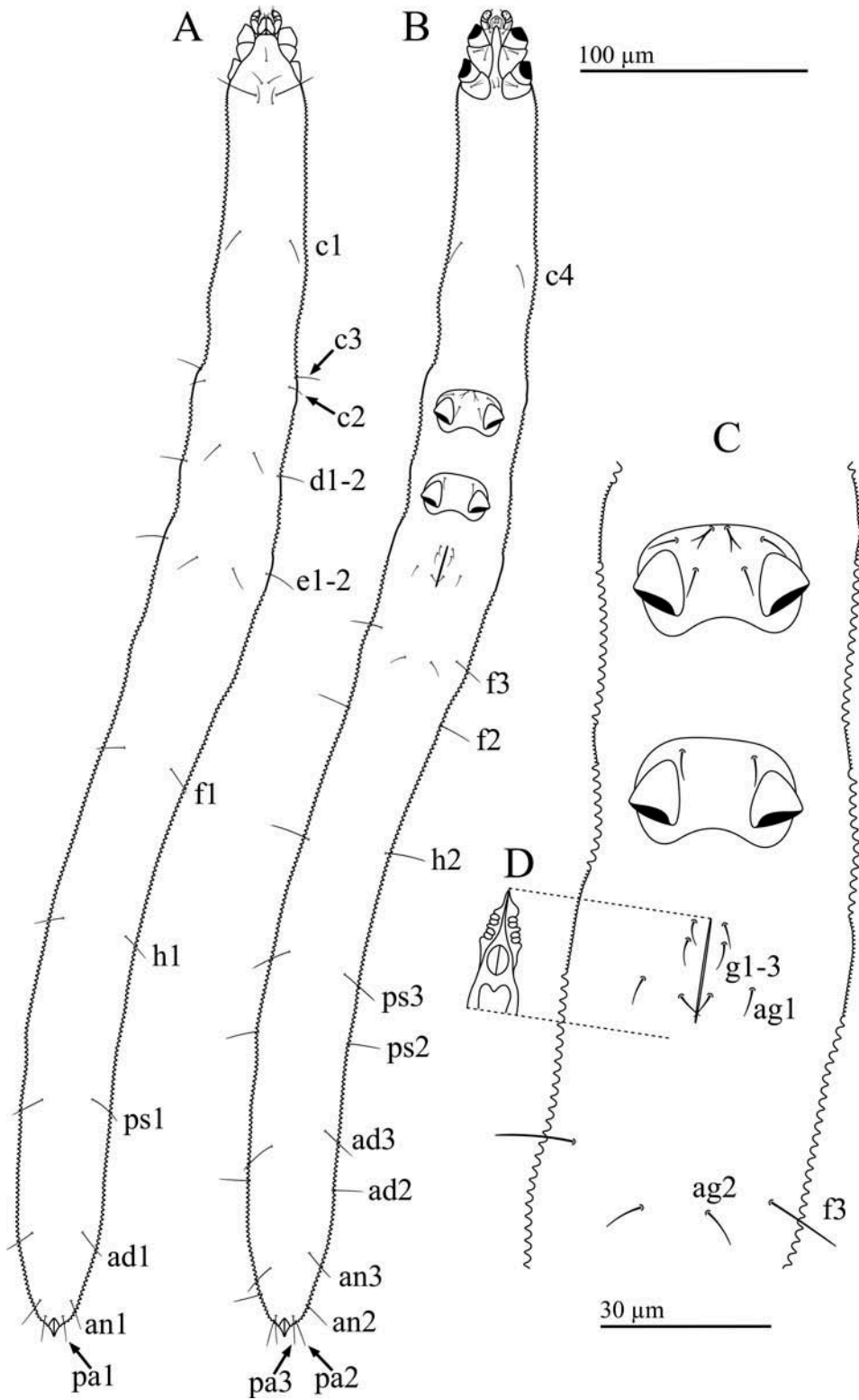


Figure 1. *Osperalycus tenerphagus* sp. nov. Female: (A) dorsal view; (B) ventral view; (C) metapodosoma and genital region (D) genitalia – internal.

