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The first species of *Verrucoentomon* RUSEK, 1974 from Europe
(*Protura: Acerentomoidea*)

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ABSTRACT. The first West Palearctic species of *Verrucoentomon* RUSEK, 1974, *V. rafalskii* sp. nov. from Besko at the Wisłok River (SE Poland) is described. Its localities (from SE Poland and W Ukraine) are listed.

Key words: entomology, taxonomy, *Protura*, *Acerentomoidea*, new species, Poland, Ukraine.

***Verrucoentomon rafalskii* sp. nov.**

(Figs 1-20)

DIAGNOSIS

Verrucoentomon rafalskii sp. n. belongs to a group of species with slender foretarsal sensillum *c* and *e*, with no seta *P2a'* on nota, and with no posterior setae on urosternite VIII. It shares these characters with *V. canadense* (TUXEN, 1955) and *V. imadatei* NOSEK, 1977. In both these species calyx of filament di sostegno is relatively large, with distinct granulation, posterior filament is short and thick, and notal seta *P1a* is distinctly longer than *P2a*, pointed, of normal shape (TUXEN 1955, 1964; NOSEK 1977). In the new species calyx is small, nearly smooth, posterior filament is long and thin, and seta *P1a* is short (subequal to *P2a*), blunt, sensillum-shaped. Posterior setae on urosternite VIII are lacking in some specimens of *V. yushuense* YIN, 1980, too (TUXEN 1984). In this species foretarsal sensillum *c* is shorter than half length of sensillum *b* (in *V. rafalskii* is longer) and sensillum *e* is

slightly dilated (in *V. rafalskii* it is parallel-sided and thin) (YIN 1980). The new species differs from all other species of *Verrucoentomon* described till now in the presence of only 10 setae on urotergite IX and only 8 on X. In the other species there are always 12 and 10 setae, respectively.

DESCRIPTION

Head setae of medium length, sensory setae not differentiated. Rostrum very short. Additional setae absent, seta *pps* present, setae of hind margin of head of normal shape. Pseudoculus small, round or slightly abbreviated, with long lever, PR about 20 (in maturi juniores 16-21). Additional pores absent. Filamento di sostegno with small, regular, nearly smooth calyx, long and thin posterior filament and distinct, simple posterior dilation. CF 4-4.8. Maxillary palps short, stocky; basal sensilla equal, thin, nearly seta-like. Labial palp with well developed "tuft" and broad basal sensillum. Inner part of labium with indistinct row of small "cilia".

Main setae of nota long, setae *P1a* and *P2a* short, sensillum-shaped; *P5* as very small sensillum. Seta *P2a* situated nearer to *P2* than to *P1*. Seta *P2* 1.2-1.5 times longer than *P1*, length ratio of *P1* : *P1a* : *P2* in adults as 4.7-5.6 : 1 : 5.7-6.9 (in preimagines, maturi juniores and larvae II as 3.4-3.5 : 1 : 4.6-4.7, 2.4-2.8 : 1 : 3.6-5.2 and 2.3-2.8 : 1 : 3.3-4.0, respectively). Pore *sl* present on meso- and metanotum, *al* only on metanotum. Thoracal sterna with no pores. Seta *A2* on prosternum absent; *M2* on prosternum and *A2* on meso- and metasternum sensillum-shaped (as *P1a* on nota), other setae of normal shape.

Foretarsus with no sensillum *b'*; sensillum *t1* filiform; *t3* very small; *d*, *f*, *t2* and *c'* seta-like; *c* and *e* thin. Sensilla parallel-sided, only *g* indistinctly dilated. Sensillum *d* very close to *e*; *f* very close to *g*; *a'* slightly distally to the level of *t2*. Length formula of sensilla: $t3 < c = e = g < t1 < a = b = a' < t2 < d = f < c'$. Seta $\beta 1$ of normal shape, longer than $\delta 1$, $\delta 4$ short, sensillum-shaped. Claw long and slender, with small (sometimes hardly visible) inner tooth, empodial appendage short. BS about 0.7 (in younger instars 0.5-0.6), TR 2.4-2.6 (in younger instars 2.2-2.5), EU 0.1-0.2.

