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New *Eosentomon* species from Luxembourg (*Protura*: *Eosentomidae*)

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ABSTRACT. *Eosentomon luxembourgense* sp. n., *E. umbrosum* sp. n. (both similar to *E. stumppi* RUSEK, 1988), *E. paucrum* sp. n. (similar to *E. delicatum* GISIN, 1945), *E. pastorale* sp. n. (similar to *E. pratense* RUSEK, 1973), and *E. weinerae* sp. n. (similar to *E. mirabile* SZEPTYCKI, 1984) are described from Luxembourg.

Key words: entomology, taxonomy, *Protura*, new species, *Eosentomon*, Luxembourg

INTRODUCTION

The material described in the present paper is a part of the large material of *Protura* from Luxembourg collected by Doz. Dr Wanda M. WEINER of the Institute of Systematics and Evolution of Animals of the Polish Academy of Sciences, Cracow, Poland and by Dr Norbert STOMP (and his collaborators) of the National Museum of the Natural History of Luxembourg. The field research in Luxembourg were done within the theme "Étude des Collembolés et Protoures des Luxembourg" of the "Programme d'échanges dans le domaines des sciences, de la culture, de l'enseignement et de la jeunesse entre le gouvernement de la République de Pologne et le gouvernement du Grand-Duché de Luxembourg".

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The type materials are preserved (as slides in the liquid of Marc ANDRÉ II) in the collection of the Institute of Systematics and Evolution of Animals of the Polish Academy of Sciences, Cracow, Poland; some paratypes are in the collection of the National Museum of the Natural History of Luxembourg.

***Eosentomon luxembourgense* n. sp.**

(figs 1-25)

DIAGNOSIS

Urotergites II and III without seta *P4a*; on urotergites IV-VII seta *P4a* of normal shape. Urosternite VIII with no anterior setae and 7 posterior setae. Foretarsus with no sensillum *b'1*; sensilla *b'2* and *t2* equal, filiform. Empodial appendage of legs II and III short. Labral seta present. Meso- and metanotum with seta *P1a* long, posteriorly to line *P1 - P2*; *P2a* relatively long; *P3a* on line *P3 - P4*. Seta *P2a* on urotergites II - VII situated in half distance *P2 - P3*, on VII long. Seta *P1a'* on urotergite VIII nearly at level of *P2*. Urosternite IX and X with 4 setae. Head with posterior additional seta present, and anterior absent. Urotergite VI with no seta *A3*, VII with no *A1 - A3*. Foretarsal sensillum *fl* filiform. Sensillum *c'* proximally to level of $\alpha 6$, close to $\delta 4'$, thick and very long - reaching base of $\delta 6$. Sensillum *t1* in half distance $\alpha 3 - \alpha 3'$, *a'* nearly at level of $\alpha 3$. Seta *D2* on III leg setiform. Seta *P1a* on urotergite VII at level of *P2*, short, not reaching hind margin of tergite; *P1a'* on urotergite VIII thin. Dorsal setae on urotergite XI about half length of dorsal setae of urotergite X. Lateral sclerotisation of urosternite VIII not connected with antecosta. Female squama genitalis short, with distinct "head" and "beak" perpendicular to body axis, penis with short basiperiphallar setae. PR 9 - 12, length of foretarsus of imago 68-73 μm .

DESCRIPTION

Head setae short, slightly differentiated, subposterior seta 1.0 - 1.5 x length of posterior seta. Posterior additional seta, seta *m4* and anterior sensillum present, anterior additional seta absent. Pseudoculus ovate till round, of middle length, with distinct, circular inner structure, PR 9 - 12 (in larvae II - 14). Clypeal apodeme distinct. Rostral seta simple, thicker than subrostral. Labrum with truncate apices and deep, narrow notch. Labral seta present. Mandibles with two small, nearly invisible apical teeth. Digits of galea well-developed, median and inner equal, shorter and thicker than outer. Sensilla of maxillary palp short, lateral sensillum much shorter than dorsal.

Setae on nota short, slightly diversified. Seta *P1a* posteriorly to line *P1-P2*, *P2* 1.2-1.6 x length of *P1*. Length ratio of *P1 : P1a : P2* on mesonotum as 0.7-1.0 : 1 : 1.0-1.5 (in larvae I 1.0-1.3 : 1 : 1.3-1.7). *P2a* subequal in length to *P3a* but relatively long, *P3a* setiform; *P4a* contiguous with *P5*. Tracheal camerae short, slightly dilated basally.

Foretarsus with no sensillum *b'1*. Sensilla *a* and *c* short, *a* about 3/4 length of *c*, *c* not reaching base of $\gamma 3$; *b* subequal to *a'*; *d* very long, exceeding base of *t3*; *e* and *g* equal, long, with spatulate dilation about half sensillum length; *fl* filiform, about half length of *e*; *t1* at half distance $\alpha 3 - \alpha 3'$; *a'* short, not reaching level of $\alpha 4$, situated slightly distally to level of $\alpha 3$; *t2* and *b'2* equal, filiform; *c'* proximally to level of $\alpha 6$, close to $\delta 4'$, thick and very long, exceeding base of $\delta 6$. Setae $\delta 4'$ and $\delta 4$ nearly at same level. BS 0.8-1.0 (in larvae I 0.7-0.8), TR 5.0-5.8, EU 0.8-0.9.

Empodial appendage of II and III leg short; basal seta (seta *D2*) of III leg of normal shape.

Chaetotaxy formula of abdomen:

I	II-III	IV-V	VI	VII	VIII	IX-X	XI	XII
4	10	10	8	4	6			
—	—	—	—	—	—	8	8	9
12	14	16	16	16	9			
4	6	6	6	6	0			
---	---	---	---	---	---	4	10	12
4	4	10	10	10	7			

Chaetotaxy formula of urotergite I: 3, 1, 2. Seta *P4a* on urotergites II and III, seta *A3* on urotergite VI and setae *A1-A3* on VII absent. Seta *P1a* on urotergite I-VI long, longer than *P1*; on urotergite VII situated at level of *P2*, short, not reaching hind margin of tergite; *P2a* on urotergite II-VI as *P1a*, situated in half distance *P2-P3*; on urotergite VII slightly shorter. *P4a* on urotergites IV-VII as normal seta. *P1a'* on urotergite VIII short and thin, with small basal dilation, situated at level of *P2*. Dorsal setae on urotergite XI about 3/4 length of setae on urotergite X, thin. Seta 2 on urosternite X about 3/4 length of seta 1.

Antecostae thick, mostly with distinct, flat central lobe. Laterostigma II-IV small, with no inner structure. Lateral sclerotisation of urosternite VIII with hind margin not connected with antecosta (rarely, and asymmetrically it can be connected with antecosta). Urotergite XII with two central pores.

Female squama genitalis short, with distinct "head" and long "beak" perpendicular to body axis. Penis with short basiperiphallar setae.

Chaetal variability: Imagines (39 specimens): symmetrical (2 specimens) and asymmetrical (1 sp-n) presence of *A3* on urotergite VI, asymmetrical lack of *A2* on urotergite VI (1 sp-n), asymmetrical lack of *A4* on urotergite VII (2 sp-ns).

In younger instars not observed.

TYPE AND OTHER MATERIAL

Holotype: female (collection number 5450). Town of Luxembourg, Am Grund, 22. 04. 1993. Near a stream, litter and debris under shrubs and grasses. Leg. W. M. WEINER.

Measurements (in μm).

	imago	mat. jun	larva II	larva I
head	95-112	94-102	90-101	83-95
pseudoculus	9-12	8-10	7-8	6-9
subpost. seta	7-9	ca 8	6-8	6-7
posterior seta	6-7	6-7	5-6	5-6
mesonotal <i>P1</i>	8-10	8-9	8-9	7-8
mesonotal <i>P1a</i>	8-12	8-10	7-9	5-8
mesonotal <i>P2</i>	12-14	11-12	10-12	9-10
foretarsus	68-73	66-68	60-63	55-58
claw	12-14	ca 12	12-13	10-12
emp. appendage	10-13	?	ca 9	9-10
max. body length	900	?	720	620
No of specimens	39	3	4	5

Paratypes: together with holotype, 35 females, 3 males (collection numbers: 5403-06, 5409-15, 5420, 5422-25, 5427-42, 5444-49).

Other material: together with holotype: 3 maturi juniores, 3 larvae II, 6 larvae I.

NAME DERIVATION

Named after the type locality.

AFFINITIES: see *E. umbrosum* sp. n.

***Eosentomon umbrosum* n. sp.**

(figs 26-48)

DIAGNOSIS

Similar to *E. luxembourgense* sp. n. Foretarsal sensillum *c'* proximally to level of $\alpha 6$, in half distance $\alpha 6 - \delta 4'$, thick and long - reaching base of $\delta 6$. Sensillum *t1* situated much nearer to $\alpha 3$ than to $\alpha 3'$, *a'* nearly at level of $\alpha 3$. Seta *D2* on IIIId leg spine-like. Seta *P1a* on urotergite VII posteriorly to level of *P2*, short, exceeding hind margin of tergite; *P1a'* on urotergite VIII dilated basally. Dorsal setae on urotergite XI about half length of dorsal setae of urotergite X. Lateral sclerotisation of urosternite VIII connected with antecosta. Female squama genitalis short, with distinct "head" and "beak" perpendicular to body axis, penis with short basiperiphallar setae. PR 6 - 8, length of foretarsus of imago 74-82 μ m.

DESCRIPTION

Head setae short, slightly differentiated, subposterior seta 1.2 - 1.6 x length of posterior seta. Posterior additional seta, seta *m4* and anterior sensillum present; anterior additional seta absent. Pseudoculus large, ovate, with indistinct inner structure, PR 6.3 - 7.5. Clypeal apodeme distinct. Rostral seta simple, subequal to subrostral. Labrum with truncate apices and deep, narrow notch, labral seta present. Mandibles with two indistinct apical teeth. Digits of galea well-developed, median and inner of equal length, distinctly shorter than outer. Sensilla of maxillary palp short, lateral sensillum shorter than dorsal.

Setae on nota short, slightly diversified. Seta *P1a* posteriorly to line *P1-P2*, *P2* 1.2 - 1.5 x length of *P1*. Length ratio of *P1* : *P1a* : *P2* on mesonotum as 0.8 - 1.0 : 1 : 1.0 - 1.3. *P2a* subequal to *P3a*; *P3a* of normal shape, on line *P3-P4*. Base of *P4a* remote from *P5*. Tracheal camerae long, slender, dilated basally.

Foretarsus with no sensillum *b'1*. Sensillum *a* longer than half of *c*; *c* reaching base of $\gamma 3$; *b* shorter than *a'*; *d* very long, reaching base of *f1*; *e* and *g* equal, with spatulate dilation longer than half length of sensillum; *f1* filiform, about 3/4 length of *e*; *t1* nearer to $\alpha 3$ than to $\alpha 3'$; *t3* short, not exceeding base of $\alpha 7$; *a'* long, exceeding base of *t2*, situated at level of $\alpha 3$, longer than *t2*; *t2* and *b'2* subequal, filiform; *c'* proximally to level of $\alpha 6$, in half distance $\alpha 6 - \delta 4'$, long and thick, reaching base of $\delta 6$. Seta $\delta 4'$ and $\delta 4$ nearly at same level. BS about 0.8, TR 5 - 6, EU about 0.9.