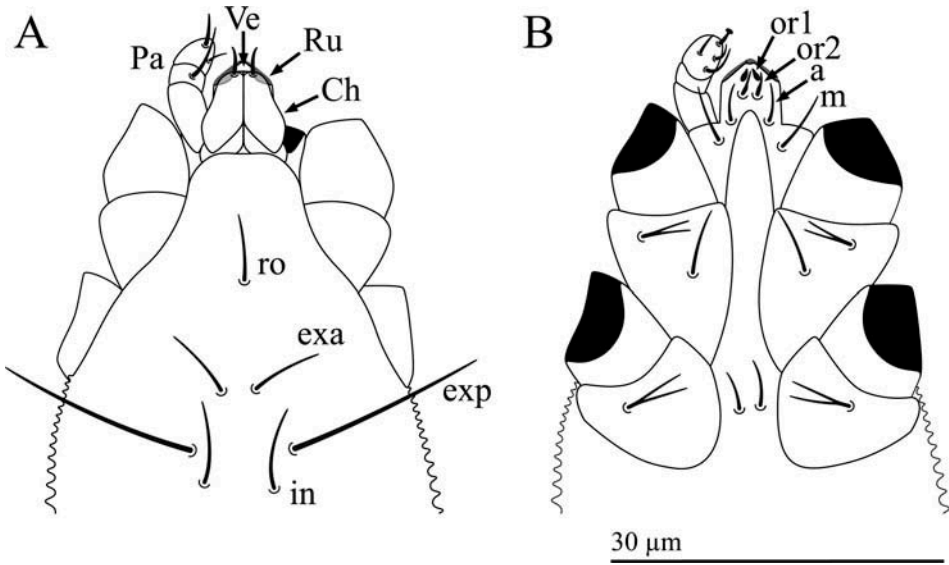


Figure 2. *Osperalycus tenerphagus* sp. nov. Female, proterosoma: (A) dorsal view (chelicerae slanted downwards into the vessel, making them appear slightly shorter; broad bases of rutella partly behind chelicerae and vessel opening – shaded pale grey); (B) ventral view.

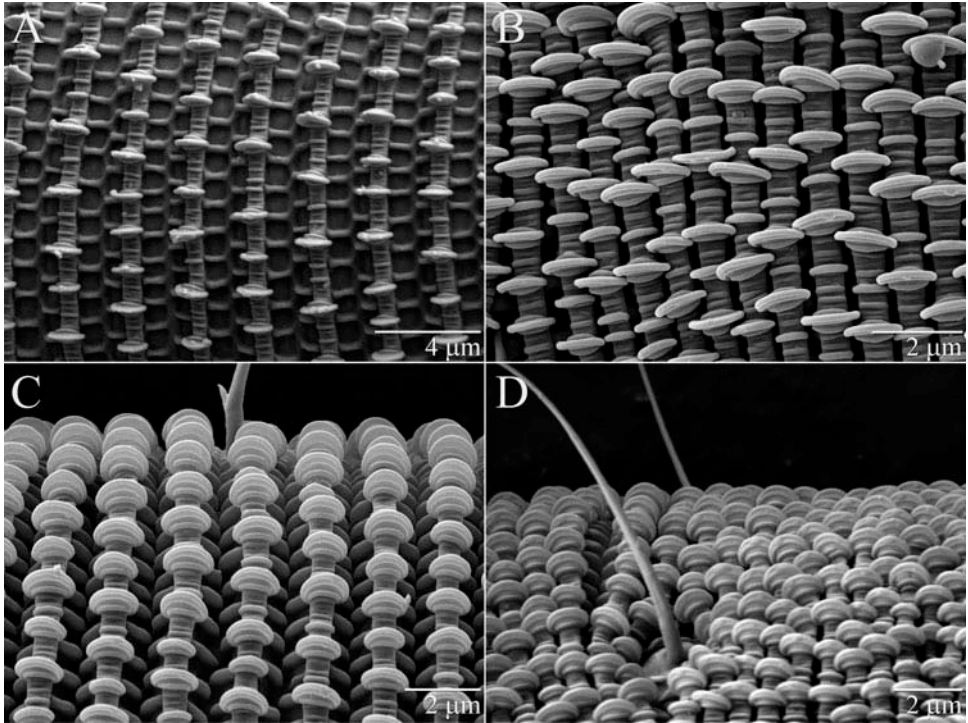


Figure 3. *Osperalycus tenerphagus* sp. nov. Integument: (A) extended, vertical view (showing palettes as thin and flat); (B) contracted, vertical view (showing interlocking palettes); (C) extended, diagonal view; (D) contracted, diagonal view.