Chaetotaxy of abdomen as in Tables I and II. Urotergite I - VII with single, distinct line in anterior part. Seta *A5* on urotergite I and accessory setae on urotergite I - VI short, blunt, as *P1a* on nota, on VII longer, of normal shape (pointed). Pore *psm* on tergite I-VI always asymmetrically (on I and II in some specimens absent), on VII and VIII symmetrically present; *al* on II - VII, dorsally to *A5*; *psl* absent.

Abdominal legs of normal *Acerella*-type¹. Lineation of urosternite I-VII very variable. Sternal accessory setae of normal shape (pointed), longer than those on tergites. Urosternite I with 1+1 pore in anterolateral part of sternite; II-VI with same pair of pores and medial one posteriorly to seta *Ac* (the last one on sternite II and III in some specimens absent), VII with single median pore situated as on the preceding sternites.

Abdominal segment VIII with some scattered grains, forming in some specimens a more or less regular row. Striate band well developed, normal. Comb VIII with

¹In single specimens of maturus junior abdominal leg II asymmetrically with one or three setae present.

straight hind margin composed of 7-10 (mostly 8) small teeth. Pore *psm* with no accompanying teeth. Hind margin of pleurite and sternite smooth.

Hind margin of segment IX-X and XII smooth; of urotergite XI with subtle (mostly hardly visible) ciliation in middle part. Urosternite VIII and segments IX-XI with no pores, XII with single median pore dorsally and two anterolateral ones ventrally.

Squama genitalis of female with relatively short, blunt acrostyli; penis with 6+6 setae (additional setae absent).

Table 1
Dorsal chaetotaxy of *Verrucoentomon rafalskii* sp. n.

composition of setae		formula			
		l.I	l.II	m.j.	ad.
Th. I	1, 2	4	4	4	4
Th. II-III	A2, 3, 4, M	<u>4</u>	<u>6</u>	<u>8</u>	<u>8</u>
	P1, 1a, 2, 2a, 3, 3a, 4, 5	10	14	16	16
Abd. I	<i>A1, 2, 5</i>	0	0	6	6
	P1, (1a)¹, 2, 2a, 3, 4	8	10	10	13
Abd. II-III	<i>A1, 2, (3), 4, 5</i>	0	0	8	10
	P1, (1a)¹, 2, 2a, 3, 4, 4a, 5	10	12	14	16
Abd. IV-VI	<i>A1, 2, (3), 4, 5</i>	0	0	8	10
	P1, (1a)¹, 2, 2a, 3, 4, 4a, 5	10	14	14	16
Abd. VII	<i>A2, (3), 4, 5</i>	0	0	6	8
	P1, 1a, 2, 2a, 3, 4, 4a, 5	10	14	14	16
Abd. VIII	<i>A4, 5</i>	0	2	4	4
	Mc, P1, 1a, 2, 2a, 3, 3a, 5	12	15	15	15
Abd. IX	<i>1, (1a), 2, 3, 4</i>		8	8	10
Abd. X	<i>1, 2, 3, 4</i>			8	8
Abd. XI	<i>1, 3, 4</i>			6	6
Abd. XII		9	9	9	9

prelarval and primary setae in bold; secondary setae in normal; tertiary setae in italics; complementary setae in italics in brackets.

Development of body chaetotaxy as in Tables I and II. Larval seta in both larval instars always present, in maturi juniores mostly absent. Seta *P1a* on urotergites I-VI in preimagines mostly absent.

¹in preimagines mostly absent.