Empodial appendage of II and III leg short, basal seta of III leg spine-like.

Chaetotaxy formula of urotergite I: 3, 1, 2. Seta *P4a* on urotergite II and III, *A3* on VI, and *A1* - *A3* on VII absent. Seta *P1a* urotergite I-VI long, longer than *P1*, on urotergite VII short, situated posteriorly to level of *P2*, slightly exceeding hind margin of tergite; *P2a* on urotergite II-VI longer than *P2*, situated mostly in half distance *P2-P3*; on urotergite VII as on proceeding tergites; *P4a* on urotergite IV-VII setiform. *P1a'* on urotergite VIII with distinct basal dilation, situated at level of *P2*. Dorsal setae on urotergite XI about half length of setae on urotergite

Chaetotaxy formula of abdomen:

I	II-III	IV-V	VI	VII	VIII	IX-X	XI	XII
4	10	10	8	4	6			
—	—	—	—	—	—	8	8	9
12	14	16	16	16	9			
4	6	6	6	6	0			
---	---	---	---	---	---	4	10	12
4	4	10	10	10	7			

X, thick. Seta 2 on urosternite X longer than half length of seta 1. Antecostae thin, with nearly invisible central lobe. Laterostigma II-IV large, with no inner structure. Lateral sclerotisation of urosternite VIII with hind margin connected with antecosta. Dorsal lobe of telson with two central pores.

Female squama genitalis short, with flattened “head” and distinct “beak” perpendicular to body axis. Penis with very short basiperiphallar setae.

Measurements (in μm) - imago: Head 107 - 120, pseudoculus 15 - 19, subposterior head seta 8 - 11, posterior head seta 6 - 9, mesonotal seta *P1* 9 - 11, *P1a* 10 - 13, *P2* 13 - 16, foretarsus 74 - 82, claw 14 - 15, empodial appendage 13 - 14, maximum body length of expanded specimen about 1180.

Chaetal variability not observed.

TYPE MATERIAL

Holotype: female (collection number 6079). Garnich, 18. 06. 1999. Litter from the bank of small creek in field brushwood, near a pasture. leg. W.M. WEINER.

Paratypes. Together with holotype: 5 females, 1 male (collection numbers: 6077, 6078, 6080 - 83); Moselle Valley, between Grevenmacher and Merttert, Deysermühle, 25. 06. 1996. Small gorge in deciduous forest, talus on S exposed slope, soil and mosses. Leg. W.M. WEINER & N. STOMP : 1 female (collection number: 6084).

NAME DERIVATION

Latin “*umbrosum*” means - connected with shadow.

AFFINITIES

E. umbrosum sp. n. belongs together with *E. stumpfi* RUSEK 1988 and *E. luxembourgense* sp. n. to the peculiar group of species characterized in the lack of the anterior additional seta and the presence of posterior additional seta on

head, the long and thick foretarsal sensillum c' situated proximally to level of $\alpha 6$, and urotergite V - VII with 10, 8, 4 anterior setae. The mentioned species can be distinguished according the following key:

1. Foretarsal sensillum c' situated in half distance $\alpha 6 - \delta 4'$, seta $D2$ on leg III spine-like. Pseudoculus large (PR 6 - 8), seta $P2a$ on nota subequal in length to $P3a$, seta $P1a$ on urotergite VII situated posteriorly to level of $P2$, seta $P1a'$ on urotergite VIII broad, with distinct basal dilation, hind margin of lateral sclerotisation on urosternite VIII connected with antecosta, length of foretarsus 74 - 82 μm .
..... *E. umbrosum* n. sp.
- 1*. Foretarsal sensillum c' situated evidently closer to $\delta 4'$ than to $\alpha 6$, seta $D2$ on leg III seta-like 2
2. Foretarsal sensillum c' short, reaching base of $\alpha 7$. Pseudoculus large (PR about 8), seta $P2a$ on nota distinctly shorter than $P3a$, seta $P1a$ on urotergite VII situated posteriorly to level of $P2$, seta $P1a'$ on urotergite VIII broad, with distinct basal dilation, hind margin of lateral sclerotisation on urosternite VIII connected with antecosta, length of foretarsus about 65 μm .
..... *E. stumpfi* RUSEK, 1988
- 2*. Foretarsal sensillum c' long, exceeding base of $\delta 6$. Pseudoculus smaller (PR 9 - 12), seta $P2a$ on nota subequal in length to $P3a$, seta $P1a$ on urotergite VII situated at level of $P2$, seta $P1a'$ on urotergite VIII narrow, with indistinct basal dilation, seta $D2$ on leg III seta-like, hind margin of lateral sclerotisation on urosternite VIII mostly not connected with antecosta, length of foretarsus 68 - 73 μm .
..... *E. luxembourgense* n. sp.

***Eosentomon paucrum* n. sp.**

(figs 49-70)

DIAGNOSIS

Typical member of “*delicatum*” group sensu SZEPTYCKI (1985). Seta $P3a$ on meso- and metanotum on line $P3 - P4$. Seta $P2a$ on urotergites II - VII situated in half distance $P2 - P3$. Urosternite IX and X with 4 setae. Sensillum c' distally to level of $\alpha 6$, short and thin. Sensillum $t1$ in half distance $\alpha 3 - \alpha 3'$, a' at level of half distance $\alpha 3 - t2$. Seta $D2$ on IIIId leg setiform. Urotergite V mostly with no seta $A3$, VI with no $A3$, VII with no $A1 - A3$. Seta $P1a$ on urotergite VII situated at level of $P2$, short, not reaching hind margin of tergite; $P1a'$ on urotergite VIII with narrow basal dilation. Dorsal setae on urotergite XI about half length of dorsal setae of urotergite X. Lateral sclerotisation of urosternite VIII connected with antecosta. Female squama genitalis short, with distinct, rounded “head” and short “beak” perpendicular to body axis, penis with short basiperiphallar setae. PR 12 - 15, length of foretarsus of imago 80 - 85 μm .

DESCRIPTION

Head setae short, slightly diversified, subposterior seta 1.2 - 1.7 x length of posterior seta. Anterior and posterior additional setae, seta *m4* and anterior sensillum present. Pseudoculus nearly round, with indistinct (sometime invisible), circular inner structure, PR 12 - 15. Clypeal apodeme indistinct. Rostral seta alate, thicker than subrostral. Labrum with truncate apices and deep, narrow notch; labral seta present. Mandibles with two indistinct apical teeth. Digits of galea well-developed, median and inner equal, shorter than outer one. Sensilla of maxillary palp short, slender, lateral sensillum shorter than dorsal.

Setae on nota short, slightly diversified. *P1a* posteriorly to line of *P1-P2*, *P2* 1.3 - 1.7 x length of *P1*. Length ratio of *P1* : *P1a* : *P2* on mesonotum as 0.8 - 0.9 : 1 : 1.2 - 1.5. *P2a* subequal or slightly shorter than *P3a*; *P3a* of normal shape, on line *P3-P4*. Base of *P4a* remote from *P5*. Tracheal camerae short, slender, dilated basally.

Foretarsus with no sensillum *b'1*. Sensillum *a* longer than half of *c*; *c* long, reaching base of $\gamma 3$; *b* shorter than *a'*; *d* thin, long, reaching base of *t3*; *e* and *g* equal¹, with spatulate dilation about half of sensillum length; *fl* filiform, nearly as long as sensillum *e*; *t1* in half distance $\alpha 3 - \alpha 3'$; *t3* short, slightly exceeding base of $\alpha 7$; *a'* short, not reaching base of $\alpha 4$, situated at half level $\alpha 3 - t1$; subequal to *t2*; *t2* and *b'2* equal, filiform; *c'* distally to level of $\alpha 6$, short and thin, shorter than *t3*. Seta $\delta 4'$ nearly at level of $\delta 4$. BS 0.8 - 0.9, TR 4.9 - 5.3, EU 0.8 - 0.9.

Empodial appendage of II and III leg short, basal seta of III leg of normal shape.

Chaetotaxy formula of abdomen:

I	II-III	IV	V-VI	VII	VIII	IX-X	XI	XII
4	10	10	8	4	6	8	8	9
---	---	---	---	---	---			
12	14	16	16	16	9			
4	6	6	6	6	0	4	8	12
---	---	---	---	---	---			
4	4	10	10	10	7			

¹ The narrow spatula of sensillum *e* in holotype is probably an artifact.

Chaetotaxy formula of urotergite I: 3, 1, 2. Seta *P4a* on urotergites II and III, *A3* on urotergites V and VI, and *A1* - *A3* on VII absent. Seta *P1a* on urotergites I-VI long, subequal in length to *P1*; on urotergite VII short, situated at level of *P2*, not reaching hind margin of tergite; *P2a* on urotergite II-VI shorter than *P2*, situated in half distance *P2* - *P3*; on urotergite VII as on proceeding tergites. Seta *P4a* on urotergite IV-VII setiform. *P1a'* on urotergite VIII with narrow basal dilation, situated at level of *P2*. Dorsal setae on urotergite XI about half length of setae on urotergite X, thin. Seta 2 on urosternite X about 3/4 length of seta 1. Antecostae thin, with indistinct (mostly invisible) central lobe. Laterostigma II-IV large, with no inner structure. Lateral sclerotisation of urosternite VIII with hind margin connected with antecosta. Dorsal lobe of telson with two central pores.

Female squama genitalis with small, rounded "head" and short "beak", perpendicular to body axis. Penis with short basiperiphallar setae.

Measurements (in μm) - imago (in brackets - matus junior): Head 110 - 120 (106 - 111), pseudoculus 8 - 10 (7 - 8), subposterior head seta 10 - 12 (about 9), posterior head seta 7 - 8 (about 7), mesonotal seta *P1* 13 - 14 (10 - 12), *P1a* 14 - 17 (11 - 12), *P2* 17 - 23 (about 16), foretarsus 80 - 85 (74 - 76), claw 16 - 17 (about 15), empodial appendage 14 - 16 (about 12), maximum body length of expanded specimen unestablished.

Chaetal variability. Imagines (7 specimens): symmetrical presence of *A3* on urotergite V (1 sp-n).

Maturi juniores (2 specimens): asymmetrical lack of *A2* on urotergite II (1 sp-n); asymmetrical lack of *A3* on urotergite IV (1 sp-n).

TYPE AND OTHER MATERIAL

Holotype: female (collection number 5755). Tintsmillen, 21. 07. 1991. Deciduous forest with the oak undergrowth, with ferns, mosses, *Oxalis* etc., litter. Leg. M. TOMMASI & M. TOMMASI-URSONE.

Paratypes. Together with holotype: 2 females, 3 males (collection numbers 5726 - 28, 5756, 5760). Stolzembourg, the road in the direction of Klangbaach and Akeschterbaach, about 420 m a.s.l. 11. 04. 1991. Copse with beech, oak, cherry-tree, blackberries and ferns, soil and debris. Leg. W.M. WEINER & M. TOMMASI-URSONE: 1 male (collection number 4397).

Other material: Together with holotype: 2 maturi juniores.

NAME DERIVATION

Latin "*paucrum*" means rare.