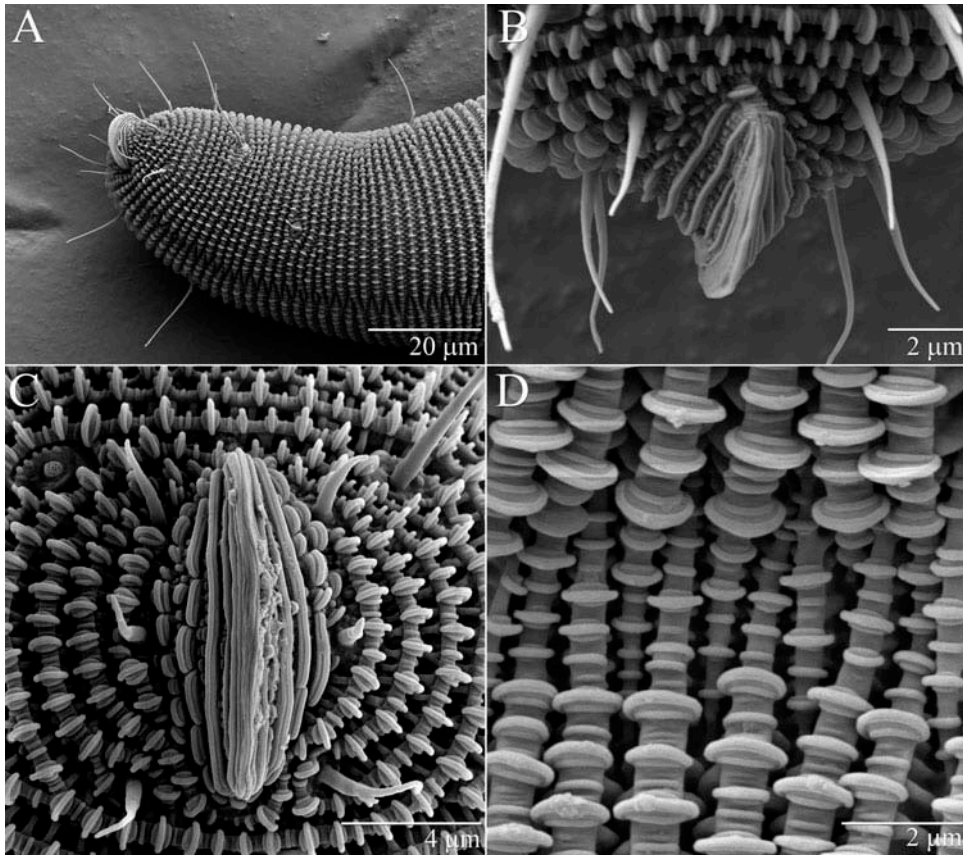


Figure 4. *Osperalycus tenerphagus* sp. nov. Tritonymph, opisthosoma: (A) anal valves and ventral furrow, ventrolateral view; (B) anal valves, dorsal view; (C) anal valves, posterior view; (D) ventral furrow, close-up.

Markedly short chelicerae (Ch) ($<15\ \mu\text{m}$) are found in both *Osperalycus tenerphagus* and *Psammolycus delamarei*, but not Nearctic cf. *Psammolycus* or any other genus of Nematalycidae. *Osperalycus* is also distinct from all other genera in having rutella (Ru) that overlap at the midline (Figure 2A).

Female

General morphology. Idiosoma $\approx 600\ \mu\text{m}$ long (≈ 12 times longer than wide) when fully extended (Figure 1A, B). Cuticle with flat round projections, or palettes, *sensu* Haupt and Coineau (1999), lining the latitudinal annuli (Figure 3A–D). Trachea and peritremes absent. Lyrifissures absent from idiosoma. Podocephalic canals terminating anteriorly between the bases of the chelicerae; extending back beyond coxae I. Distinct glands leading into podocephalic canals at coxae I. Long narrow oesophagus extends to proximity of metapodosoma.

Prodorsum. Trichobothria absent; naso absent; eyes absent. Three pairs of setae (*exa*, *in* and *le*) and one unpaired rostral (*ro*) seta. All setae simple and close to the midline