Table 2

Ventral chaetotaxy of *Verrucoentomon rafalskii* sp. n.

composition of setae		formula			
		1.I	1.II	m.j.	ad.
Th. I	A1, M1, 2 P1, 2, 3	<u>2+2</u> 4	<u>2+2</u> 4	<u>4+2</u> 6	<u>4+2</u> 6
Th. II	Ac, 2, 3, M P2, 3	<u>5+2</u> 2	<u>5+2</u> 2	<u>5+2</u> 4	<u>5+2</u> 4
Th. III	Ac, 2, 3, 4, M P2, 3	<u>5+2</u> 2	<u>5+2</u> 2	<u>7+2</u> 4	<u>7+2</u> 4
Abd. I	Ac, 3 P2	<u>0</u> 2	<u>3</u> 2	<u>3</u> 2	<u>3</u> 2
Abd. II-III	Ac, 3 Pc, 1a, 2	<u>0</u> 3	<u>1</u> 5	<u>3</u> 5	<u>3</u> 5
Abd. IV- VII	Ac, 3 P1, 1a, 2, 3	<u>1</u> 4	<u>1</u> 6	<u>3</u> 8	<u>3</u> 8
Abd. VIII	1, 2	2	4	4	4
Abd. IX	1, 2		4	4	4
Abd. X	1, 2		0	4	4
Abd. XI				2	6
Abd. XII		<u>2</u> 6	<u>2</u> 6	<u>0</u> 6	<u>0</u> 6

prelarval and primary setae in bold; secondary setae in normal; tertiary setae in italics.

Body measurements (in μm)

	imago	preim.	mat.jun	larva II	larva I
head	127-132	107-113	105-118	ca 96	?
pseudoculus	ca 6	ca 6	5-6	4-6	ca 5
filamento di sostegno	28-32	ca 26	20-29	18-23	ca 20
mesonotal <i>P1</i>	33-42	20-22	17-24	14-16	ca 13
mesonotal <i>P1a</i>	6-8	ca 6	6-8	5-6	?
mesonotal <i>P2</i>	41-48	27-30	23-32	19-22	ca 19
foretarsus	82-91	72-74	60-75	52-59	ca 52
claw	32-35	?	26-31	23-26	?
empodial appendage	4-5	?	2-4	3-4	?
maximum body length ²	ca 1170	?	ca 1090	ca 820	?
No of specimens studied	9	2	21	9	1

²Not wholly extended specimens.

CHAETAL VARIABILITY

Imagines (9 specimens). Metanotum: asymmetrical lack of seta *M* (1 sp-n); urotergite I: asymmetrical (1 sp-n) and symmetrical (1 sp-n) lack of *P1a*; asymmetrical lack of *P1a* on urotergites III and IV (1 sp-n); urotergite IV: asymmetrical lack of *A5* (1 sp-n); urotergite IX: asymmetrical presence of seta *2a*.

Table 3

Lack of tertiary setae in matus junior of *V. rafalskii* sp. n.

Terg.	A1		A2		A4		A5		P4a	
	sm.	asm.	sm.	asm.	sm.	asm.	sm.	asm.	sm.	asm.
I								3		
II				1	3	2		1	6	6
III	1	1	1	1	2	6		1		
IV	3	3		1	1	2		2		
V	3	4	1	1	1	1		1		
VI	7	10				3				
VIII						1		2		

sm. - symmetrical lack of seta; asm. - asymmetrical lack of seta

Preimagines (2 specimens). Urotergites V-VII: asymmetrical lack of *A3* (1 sp-n); urotergites V-VI: asymmetrical (on V) and symmetrical (on VI) presence of *P1a* (1 sp-n).

Maturus junior (20 specimens): tertiary setae *A1*, *A2*, *A4*, *A5* and *P4a* commonly absent (Table III); urotergite VII: complementary seta *A3* asymmetrically present (1 sp-n); urosternite XII: larval seta symmetrically (1 sp-n) or asymmetrically (3 sp-n) present.

Larvae II (9 specimens) and larvae I (1 specimen) - not observed.

TYPES

Holotype: male no 4206: Poland, Besko at Wisłok River, Δ 373 m. Beech forest with admixture of hornbeam on northern slope. In undergrowth mostly *Carex remota*, *Asperula odorata*, *Mercurialis perennis* etc. Litter. 2 IV 1981; leg. J. RAFALSKI.