AFFINITIES

E. paucrum sp. n. is the most similar to *E. delicatum* GISIN, 1945 and *E. palustre* SZEPTYCKI et SŁAWSKA, 2000. All three species are characterized by the short and thin foretarsal sensillum *c'* situated distally to level of $\alpha 6$, and seta *P1a*

on urotergite VII situated at level of $P2$. The new species differs from both of the mentioned species in the shape of female squama genitalis (comp. SZEPTYCKI 1985, fig. 19; SZEPTYCKI & SŁAWSKA 2000, figs 15 and 16) and in the lateral sclerotisation of urosternite VIII with hind margin connected with the antecosta (in both known species it is not connected with antecosta). Of *E. delicatum* the new species differs also in the foretarsal sensillum $t1$ situated in half distance $\alpha3 - \alpha3'$ (in *delicatum* it is situated nearer to $\alpha3'$ than to $\alpha3$), of *E. palustre* in the slender seta $P1a'$ on urotergite VIII (in *palustre* this seta is broad).

***Eosentomon pastorale* n. sp.**

(figs 71-94)

DIAGNOSIS

Typical member of “*delicatum*” group sensu SZEPTYCKI (1985). Seta $P3a$ on meso- and metanotum on line $P3 - P4$. Seta $P2a$ on urotergites II - VII in half distance $P2 - P3$, Urosternite IX and X with 4 setae. Sensillum c' distally to level of $\alpha6$, short and thin. Sensillum $t1$ nearer to $\alpha3'$ than to $\alpha3$, a' at level of half distance $\alpha3 - t1$. Seta $D2$ on IIIId leg spine-like. Urotergite V and VI with no seta $A3$, VII with no $A1 - A3$; seta $A5$ on urotergite II - VII present. Seta $P1a$ on urotergite VII at level of $P2$, short, not reaching hind margin of tergite; $P1a'$ on urotergite VIII with distinct basal dilation. Dorsal setae on urotergite XI shorter than half length of dorsal setae of urotergite X. Lateral sclerotisation of urosternite VIII absent. Female squama genitalis short, with distinct, flattened “head” and long “beak” perpendicular to body axis, penis with short basiperiphallar setae. PR 10 - 13, length of foretarsus of imago 104 - 115 μm .

DESCRIPTION

Head setae long, strongly diversified, subposterior seta 1.5-2.1 x length of posterior seta. Anterior and posterior additional setae, seta $m4$, and anterior sensillum present. Pseudoculus ovate, with distinct, circular inner structure, PR 10-13. Clypeal apodeme distinct. Rostral seta alate, thicker than subrostral. Labrum with truncate apices and deep, narrow notch; labral seta present. Mandibles with two indistinct apical teeth. Digits of galea well-developed, truncate, median and inner equal. Sensilla of maxillary palp short, lateral sensillum shorter than dorsal.

Setae on nota long, strongly diversified, $P1a$ posteriorly to line of $P1-P2$, $P2$ 1.3 - 1.6 x length of $P1$. Length ratio of $P1 : P1a : P2$ on mesonotum as 1.2 - 1.5 : 1 : 1.7 - 2.1. $P2a$ longer than $P3a$; $P3a$ of normal shape, on line $P3 - P4$. Base of $P4a$ contiguous with $P5$. Tracheal camerae short, slender, more or less dilated basally.

Foretarsus with no sensillum $b'1$. Sensillum a about $3/4$ of length of c ; c long, reaching base of $\gamma3$; b subequal to a' ; d short and thin, reaching base of $\alpha5$; e and g equal, with spatulate dilation about half of sensillum length; $f1$ filiform, subequal

or slightly longer than sensillum *e*; *t1* nearer to $\alpha 3'$ than to $\alpha 3$; *t3* very long, distinctly exceeding base of $\alpha 7$; *a'* short, not reaching level of $\alpha 4$, situated at level of half distance $\alpha 3 - t1$, shorter than *t2*; *t2* and *b'2* equal, filiform; *c'* distally to level of $\alpha 6$, short and thin, shorter than *t3*. Seta $\delta 4'$ nearly at level of $\delta 4$. BS 0.9 - 1.0, TR 4.9 - 6.0, EU about 0.9.

Empodial appendage of II and III leg short, basal seta of III leg spine-like.

Chaetotaxy formula of abdomen:

I	II-III	IV	V-VI	VII	VIII	IX-X	XI	XII
4	10	10	8	4	6			
---	---	---	---	---	---	8	8	9
12	14	16	16	16	9			
4	6	6	6	6	0			
---	---	---	---	---	---	4	8	12
4	4	10	10	10	7			

Chaetotaxy formula of urotergite I: 3, 1, 2. Seta *P4a* on urotergites II and III, A3 on V and VI, and A1 - A3 on VII absent. Seta *P1a* urotergite I-VI long, shorter than *P1*; on urotergite VII situated at level of *P2*, very short, not reaching hind margin of tergite; *P2a* on urotergite II-VI as *P1a*, situated more or less in half distance *P2 - P3*; on urotergite VII slightly shorter. *P4a* on urotergite IV-VII setiform. *P1a'* on urotergite VIII with distinct basal dilation, situated at level of *P2*. Dorsal setae on urotergite XI about half length of setae on urotergite X, thick. Seta 2 on urosternite X about half length of seta 1. Antecostae distinct, with distinct central lobe. Laterostigma II-IV small, with no inner structure. Lateral sclerotisation of urosternite VIII absent. Dorsal lobe of telson with two central pores.

Female squama genitalis with flattened "head", and long, slender "beak" perpendicular to body axis. Penis with short basiperiphallar setae.

Chaetal variability: Imagines (28 specimens): asymmetrical (2 sp-ns) and symmetrical (1 sp-n) presence of seta *A2* on urotergite VII.

Maturi juniores (21 sp-ns): asymmetrical lack of seta *A3* on urotergite II and asymmetrical presence of mentioned seta on urotergite IV (1 sp-n); asymmetrical lack of seta *A1* on urotergite IV (1 sp-n).

In larval instars not observed.

Measurements (in μm)

	imago	mat. jun	larva II	larva I
head	133-156	122-139	116-124	110-113
pseudoculus	12-14	10-11	8-10	ca 8
subpost. seta	17-25	15-19	13-16	12-14
posterior seta	10-14	9-12	8-10	ca 9
mesonotal <i>P1</i>	26-36	23-28	17-21	15-16
mesonotal <i>P1a</i>	21-27	18-23	15-20	11-13
mesonotal <i>P2</i>	38-47	32-39	24-32	ca 22
foretarsus	104-115	95-101	82-89	75-77
claw	18-23	17-20	16-18	ca 15
emp. appendage	18-21	16-19	14-16	ca 13
max. body length	unestablished			
No of specimens	28	21	9	3

TYPE AND OTHER MATERIAL

Holotype: female (collection number 6099). Baschleiden-Langescht. 19. 06. 1999. Fresh meadow (former pasture) with *Colchicum*, *Primula*, *Pulmonaria*, *Centaurea montana*, and willow-herb. Soil and plant-debris. leg. W.M. WEINER & N. STOMP.

Paratypes. Together with holotype: 14 females, 13 males (collection numbers 6085 - 98, 6100 - 08, 6110 - 13)

Other material. Together with holotype: 21 maturi juniores, 9 larvae II, 3 larvae I.

NAME DERIVATION

Latin "*pastorale*" means - associated with pastures.

AFFINITIES

In the structure of the foretarsus (relative position of *t1* and *a'*, short sensilla *a'* and *d*, position of sensillum *c'*), position of *P1a* on urotergite VII, shape of *P1a'* on VIII and the general appearance of female squama genitalis *E. pastorale* sp. n. is most similar to *E. pratense* RUSEK, 1973 and *E. kamenickiense* RUSEK, 1974 (comp. RUSEK 1973, 1974; SZEPTYCKI 1985). It differs from both of them in the thin foretarsal sensillum *c'* (in both the species it is very thick), in the presence of seta *A5* on urotergites IV-VII (in both *pratense* and *kamenickiense* this seta is lacking, at last on urotergites VI and VII), and in the shape of "beak" of female squama genitalis (in *pratense* and *kamenickiense* it is more or less oblique to the body axis).

***Eosentomon weinerae* n. sp.**

(figs 95-118)

DIAGNOSIS

Urotergites II and III without seta *P4a*; on urotergites IV-VII seta *P4a* of normal shape. Urosternite VIII with no anterior setae and 7 posterior setae. Foretarsus with no sensillum *b'1*; sensilla *b'2* and *t2* equal, filiform. Empodial appendage of legs II and III short. Labral seta absent. Meso- and metanotum with seta *P1a* long, posteriorly to line *P1* - *P2*; *P2a* relatively long; *P3a* medially to line *P3* - *P4*. Seta *P2a* on urotergites II - VII nearer to *P3* than to *P2*, on VII long. Seta *P1a'* on urotergite VIII anteriorly to level of *P2*. Urosternite IX and X with 6 setae. Head with anterior and posterior additional setae present. Urotergite IV - VI with 10 anterior setae, VII with no *A1* and *A3*. Foretarsal sensillum *f1* filiform. Sensillum *c'* at level of α_6 , short but relatively thick. Sensillum *t1* in half distance α_3 - α_3' , *a'* at level of α_3 , *t3* longer than *c'*. Seta *D2* on IIIId leg setiform. Seta *P1a* on urotergite VII posteriorly to level of *P2*, near hind margin of tergite, relatively long; *P1a'* on urotergite VIII broad, short. Dorsal setae on urotergite XI shorter than half length of dorsal setae of urotergite X. Lateral sclerotisation of urosternite VIII absent. Female squama genitalis very short, with distinct "head" and "beak" perpendicular to body axis, penis with short basiperiphallar setae. PR 9 - 10, length of foretarsus of imago 60-67 μ m.

DESCRIPTION

Head setae short, slightly diversified, subposterior seta 1.0 - 1.4 x length of posterior seta. Anterior and posterior additional setae, seta *m4* and anterior sensillum present. Pseudoculus ovate, with distinct longitudinal inner structure, PR 9 - 10 (in matus junior about 12). Clypeal apodeme elongated, indistinct. Rostral seta simple, thicker than subrostral. Labrum with truncate apices and

deep, narrow notch; labral seta absent. Mandibles with small subapical tooth and two small apical teeth. Digits of galea well-developed, slender; median and inner of equal length, nearly as long as outer. Sensilla of maxillary palp short, slender, lateral sensillum much shorter than dorsal.

Setae on nota short, slightly diversified. *P1a* posteriorly to line *P1-P2*, *P2* 1.1 - 1.3 x length of *P1*. Length ratio of *P1* : *P1a* : *P2* on mesonotum as 1.0 - 1.2 : 1 : 1.2 - 1.6. *P2a* longer and thinner than *P3a*; *P3a* alate, medially to line *P3* - *P4*. Base of *P4a* close to *P5*. Tracheal camerae slender, nearly parallel-sided.