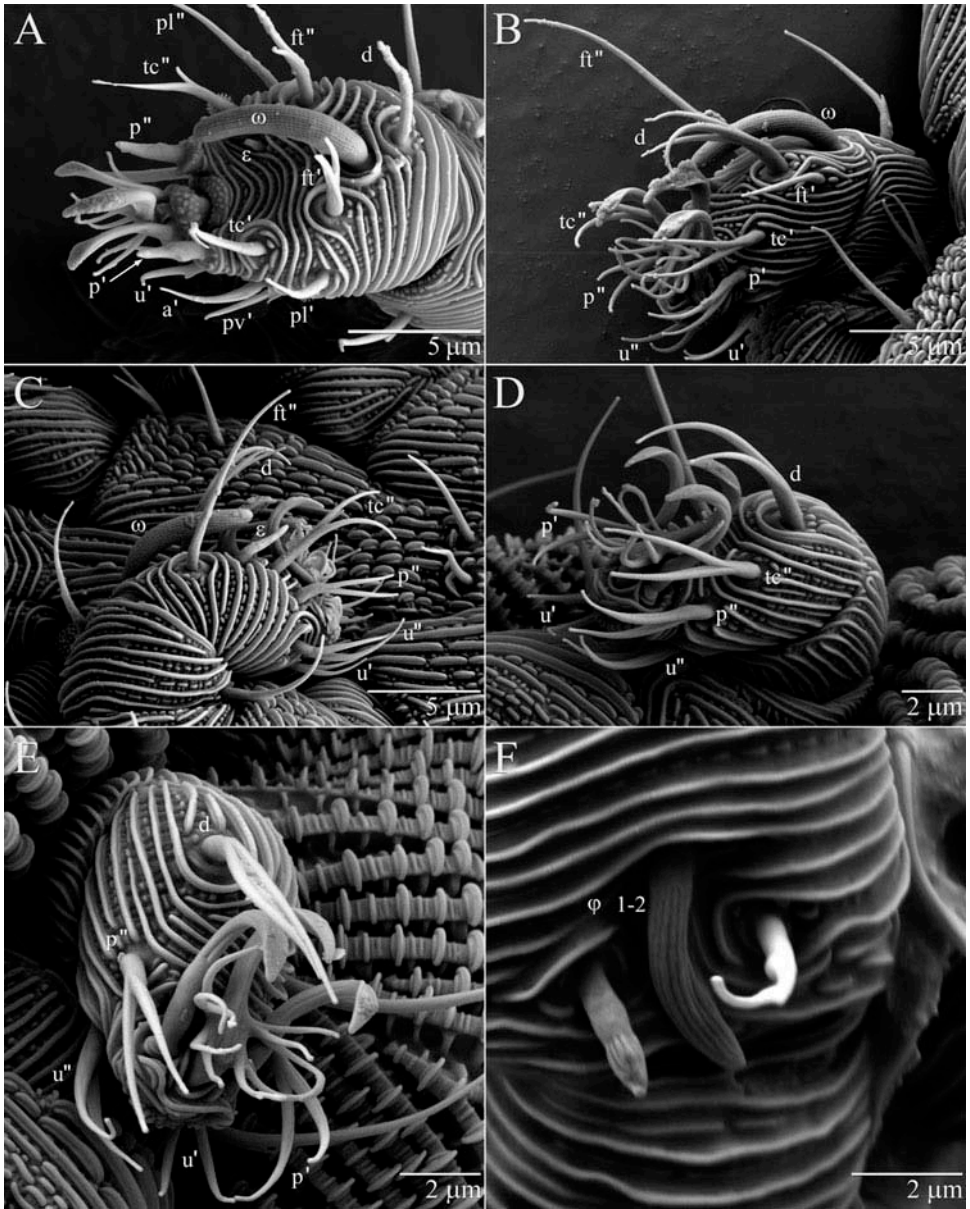


Figure 5. *Osperalycus tenerphagus* sp. nov. Female: (A–E) tarsi I–IV; (A) tarsus I; (B) tarsus II, ε obscured; (C) tarsus II, ε visible; (D) tarsus III; (E) tarsus IV. Deutonymph: (F) tibia I.

of the prodorsum (Figure 2A). Setae *ro*, *le* and *in* subequal and short (4–8); *exa* long (16–22).

Opisthosoma. All setae simple. Setae associated with all nine opisthonotal segments: *cl*–4, *dl*–2, *el*–2, *fl*–3, *hl*–2, *psl*–3, *adl*–3, *anl*–3, *pal*–3. Frequent and noticeable asymmetry

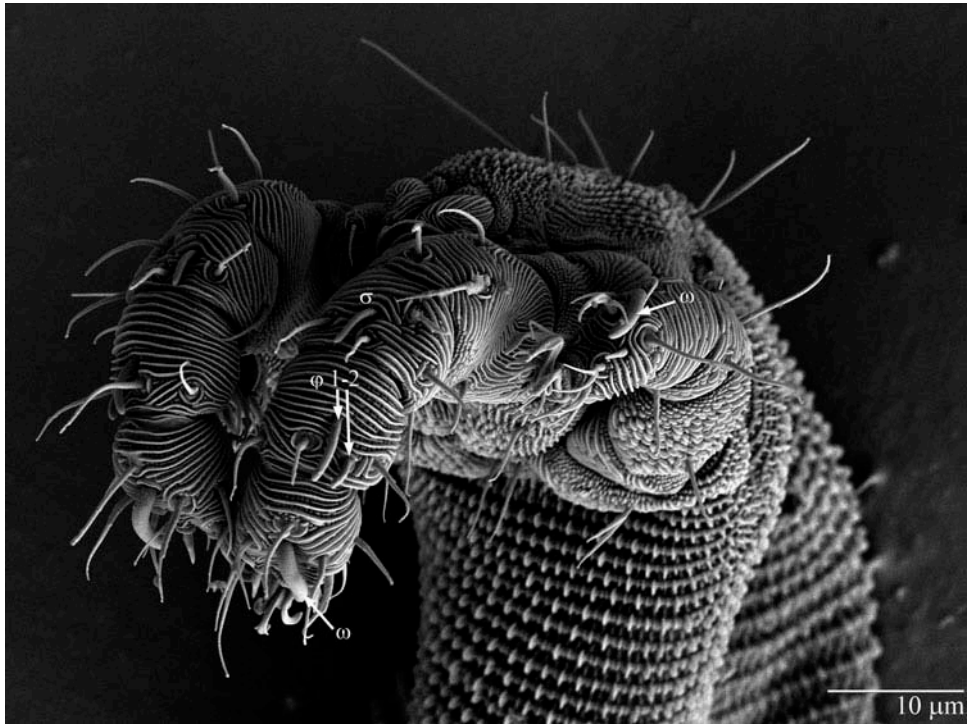


Figure 6. *Osperalycus tenerphagus* sp. nov. Female: solenidia on legs I and II, female.