OTHER MATERIAL (young instars are not included into the type-material)

Poland:

Together with holotype: 1 female (paratype no 4207)

Bieszczady Mts. Cisna, fir - spruce forest with rich undergrowth, 580-600 m a.s.l. Litter and moss under very old hazel near the border of the forest. 7 VII 1977; 1 m. jun., 1 1 2; leg. ZMZ³.

Bieszczady Mts. Kiczera Mt (Δ 632) near Krościenko; E slope. Small gorge with a creek; young forest with beech, hornbeam, maple, fir, spruce, *Alnus incana*; in the undergrowth *Equisetum maximum*, *Petasites* sp. etc. Wet soil, litter, mosses. 7 VII 1977; 16 m. jun., 4 1 2, 1 1 1; leg. ZMZ.

Bieszczady Mts. Ostre Crest between Czarna and Polana villages, NW slope. Slope of deep gorge with a stream; old fir forest with admixture of beech and hazel; soil and litter. 7 VII 1977; 1 male (paratype no 1507), 1 m. jun., 4 1 2; leg. ZMZ.

Bieszczady Mts, gorge of Wołosaty Stream under Bereżki village. Mixed forest, mostly beech and hazel on a steep slope, litter. 18 IX 1954; 3 males (paratypes no 4061, 4062, 4063); leg. M. JACKIEWICZ & J. RAFALSKI.

Bieszczady Mts, between Tarnica Mt and Krzemień Mt. Beech forest on timberline, litter. 19 VIII 1968; 1 female (paratype no 4208), 1 m. jun.; leg. P. LEGEZYŃSKI.

Ukraine:

Zakarpac'ka obl., Vinogradiv, Chorna Mt., beech forest, soil and litter. 5 IV 1989; 1 male (paratype no 5043); leg. I. KAPRUS'

Zakarpac'ka obl., Tyachivskii r-n, Mala Ugolka, Menchul Mt. Beech forest 200-250 years old, soil and litter. 24 VIII 1991; 2 preim., 2 m. jun.; leg. I. KAPRUS'

Lvivs'ka obl., "Rostoch'e" reserve. Fresh oak forest with beech, soil. 22 X 1986; 1 female (paratype no 5051); leg. I. KAPRUS'

All material is preserved at the Institute of Systematics and Evolution of Animals of the Polish Academy of Sciences, Cracow.

DERIVATIO NOMINIS

Named in the memory of my dear Master and Friend, prof. dr. Jan RAFALSKI of the Adam Mickiewicz University in Poznań to whom I owe all my formation as a zoologist.

REMARKS

The genus *Verrucoentomon* RUSEK, 1974 at present comprises 9 species: *V. canadense* (TUXEN, 1955) and *V. imadatei* NOSEK, 1977 from Canada and Alaska⁴;

³Samples taken collectively by the staff of the Department of Animal Morphology of the Adam Mickiewicz University in Poznań.

⁴The third Nearctic species, *V. mixtum* NOSEK, 1981 is characterized by the presence of seta *A1* on metanotum and reduction of terminal tuft on the labial palps. Thus it probably belongs to a different genus (cf. NOSEK 1981).

V. kawakatsui (IMADATÉ, 1964) from Japan; *V. shirampa* (IMADATÉ, 1964) from Japan and Korea; *V. xinjiangense* YIN, 1987) and *V. yushuense* YIN, 1980 from China; *V. aurifer* SZEPTYCKI, 1988 and *V. joannis* SZEPTYCKI, 1988 from Altai Mts (IMADATÉ 1974, 1981; NOSEK 1977, RUSEK 1974, SZEPTYCKI 1988, TUXEN 1955, YIN 1980, 1987). Thus, *V. rafalskii* n. sp. is the first species of the genus recorded from the Western Palearctic.