Foretarsus with no sensillum *b'1*. Sensillum *a* shorter than half of *c*; *c* long, reaching base of $\gamma 3$; *b* subequal to *a'*; *d* long and thick, reaching nearly base of z ; *e* and *g* equal, with spatulate dilation longer than half of sensillum length; *f1* filiform, about 2/3 length of sensillum *e*; *t1* in half distance $\alpha 3$ - $\alpha 3'$; *t3* long, exceeding base of $\alpha 7$; *a'* long, reaching level of $\alpha 4$, situated at level of $\alpha 3$, shorter than *t2*; *t2* and *b'2* equal, filiform; *c'* at level of $\alpha 6$, short, thicker than *t3*. Seta $\delta 4'$ distally to level of $\delta 4$. BS 0.9 - 1.0, TR 5.4 - 6.4, EU about 0.8.

Empodial appendage of II and III leg short, basal seta of III leg of normal shape.

Chaetotaxy formula of abdomen:

I	II-III	IV-VI	VII	VIII	IX-X	XI	XII
4	10	10	6	6			
---	----	----	----	---	8	8	9
12	14	16	16	9			
4	6	6	6	0			
---	---	---	---	---	6	8	12
4	4	10	10	7			

Chaetotaxy formula of urotergite I: 3, 1, 2. Seta *P4a* on urotergites II and III, and setae *A1* and *A3* on urotergite VII absent. Seta *P1a* urotergite I-VI long, longer than *P1*, on urotergite VII much shorter (but relatively long), situated posteriorly to level of *P2*, exceeding hind margin of tergite; *P2a* on urotergite II-VI as long as *P1a*, situated nearer to *P3* than to *P2*, on urotergite VII as on proceeding tergites but slightly shorter; Seta *P4a* on urotergites IV-VII setiform. *P1a'* on urotergite VIII strongly dilated basally, small, situated anteriorly to level of *P2*. Dorsal setae on urotergite XI about half length of setae on urotergite X,

thick. Seta 2 on urosternite X longer than $3/4$ of seta *I*. Antecostae thin, with large, indistinct central lobe. Laterostigma II-IV very small, with no inner structure. Lateral sclerotisation of urosternite VIII absent. Pores on dorsal lobe of telson invisible.

Female squama genitalis very short, with distinct "head" and long "beak" perpendicular to body axis. Penis with short basiperiphallar setae.

Measurements (in μm) - imago (in brackets: maturus junior and single specimen of larva II): Head 90 - 94 (82 - 92, 82), pseudoculus 9 - 11 (about 8, ?), subposterior head seta 7 - 10 (6 - 7, 7), posterior head seta 6 - 7 (5 - 6, 6), mesonotal seta *P1* 10 - 11 (8 - 9, 9), *P1a* 9 - 11 (7 - 8, 7), *P2* 10 - 14 (10 - 12, 11), foretarsus 60 - 67 (59 - 61, 55), claw 10 - 11 (10 - 11, ?), empodial appendage 8 - 9 (8 - 9, ?), maximum body length of expanded specimen about 940 (820, 730).

Chaetal variability not observed.

TYPE AND OTHER MATERIAL

Holotype: female (collection number 6159) Baschleiden - Langescht, 10. 06. 1995. Meadow near Bech Stream, southern slope with: *Centaurea jacea*, *C. scabiosa*, *Knautia arvensis*, *Primula pratense*, and some mosses. leg. N. STOMP & W.M. WEINER.

Paratypes: Baschleiden-Langescht. Abandoned pasture with *Colchicum*, *Primula*, *Pulmonaria*, *Centaurea montana*, and mosses. leg. N. STOMP & W.M. WEINER. 2. 05. 1993: 1 male (collection number 6156) and 10. 06. 1995: 1 female (6151).

Valley of River Syr between Manternach and Mertert, 17 06 1996. Mixed forest on the northern slope, at foot of calcareous rock, litter and soil under *Arum maculatum*. leg. N. STOMP & W.M. WEINER. 1 female (collection number 6152).

Other material: Valley of River Syr (as above) 2 maturi juniores.

Between Baschleiden and Surré am Sierberg, 16 05 1993. Meadow, sample taken from the place with *Polygonum bisorta*. leg. N. STOMP & W.M. WEINER. 1 larva II.

Valley of River Eisch, near the lane Sept Châteaux, 22 06 1998. Pine forest with *Lonicera caprifolium* and *Eupatorium cannabinum* on the western slope- moss, litter and soil. leg. N. Stomp & W.M. Weiner. 1 maturus junior.

NAME DERIVATION

Named in the honor of Doz. Dr. Wanda M. WEINER, who collected most of the materials described in the present paper.

AFFINITIES

E. weinerae sp. n. is the most similar to *E. mirabile* SZEPTYCKI, 1984 and *E. rusekianum* STUMPP et SZEPTYCKI, 1989 (SZEPTYCKI 1984; STUMPP & SZEPTYCKI 1989). It shares with them such characters as the lack of labral seta, the position of notal seta *P3a* (medially to the line *P3* - *P4*), the position of seta *P2a* on urotergites II - VII (nearer to *P3* than to *P2*), the shape and position of seta *P1a* on urotergite VII (relatively long, situated close to hind margin of tergite), the shape

and the position of seta *Pl_a'* on urotergite VIII (it very short but broad and situated anteriorly to the level of seta *P₂*), the presence of six setae on urosternites IX and X, and the very short female squama genitalis. Three mentioned species can be distinguished according the following key:

1. Head with no posterior additional seta, pseudoculus very large (PR about 5), foretarsal sensillum *t1* situated closer to $\alpha 3'$ than to $\alpha 3$, foretarsus 70 - 75 μm long
..... *E. rusekianum* STUMPP & SZEPTYCKI, 1989
- 1*. Head with posterior additional seta present, pseudoculus moderate (PR 9 - 10), foretarsal sensillum *t1* situated in half distance $\alpha 3$ - $\alpha 3'$, foretarsus 62 - 66 μm long 2
2. Female squama genitalis with no distinct "head" but with very long, sickle-like "beak", foretarsal sensillum *fl* spatulate
..... *mirabile* SZEPTYCKI, 1984²
- 2*. Female squama genitalis with distinct, rounded "head" and "beak" more or less straight, foretarsal sensillum *fl* filiform
..... *weineriae* n. sp.

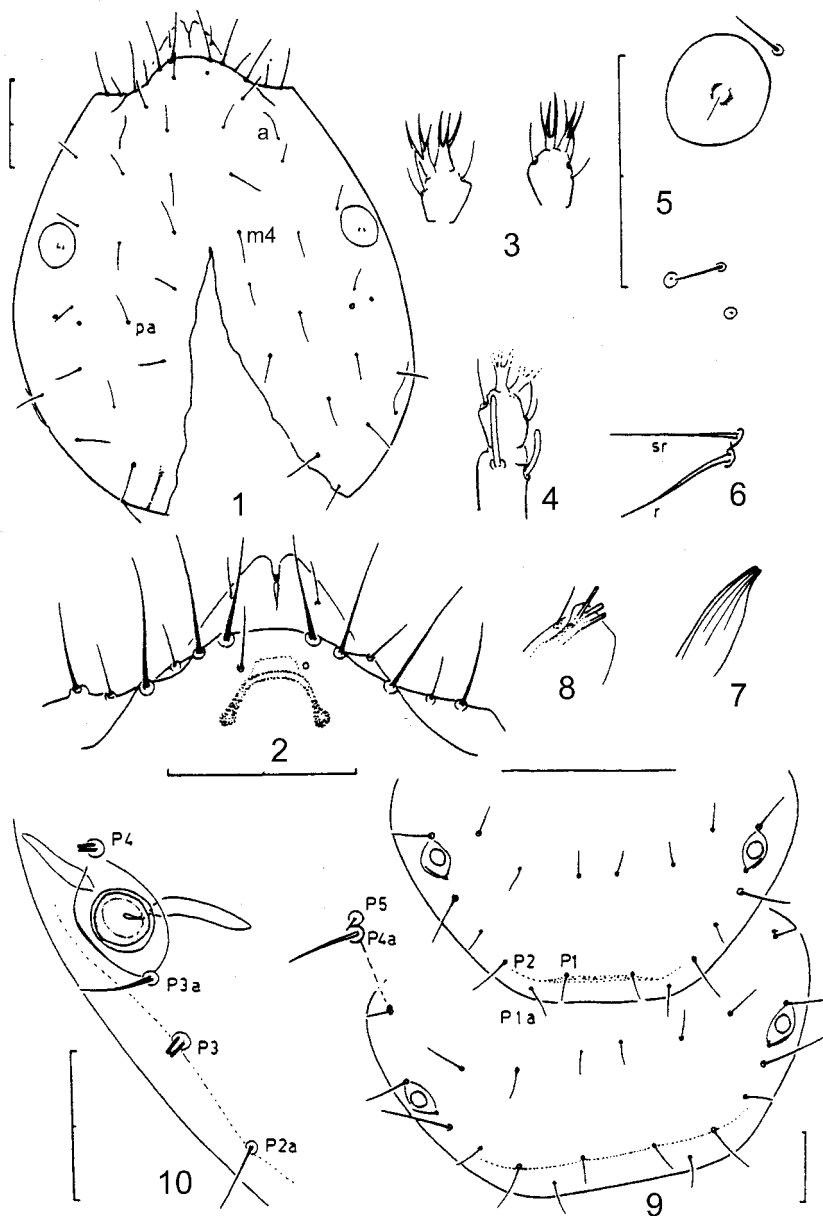
ACKNOWLEDGEMENTS

I am very indebted to Dr Wanda M. WEINER and Dr Norbert STOMP for very rich material of *Protura* from Luxembourg, and to Miss Maria BIENIEK for her assistance during the work on it. This studies was possible thanks the grant no 6PO4C 016 14 of the Polish Committee of Scientific Research.