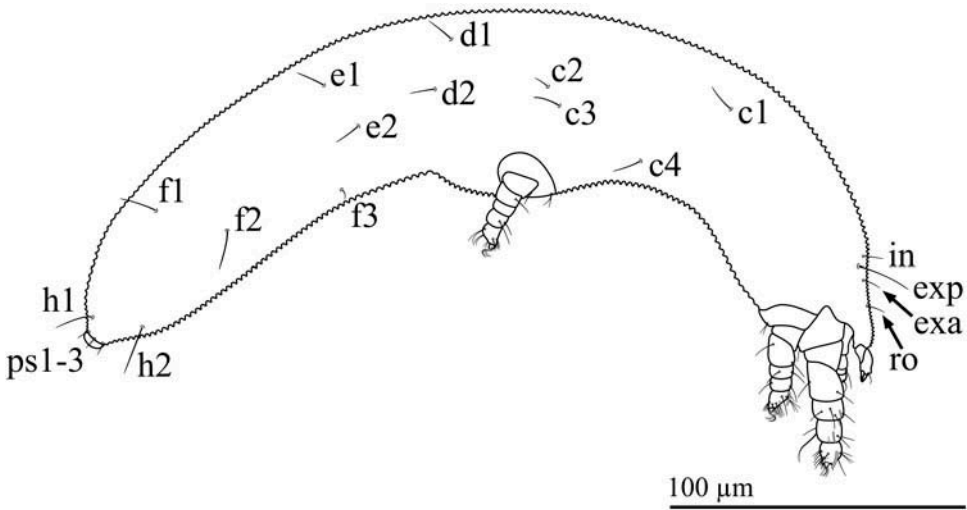


Figure 7. *Osperalycus tenerphagus* sp. nov. Larva: lateral view.

in the longitudinal positions of pairs of setae (Figure 1A, B). In segmental remnants F-PA, ancestrally dorsolateral setae are displaced to a ventrolateral or ventral position that is usually noticeably more anterior than the dorsomedial setae of the same segment. Segment C very long; position of *c2* and *c3* much more posterior than *c1* and *c4*.

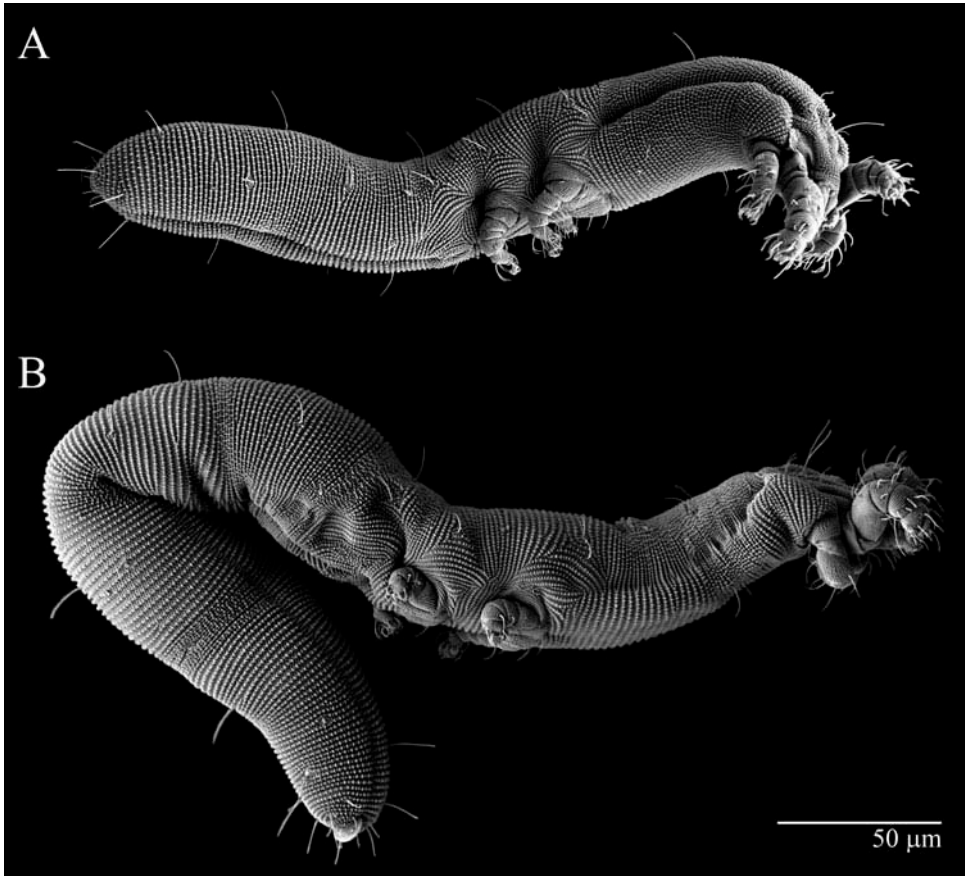


Figure 8. *Osperalycus tenerphagus* sp. nov. Nymphs: lateral view: (A) protonymph; (B) tritonymph.