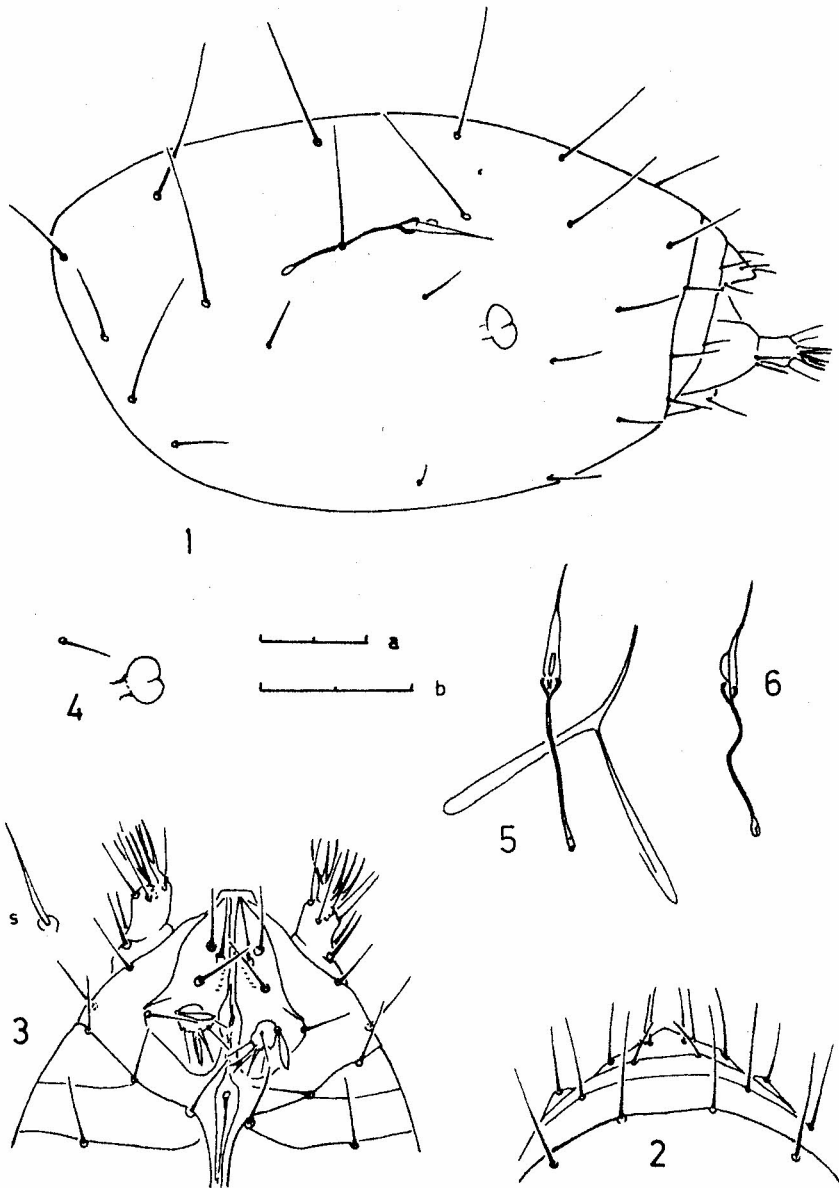
There are only few data about the porotaxy of the species of *Verrucoentomon*. It was described only in *V. joannis* and *V. aurifer* (SZEPTYCKI 1988); I have studied this character in some specimens of *V. shirampa*, too. The new species differs from them in the presence of anterolateral pore on urosternite II-VI, in the asymmetry of pore *psm* on tergites I-VI (in *V. shirampa* on urotergite VII *psm* is absent!), and in the lack of pore on meso- and metasternum.