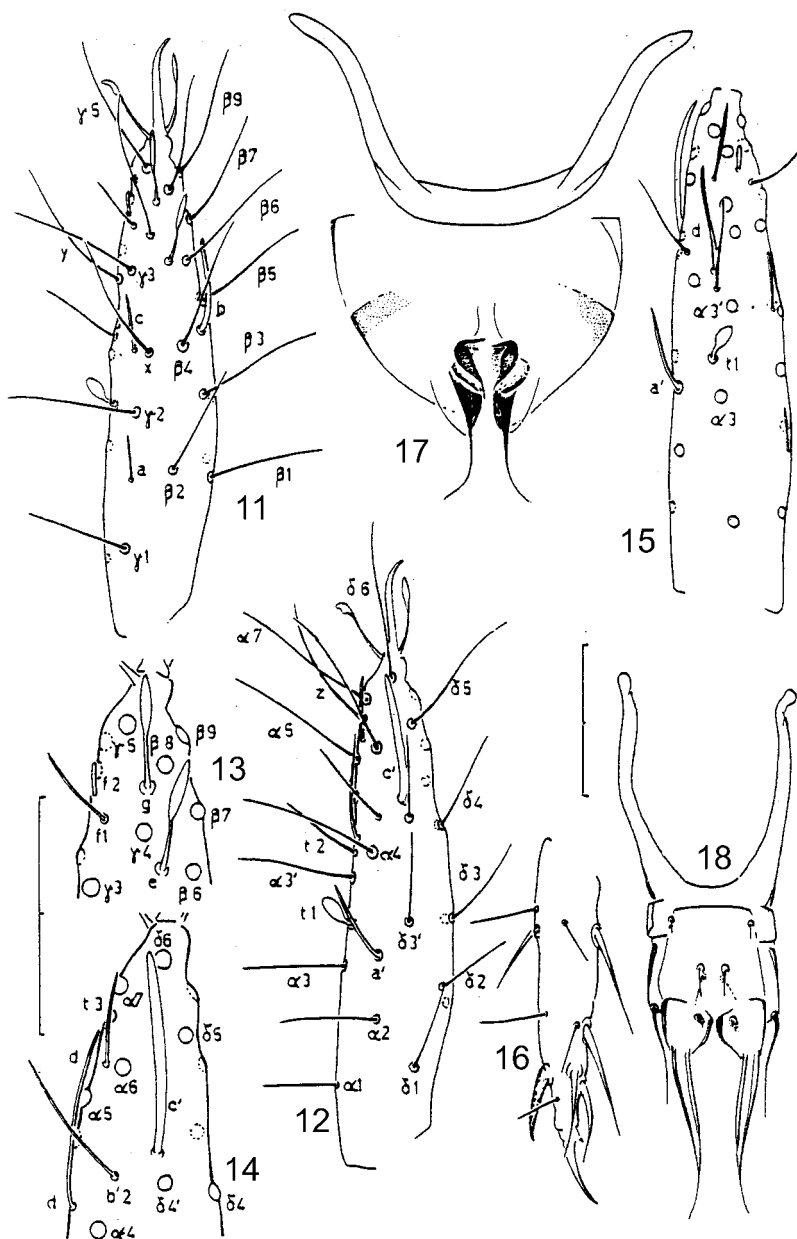
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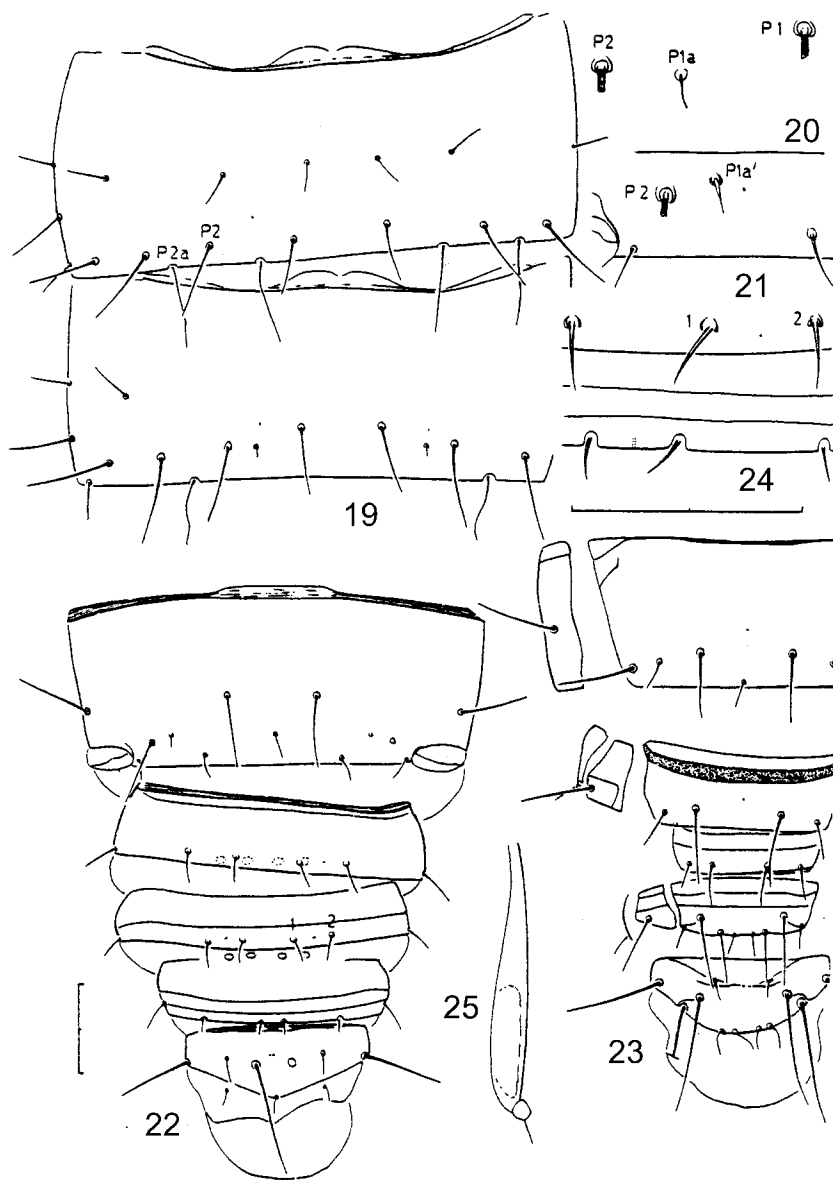
² In the original description of *E. mirabile* I have driven erroneously sensillum *c'* as very thin, nearly seta-like (SZEPTYCKI 1984, fig. 39). The sensillum under question is much thicker, as on fig. 111.



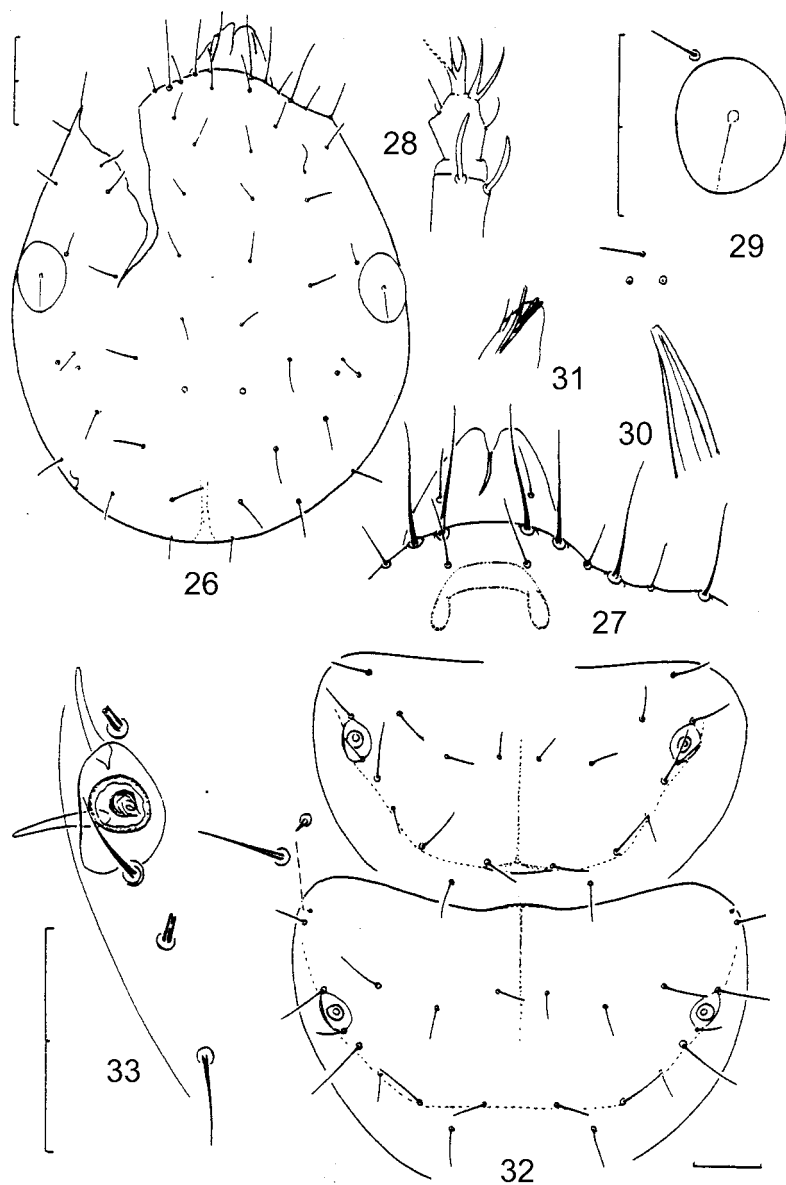
1-10. *Eosentomon luxembourgense* sp. n.: 1 - head (paratype 5447; a - anterior sensillum, pa - posterior additional seta); 2 - anterior part of head, dorsal side (paratype 5447); 3 - distal tufts of palpus maxillaris (paratype 5410 oba rys); 4 - sensilla of palpus maxillaris (paratype 5410); 5 - pseudoculus (paratype 5447); 6 - rostral (r) and subrostral (sr) setae (paratype 5420); 7 - mandible (paratype 5447); 8 - galea (paratype 5447); 9 - meso- and metanotum (paratype 5446); 10 - tracheal camerae (paratype 5447). Scale: 20 μ m (figs 3-8 - magnification as 3)



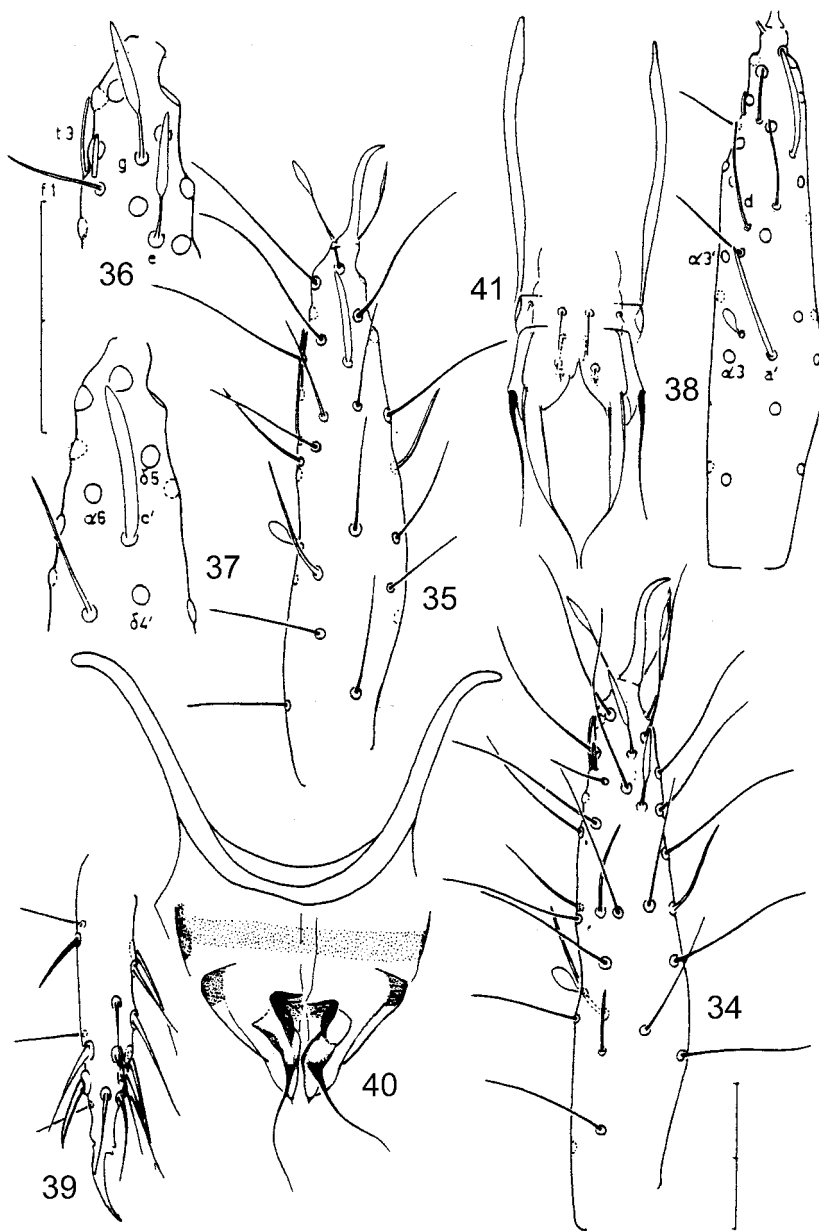
11-18. *Eosentomon luxembourgense* sp. n.: 11 - foretarsus, exterior view (holotype); 12 - foretarsus, interior view (holotype); 13 - distal part of foretarsus, exterior view (holotype); 14 - distal part of foretarsus, interior view (holotype); 15 - foretarsus, dorsal view (paratype 5415); 16 - leg III (paratype 5447); 17 - squama genitalis (holotype); 18 - penis (paratype 5441). Scale: 20 μ m (figs 13, 14, 17 - magnification as 13; others - as 18)