Setae on segments C–E generally shorter (5–15) than those on segments F–PA (10–19). Setae *c2* short (5–8); proximal setae *c3* comparatively long (9–13). Longest opisthosomal setae *h2* and *ps3* (15–19). From segments H to PA, ventral setae (*h2*, *ps3*, *ad3*, *an3*, *pa3*) typically 1 to 4 μm longer than lateral and dorsal setae on the same segment; lateral and dorsal setae subequal.

Distinct anal valves projecting from the anus (Figure 4A–C). Ventral furrow, in which annular ridges terminate (Figure 4D), extending from proximity of anal valves to genital region (Figure 4A).

Three pairs of genital (*g*) setae and two pairs of aggenital (*ag*) setae (Figure 1C). Genital and aggenital setae short (3–7) compared with most other opisthosomal setae. Two pairs of bilobed genital papillae (Figure 1D).

Podosoma. Large gap separating legs II and III (Figure 1B). Coxal fields I and II medially separated by intercoxal region (Figure 2B). Single pair of intercoxal setae (between coxal fields II). Coxal fields III and IV medially fused (Figure 1C). Each

coxal field I with one bifurcate seta and one simple seta; each coxal field II with one bifurcate seta; coxal fields III with one bifurcate seta and two simple setae on each side of the fused coxal plate; coxal fields IV with one simple seta on each side of the fused coxal plate.

Legs. Pretarsi I–IV each with two lateral claws and a ciliated empodium (Figure 5A–E). Solenidial formulae femora–tarsi for individual legs I–IV: 0-1-2-1; 0-0-0-1; 0-0-0-0; 0-0-0-0. Longitudinal grooves of shortest solenidion phi (ϕ) (tibia I) restricted to bulbous tip (Figure 5F). Other solenidia baculiform with longitudinal grooves extending almost all the way to the base. Solenidia omega (ω) on tarsi I and II subequal and noticeably larger than solenidion phi (ϕ) and sigma (σ) on, respectively, tibia I and genu I (Figure 6).

Setae absent from trochanters I–IV. Setal formulae femora–tarsi for individual legs I–IV (excluding solenidia and famuli): 4-6-7-16; 2-2-2-9; 1-0-2-6; 1-0-2-5. All setae on femora–tibiae I–IV simple. Tarsi I–IV with various setae (see below). Femur I sometimes lacking the dorsal seta normally added in post-protonymphal instars – some individuals with three setae on one femur I and four on the other.

Tarsus I (Figure 5A). Seven pairs of setae (*p*, *tc*, *ft*, *u*, *a*, *pv* and *pl*) and two unpaired setae (*s* and *d*). Proral (*p*) setae conical and extending from tubercle. One tectal (*tc''*) and one fastigial (*ft''*) seta usually semi-bifurcate, with one branch short and barb-like – sometimes short and basal enough for the seta to qualify as simple (see aforementioned criteria in Material and methods section), or rarely long enough to be bifurcate. Other fastigial (*ft'*) seta usually bifurcate, rarely semi-trifurcate or trifurcate. All other setae simple. Subunguinal (*s*) seta centred between pair of anterolateral (*a*) setae. Dorsal (*d*) seta proximal and posterior to base of solenidion ω . Small stubby famulus (ϵ) near *tc''*. Dorsolateral lyrifissure next to posterior margin of tarsus (obscured by overlying integument when viewed under LT-SEM).

Tarsus II (Figure 5B, C). Four pairs of setae (*p*, *tc*, *ft* and *u*) and one unpaired seta (*d*). Setae *p*, *tc* and *u* bifurcate and projecting forward past base of ambulacrum; *ft* simple; *d* trifurcate. Long rod-like famulus near *tc''*. Base of solenidion ω next to posterior margin of tarsus.

Tarsus III (Figure 5D). Two pairs of setae (*p* and *u*) and two unpaired setae (*tc''* and *d*). Setae *p*, *u* and *tc''* bifurcate and projecting forward past base of ambulacrum; *d* bifurcate.

Tarsus IV (Figure 5E). Identical to tarsus III but with *tc''* absent.

Gnathosoma. Gnathosoma including a vessel (Ve) – modified from the lateral lips – into which the chelae (opposing digits) slot (Figure 2A). Chelicerae (Ch) $\approx 12 \mu\text{m}$ long and slanting downwards, anteriorly, into the vessel. Single dorsal seta on each chelicera. Rutella (Ru) consisting of a swollen base with a narrow extending digit. The rutella lie against the anterior surface of the vessel and overlap at the midline, appearing as an inverted v – more discernible, under a light microscope, when the chelae are not within the vessel. Palps (Pa) $\approx 10 \mu\text{m}$ long and three-segmented, tentatively designated femur, genu and tarsus; solenidia absent; setal formula femur–tarsus for each palp: 0-1-6; distal tarsal seta with cup-shaped tip; all other setae simple. Palp tarsus also with three very small cuticular protuberances (only visible under LT-SEM and omitted from Figure 2A, B). Subcapitulum with four pairs of setae: *m*, *a*, *or1–2* (Figure 2B). Adoral setae

(*or1*–2) typically unevenly tapering (*or2* sometimes evenly tapering); anterior pair (*or1*) vestigial and broad.