ACKNOWLEDGEMENTS

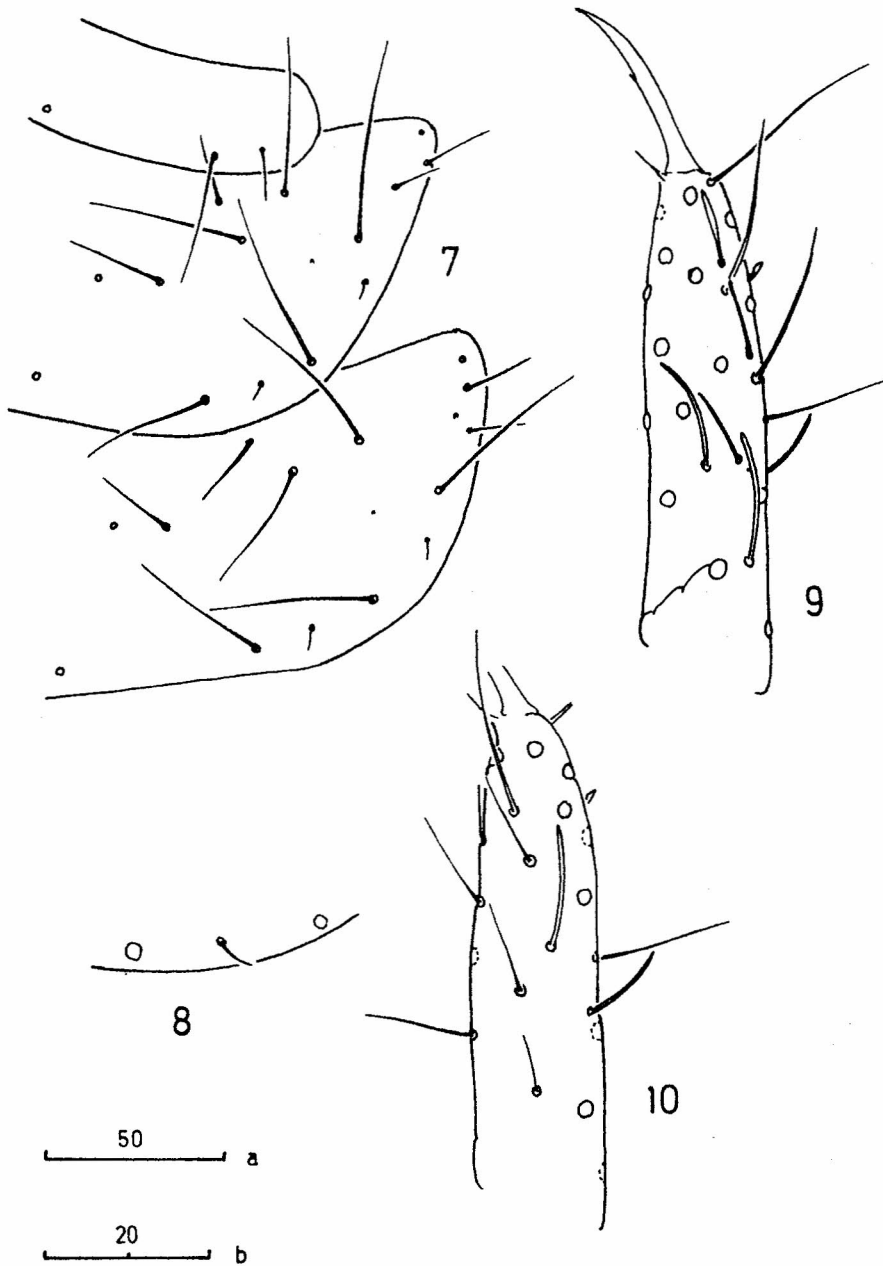
I owe all the Polish material described in this paper to the kindness of the late Prof. Dr Jan RAFALSKI, to whom this paper is dedicated. For the Ukrainian material express my very cordial thanks to Dr Igor KAPRUS' of the Museum of Natural History of the Ukrainian Academy of Sciences in Lviv.