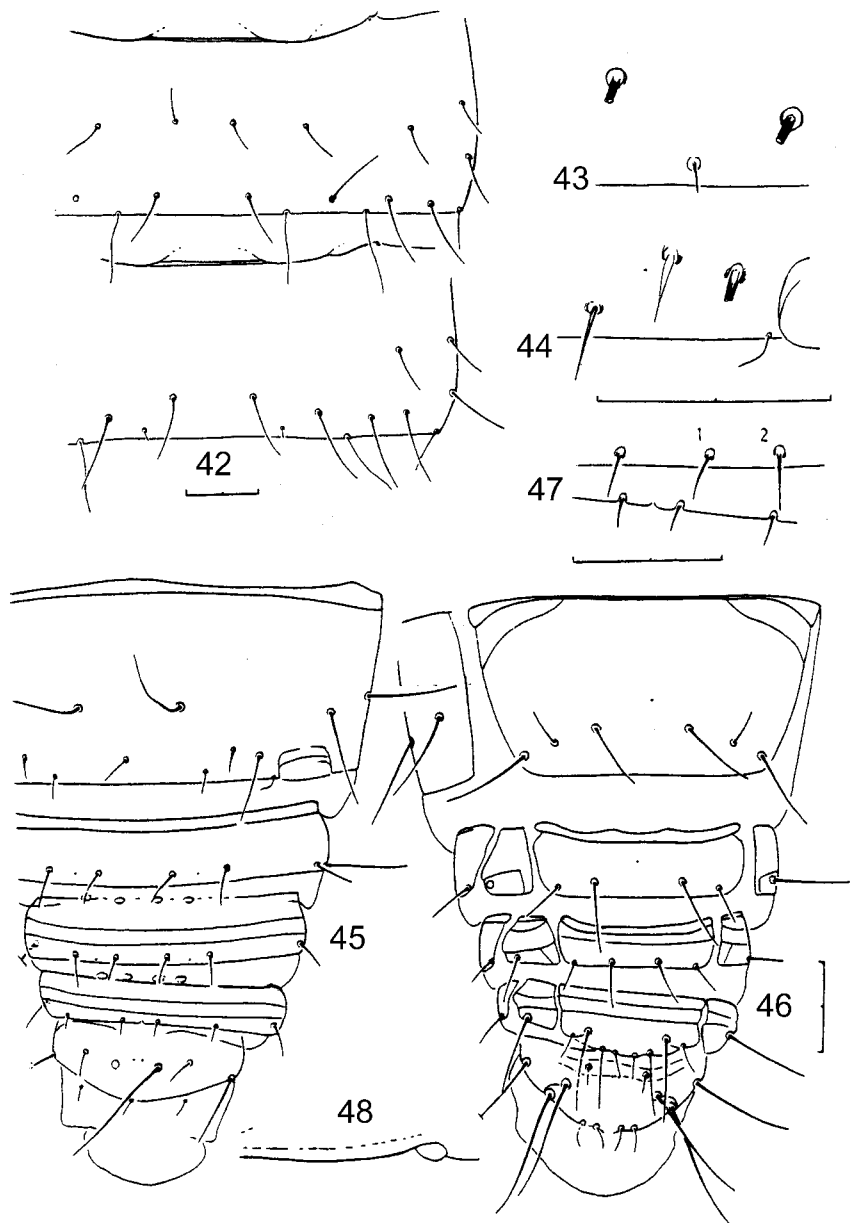
19-25. *Eosentomon luxembourgense* sp. n.: 19 - urotergite VI - VII (paratype 5409); 20 - seta *P1a* on urotergite VII (paratype 5446); 21 - seta *P1a'* on urotergite VIII (paratype 5446); 22 - urotergite VIII - XII (paratype 5446); 23 - urosternite VIII - XII (paratype 5446); 24 - dorsal setae of urotergite X and XI (paratype 5446); 25 - laterostigma II (paratype 5409). Scale: 20 μ m (figs 19, 22, 23 - magnification as 22; others - as 24)



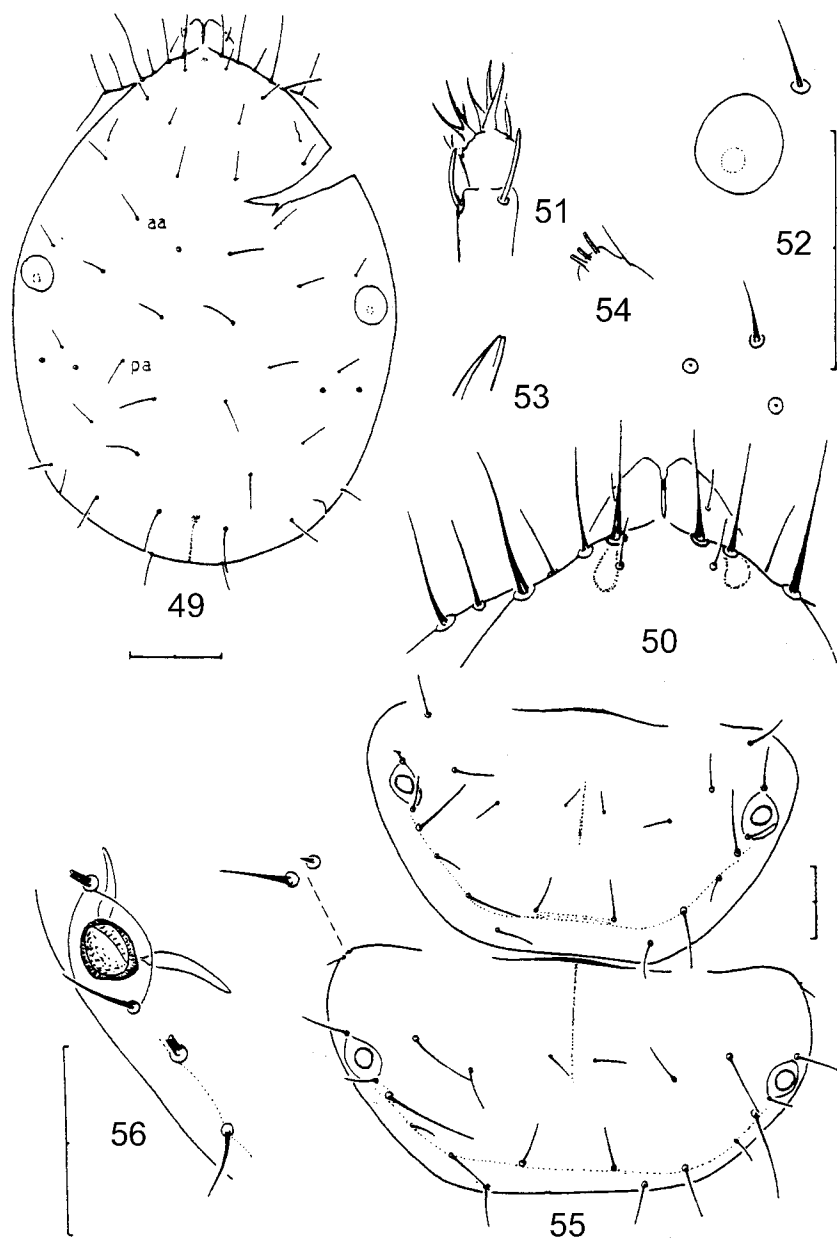
26-33. *Eosentomon umbrosum* sp. n.: 26 - head (paratype 6082); 27 - anterior part of head, dorsal view (paratype 6082); 28 - distal part of palpus maxillaris (paratype 6082); 29 - pseudoculus (paratype 6083); 30 - mandible (paratype 6082); 31 - galea (paratype 6082); 32 - meso- and metanotum (paratype 6082); 33 - tracheal camerae (paratype 6082). Scale: 20 μ m (figs 27-30 - magnification as 29)



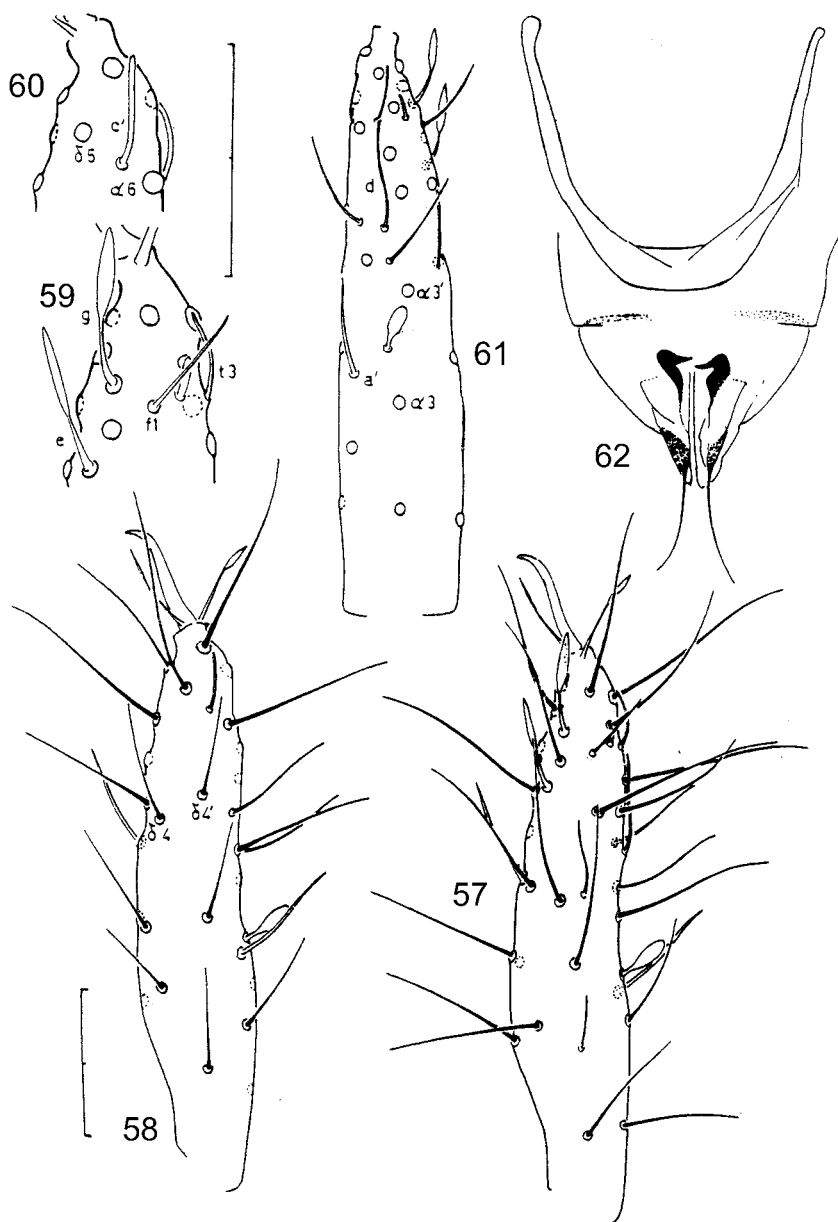
34-41. *Eosentomon umbrosum* sp. n.: 34 - foretarsus, exterior view (holotype); 35 - foretarsus, interior view (holotype); 36 - distal part of foretarsus, dorsal view (holotype); 37 - distal part of foretarsus, ventral view (holotype); 38 - foretarsus, dorsal view (holotype); 39 - leg III (paratype 6083); 40 - squama genitalis (holotype); 41 - penis (paratype 6080). Scale: 20 μ m (figs 36, 37, 40 - magnification as 36; others - as 34)