Ontogeny

Idiosoma and appendages. From larva to adult, the idiosoma increases greatly in length compared with the appendages (Table 1; Figures 7, 8A, B). Notably, there is no apparent increase in the length of the palp.

Chaetotaxy. Aside from the legs and coxal fields (see below), setal additions only occur in the genital region and segments AD to PA (Table 2). Adults readily distinguished from tritonymphs by the presence of setae *ag2* (very posterior and close to *f3*) and long *pal*–3 (Table 2).

New segmental additions of setae to the posterior tip of the opisthosoma always short (3–7), increasing two- to four-fold in length at the next instar (Table 2). Several other opisthosomal setae noticeably increase in length from the larval to adult instar (Figures 1A, B, 7): seta *f3* increases approximately four-fold (from 3–4) to be sub-equal to *f2* and *f1* (11–16); setae *d2* and *e2* increase by about 50% (from 7–10 to 10–15). All other opisthosomal and prodorsal setae increase only slightly (< 30%) or not at all.

Leg setation complete (including coxal fields) by the deutonymphal instar (Table 3). Setation of tarsus I is completed by the addition of an unpaired dorsal (*d*) seta in the protonymph. Chaetotaxy unchanging for tarsi II–IV. Numbers of solenidia, famuli and lyrifissures also unchanging for all leg segments. Gnathosoma without additions of setae or any other structures.

Material examined

Holotype female (OSAL 015134), USA, Ohio, Franklin Co., Kinnear Road, 39.9990 N, 83.0468 W, silty clay loam from suburban prairie (including shrubs, grasses and small trees); collector: Samuel Bolton, May 2011, 40 cm deep (SB11-05-I). Same data: 9 F (OSAL 0103239, 0105137, 0105138, 0105147, 0105148, 0105149, 0105153, 0105155, 0105156), 1 TN/F? (OSAL 0105135), 5 TN (OSAL 0105143, 0105146, 0105151, 0105152, 0105157), 1 DN (OSAL 0105145), 1 PN

Table 1. *Osperalycus tenerphagus* sp. nov. Mean length of appendages and idiosoma across instars (μm).

	La	PN	DN	TN	F	Overall increase (%)
Palp	10	9	10	10	10	0
Leg I	43	43	48	54	57	33
Leg II	30	30	35	38	39	30
Leg III	29	30	32	34	34	17
Leg IV	–	28	30	32	35	25
Idiosoma	334	363	458	526	611	83

Note: Measurements taken from slide-mounted specimens rather than scanning electron microscopy, for which the integument is generally not fully extended.

Table 2. *Osperalycus tenerphagus* sp. nov. Distinguishing attributes of instars.

	La	PN	DN	TN	F
Number of genital setae	0	1	3	3	3
Number of aggenital setae	0	0	0	1	2
Number of genital papillae	0	1	2	2	2
Length of PS setae (µm)	3–7	≥10	≥10	≥10	≥10
Length of AD setae (µm)	–	3–7	≥10	≥10	≥10
Length of AN setae (µm)	–	–	3–7	≥10	≥10
Length of PA setae (µm)	–	–	–	3–7	≥10

Table 3. *Osperalycus tenerphagus* sp. nov. Setal addition pattern for legs (including coxal fields) across instars.

	La	PN	DN	TN	F
Tarsus I	10 (1) (2) (2)	11 (1) (2) (2)	11 (1) (2) (2)	11 (1) (2) (2)	11 (1) (2) (2)
Tibia I	6	6	7	7	7
Genu I	4	6	6	6	6
Femur I	2	3	4	4	4
Trochanter I	-	-	-	-	-
Coxal field I	1	1 (1)	1 (1)	1 (1)	1 (1)
Tarsus II	2 (6) ((1))	2 (6) ((1))	2 (6) ((1))	2 (6) ((1))	2 (6) ((1))
Tibia II	2	2	2	2	2
Genu II	2	2	2	2	2
Femur II	2	2	2	2	2
Trochanter II	-	-	-	-	-
Coxal field II	(1)	(1)	(1)	(1)	(1)
Tarsus III	(6)	(6)	(6)	(6)	(6)
Tibia III	2	2	2	2	2
Genu III	-	-	-	-	-
Femur III	1	1	1	1	1
Trochanter III	-	-	-	-	-
Coxal field III	1 (1)	2 (1)	2 (1)	2 (1)	2 (1)
Tarsus IV	n/a	(5)	(5)	(5)	(5)
Tibia IV	n/a	2	2	2	2
Genu IV	n/a	-	-	-	-
Femur IV	n/a	-	1	1	1
Trochanter IV	n/a	-	-	-	-
Coxal field IV	n/a	-	1	1	1

Notes (Key): Unbracketed: simple seta; bracketed: bifurcate; bracketed and underscored: semi-bifurcate; double bracketed: trifurcate; angle bracketed: conical; hyphen: absence of setae; n/a: leg absent; highlighted grey: seta added in this instar.