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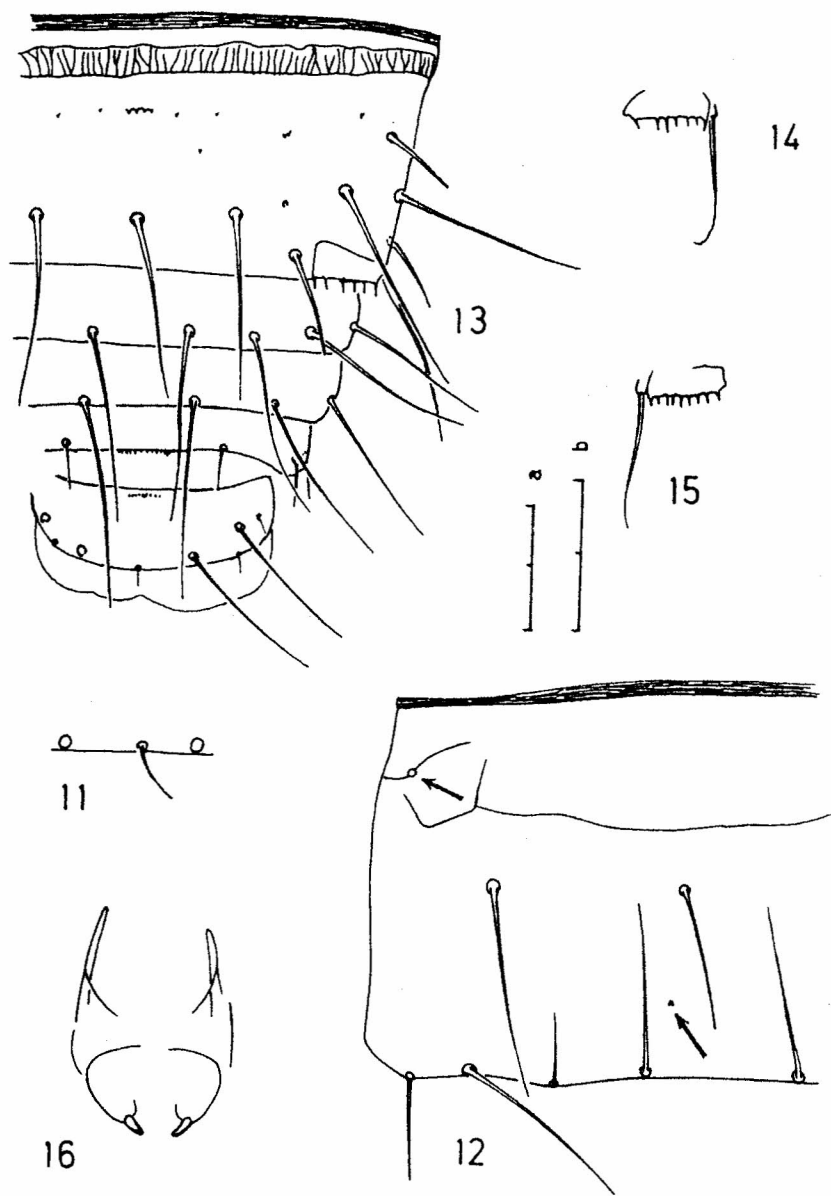
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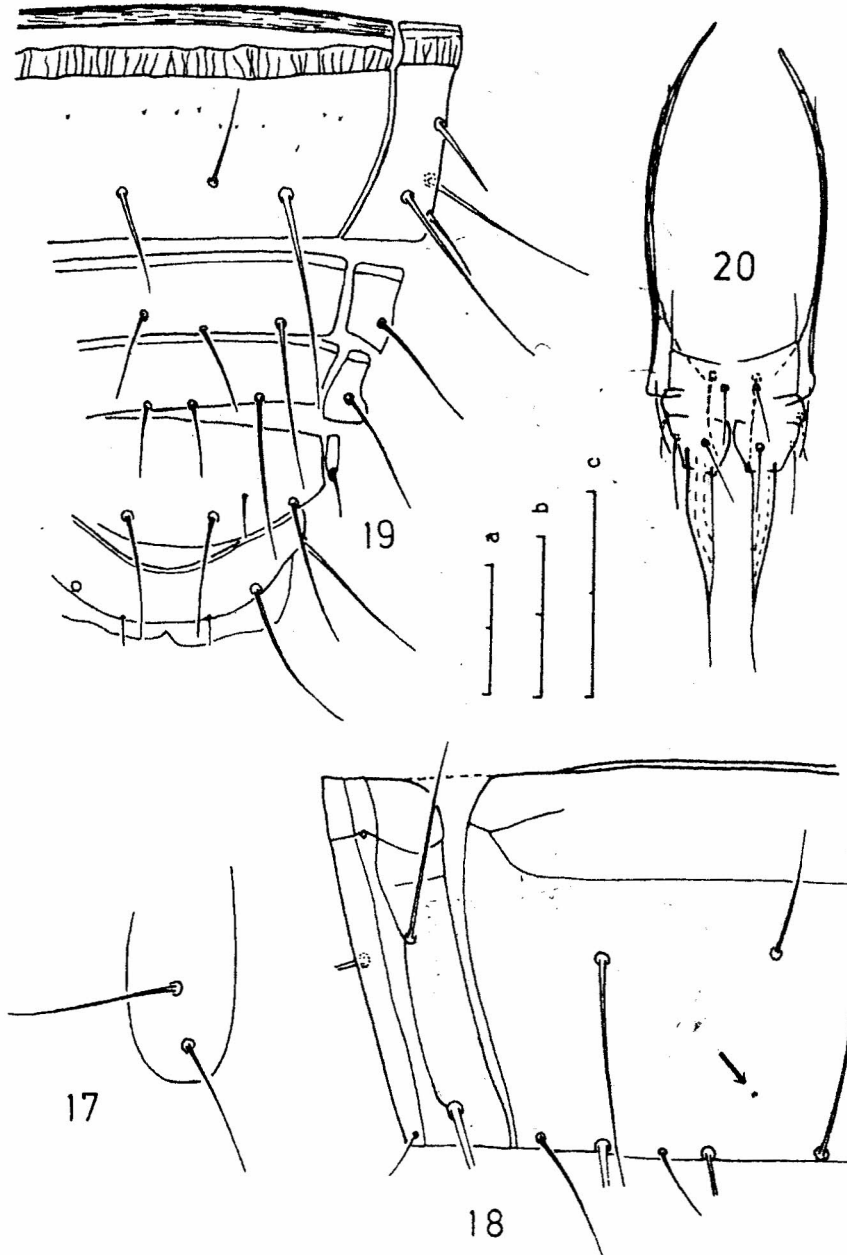
1-6. *Verrucoentomon rafalskii* sp. n. 1 - head (paratype nr 4207); 2 - anterior part of head, dorsal view (holotype); 3 - ditto, ventral view (holotype) (s - sensillum of maxillary palp); 4 - pseudoculus (holotype); 5, 6 - filamento di sostegno (holotype and paratype nr 4707) (scale: 20 μ m, 1 - magnification a, others: b)



7-10. *Verrucoentomon rafalskii* sp. n. 7 - dorsal chaetotaxy of thorax (paratype nr 4207); 8 - mesonotal seta *Pla* (holotype); 9 - foretarsus, exterior view (paratype nr 4061); 10 - foretarsus, interior view (paratype nr 4061) (scale in μm , 7 - magnification a, others: b)



11-16. *Verrucoentomon rafalskii* sp. n. 11 - seta *Pl*a on urotergite VII (holotype); 12 - urosternite VI (holotype)(arrows - sternal pores); 13 - urotergite VIII-XII (holotype); 14, 15 - comb VIII (paratypes nr 4061 and 4062); 16 - squama genitalis female (paratype nr 4207) (scale: 20 μ m, 13 - magnification a, others: b)



17-20. *Verrucoentomon rafalskii* sp. n. (holotype). 17 - abdominal leg II; 18 - urosternite VII (arrow - sternal pore); 19 - urosternite VIII-XI; 20 - penis; (scale: 20 μ m, 17 - magnification c, 19 - magnification a, others: b)