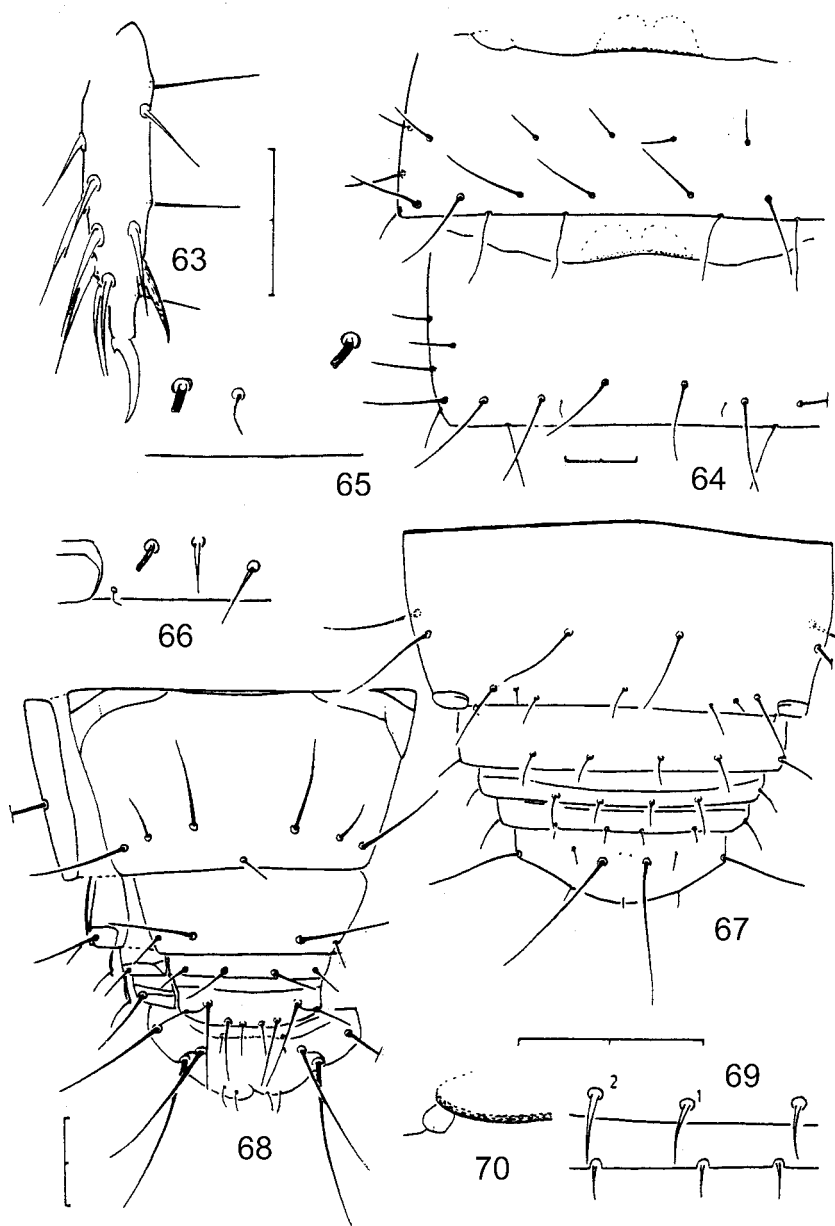
42-48. *Eosentomon umbrosum* sp. n.: 42 - urotergite VI and VII (paratype 6082); 43 - seta P1a on urotergite VII (paratype 6082); 44 - seta P1a' on urotergite VIII (holotype); 45 - urotergite VIII-XII (holotype); 46 - urosternite VIII-XII (holotype); 47 - dorsal setae of urotergite X and XI (holotype); 48 - laterostigma II (paratype 6082). Scale: 20 μ m (figs 43, 44, 47, 48 - magnification as 47; 45, 46 - as 46)



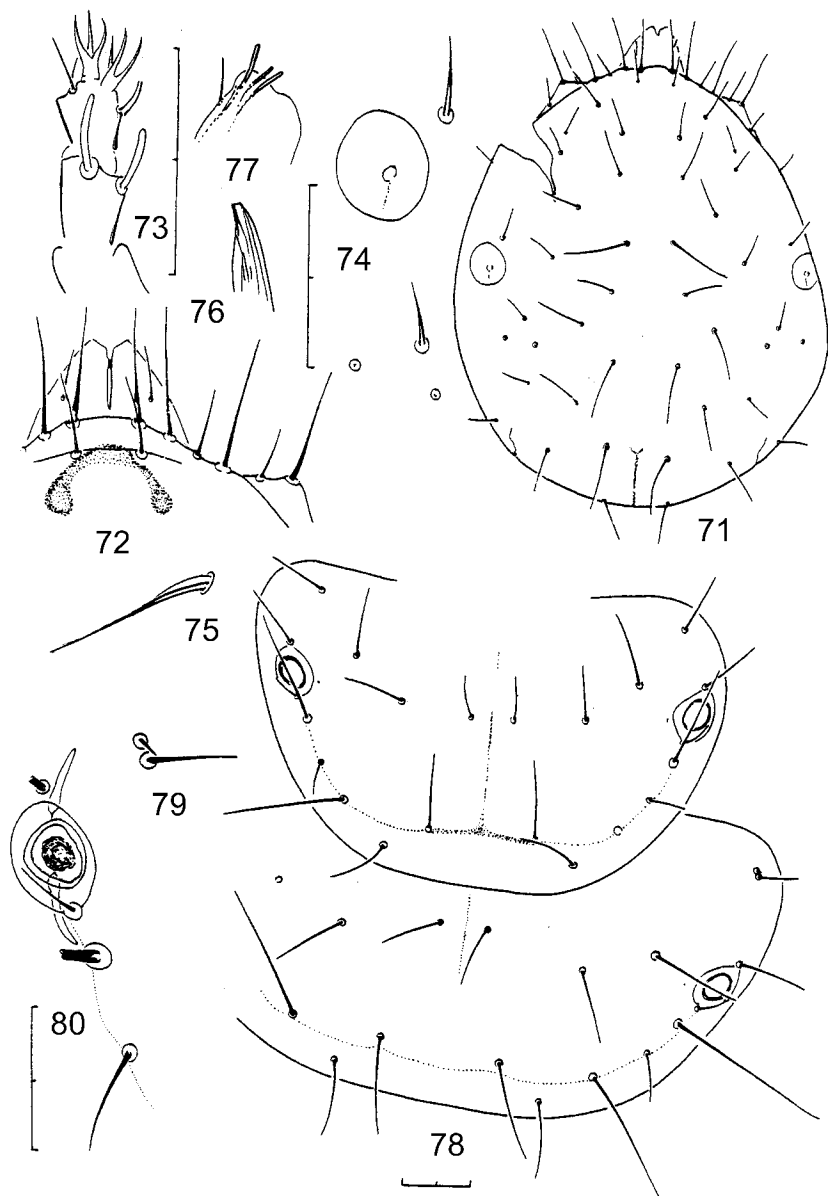
49-56. *Eosentomon paucrum* sp. n.: 49 - head (holotype; aa - anterior additional seta, pa - posterior additional seta); 50 - anterior part of head, dorsal view (holotype); 51 - distal part of palpus maxillaris (paratype 5756); 52 - pseudoculus (holotype); 53 - mandible (paratype 5760); 54 - galea (paratype 5760); 55 - meso- and metanotum (paratype 5760); 56 - tracheal camerae (holotype). Scale: 20 μ m (figs 50-54 - magnification as 52)



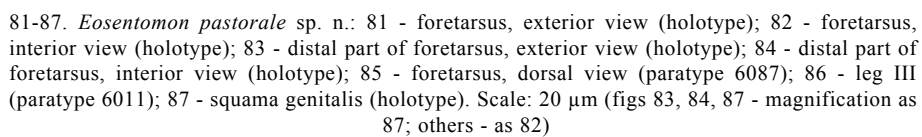
57-62. *Eosentomon paucrum* sp. n.: 57 - foretarsus, exterior view (holotype); 58 - foretarsus, interior view (holotype); 59 - distal part of foretarsus, exterior view (holotype); 60 - distal part of foretarsus, interior view (holotype); 61 - foretarsus, dorsal view (paratype 5760); 62 - squama genitalis (holotype). Scale: 20 μ m (figs 59, 60, 62 - magnification as 62; others - as 58)