(OSAL 0105150), 3 L (OSAL 0103237, 0105141, 0105142), 1 pharate (TN–F, OSAL 0105154). Same locality and collector, July 2010, 60 cm deep (SB10-0724-I): 4 F (OSAL 0103240, 0105136, 0105139, 0105140), 1 DN, (OSAL 0105144), 2 PN (OSAL 0103241, 0103242), 1 L (OSAL 0103245), 2 pharates (L–PN, OSAL 0103243,

0103244). August 2011 (LT-SEM material), 60 cm deep: 9 F, 1 TN/F?, 6 TN, 1 DN/TN?, 1 DN, 1 PN (used for SEM, not recovered). USA, Ohio, Ashtabula Co., West Main Road, 41.9246 N, 80.6138 W, sandy loam in small chestnut plantation, collector: Samuel Bolton, July 2011, 40 cm deep (SB11-07-IV): 1 F (OSAL 0105133), 1 TN (OSAL 0103238), 1 DN (OSAL 0105132).

Type material and depositor

Holotype female (OSAL 0105134) at Ohio State University Acarology Collection (OSAL), Columbus, Ohio, USA. Paratypes: US National Collection (USNM), housed at the Beltsville Agricultural Research Center, USDA, Beltsville, MD, USA: 2 F (OSAL 0105137, 0105147); Natural History Museum (BMNH), London, UK: 2 F (OSAL 0105140, 0105148); all other paratypes at OSAL.

Etymology

Binomial. *Osperalycus tenerphagus*. *Ospera-* is a combination of the Latin terms for “mouth” (*os*) and “purse/bag” (*pera*) in reference to the soft and unsclerotized vessel of the gnathosoma; *-lycus* is a Latinized Greek ending given to three of the four other genera of Nematalycidae. The species name, *tenerphagus*, combines the Latin term for “tender” with the Greek-derived Latin suffix for “feeding”, referring to the delicate mechanism hypothesized to explain how this mite may carefully pick up small micro-organisms and place them into its feeding vessel without rupturing them (Bolton et al. in preparation).

Systematic relationships

Whereas rutella were thought to be absent from the Nematalycidae (Walter 2009), they are clearly present in *Osperalycus tenerphagus*. Rutella also appear to be present in *Gordialycus* sp. nov. and cf. *Psammolycus* sp. nov. (pers. obs.). The presence of rutella combined with the absence of a tracheal system more firmly places the Nematalycidae within the Endeostigmata. Other newly observed characters also suggest a closer relationship with the Endeostigmata than the Tydeoidea, e.g. presence of setae for all nine opisthosomal segments and more than two pairs of setae on the C and F segments.

Key to the genera of the Nematalycidae

1. Opisthosomal setae near the anal opening at least three times as long as those along the rest of the opisthosoma, which is often almost completely nude; chelicerae long (>15 µm). **2**
 Setae along the length of the opisthosoma of similar size; chelicerae can be short (<15 µm) or long (>20 µm). **3**
2. Legs III and IV noticeably smaller than leg II; body usually extremely elongated (adult length >20× width). ***Gordialycus***
 Legs III and IV not noticeably smaller than leg II; body not extremely elongated (adult length <20× width). ***Nematalycus***

3. Palps with two segments; pretarsi II to IV without claws; tritonymphs and adults with three pairs of simple genital papillae; chelicerae long (>20 μm) but with very short chelae (opposing digits); opisthosomal setae always trifurcate. *Cunliffea*
 Palps with three or four segments; lateral claws present on pretarsi II to IV; tritonymphs and adults with two pairs of bilobed genital papillae; if chelicerae long (>20 μm), chelae distinctly elongated; opisthosomal setae trifurcate, bifurcate or simple. **4**
4. Palps with four segments; opisthosomal setae distinctly bifurcate or trifurcate; rutella absent or never overlapping at the midline when present; if chelicerae long (>20 μm), chelae distinctly elongated. *Psammolycus*
 Palps with three segments; opisthosomal setae long and simple (with very small basal barbs that are not visible under a light microscope); rutella overlap at the midline; chelicerae short (<15 μm). *Osperalycus*

Acknowledgements

This research was partly funded by the Smithsonian Institution (predoctoral fellowship) for SB. Chris Pooley presented and arranged the LT-SEM image plates. Thanks to the Field Museum, Chicago, for the loan of specimens for comparison. Thanks also to Cal Welbourn for useful suggestions, and to Julie Stehli for permission to collect from her land in Ashtabula County, Ohio, USA. Mention of trade names or commercial products in this publication does not imply recommendation or endorsement by the USDA or The Ohio State University. Figures 3, 4, 5, 6 and 8 in this publication are sourced from: US Department of Agriculture, Agricultural Research Service, Electron and Confocal Microscopy Unit, Beltsville, Maryland, USA. These images are in the public domain.

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