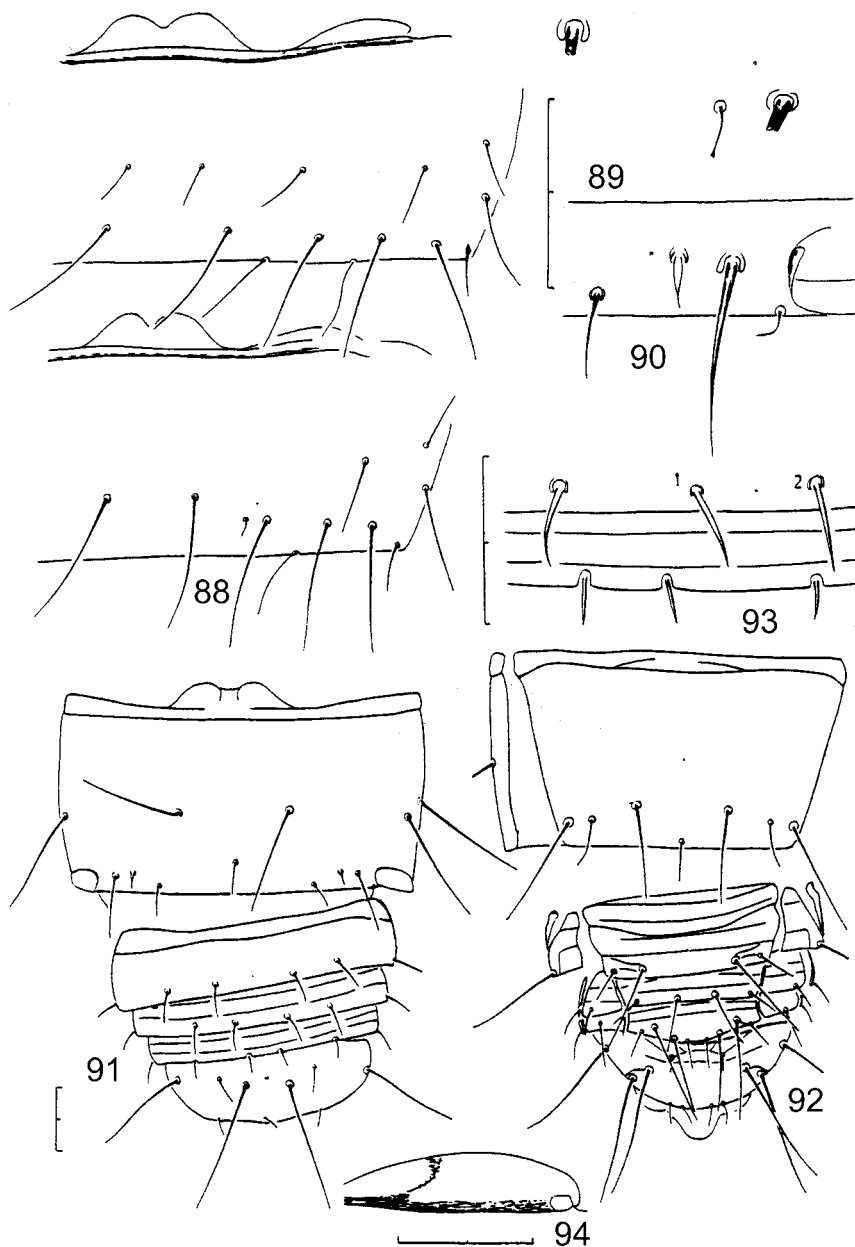


63-70. *Eosentomon paucrum* sp. n.: 63 - leg III (paratype 5756); 64 - urotergite VI and VII (holotype); 65 - seta P1a on urotergite VII (holotype); 66 - seta P1a' on urotergite VIII (holotype); 67 - urotergite VIII-XII (holotype); 68 - urosternite VIII-XII (holotype); 69 - dorsal setae of urotergite X and XI (holotype); 70 - laterostigma II (paratype 5760). Scale: 20 μ m (figs 65, 66, 69, 70 - magnification as 69; 68, 67 - as 68)

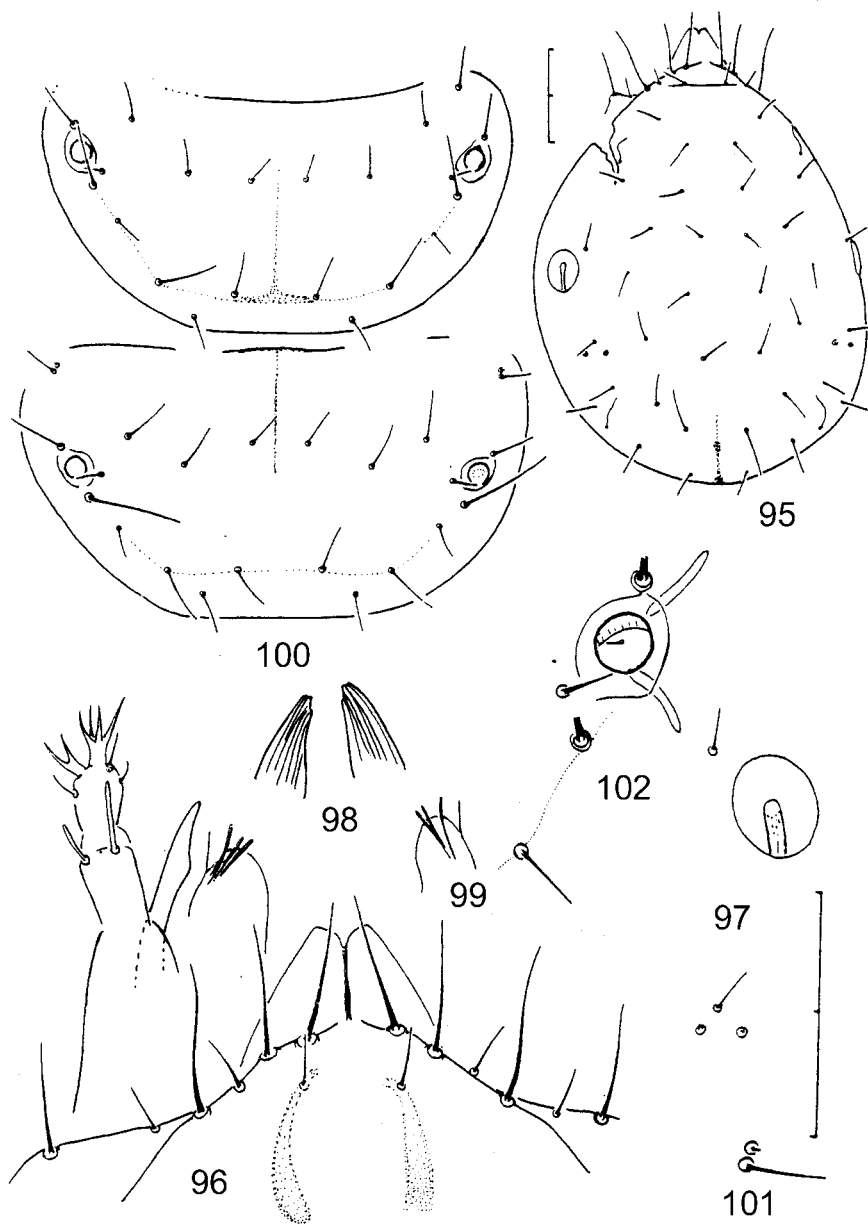


71-80. *Eosentomon pastorale* sp. n.: 71 - head (paratype 6107); 72 - anterior part of head, dorsal view (holotype); 73 - distal part of palpus maxillaris (paratype 6086); 74 - pseudoculus (paratype 6085); 75 - rostral seta (lateral view) (paratype 6011); 76 - mandible (holotype); 77 - galea (holotype); 78 - meso- and metanotum (holotype); 79 - setae *P4a* and *P5* on metanotum (holotype); 80 - tracheal camerae (holotype). Scale: 20 μ m (figs 73, 75-77, 79 - magnification as 73; 71, 78 - as 78)

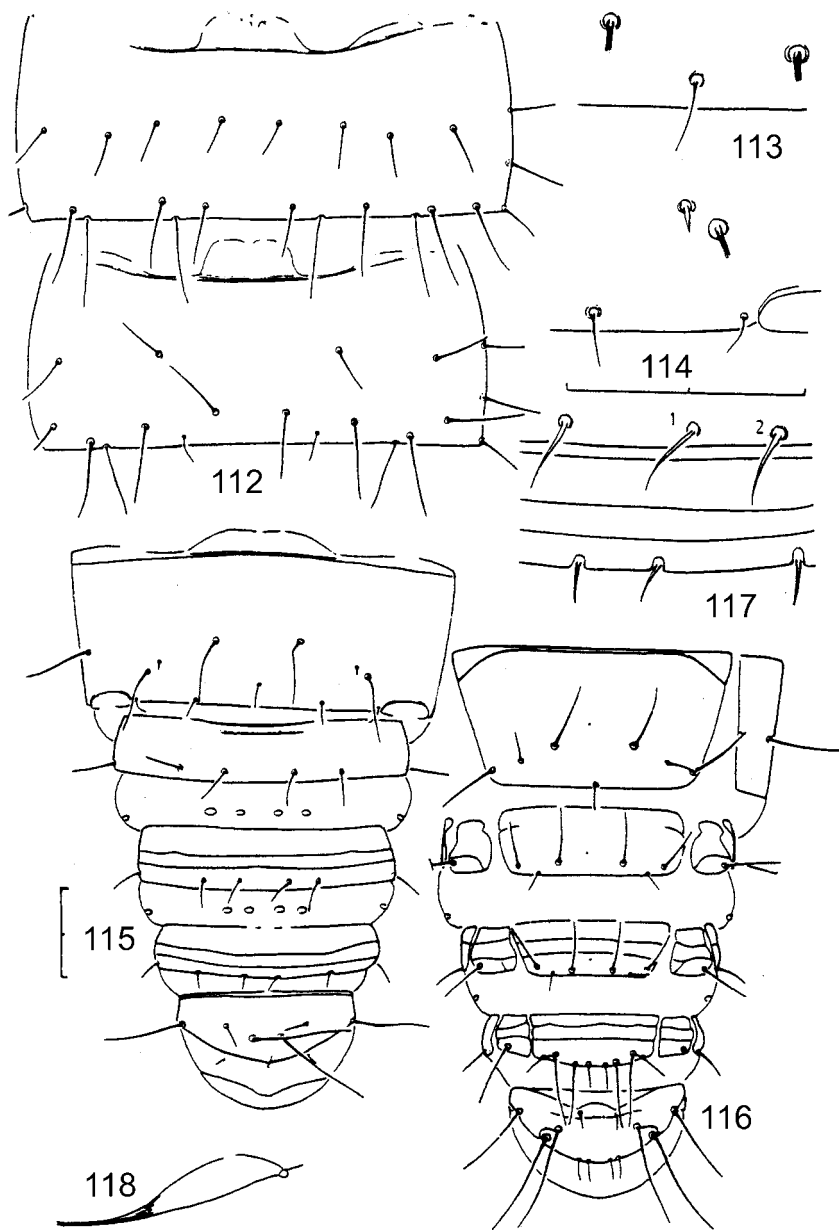




88-94. *Eosentomon pastorale* sp. n.: 88 - urotergite VI and VII (paratype 6097); 89 - seta P1a on urotergite VII (paratype 6097); 90 - seta P1a' on urotergite VIII (paratype 6097); 91 - urotergite VIII-XII (holotype); 92 - urosternite VIII-XII (holotype); 93 - dorsal setae of urotergite X and XI (holotype); 94 - laterostigma III (paratype 6097). Scale: 20 μ m (figs 88, 91, 92 - magnification as 91)



95-102. *Eosentomon weinerae* sp. n.: 95 - head (paratype 6156); 96 - anterior part of head, dorsal view (holotype); 97 - pseudoculus (holotype); 98 - mandibles (holotype); 99 - galea (holotype); 100 - meso- and metanotum (holotype); 101 - setae *P4a* and *P5* on metanotum (holotype); 102 - tracheal camerae (holotype). Scale: 20 μ m (figs 96-99, 102 - magnification as 97)



112-118. *Eosentomon weineriae* sp. n.: 112 - urotergite VI and VII (holotype); 113 - seta P1a on urotergite VII (holotype); 114 - seta P1a' on urotergite VIII (holotype); 115 - urotergite VIII-XII (holotype); 116 - urosternite VIII-XII (holotype); 117 - dorsal setae of urotergite X and XI (holotype); 118 - laterostigma II (holotype). Scale: 20 μ m (figs 112, 115, 116 - magnification as 115; others - as 117)