Genus	Vol. 15 (3): 301-322	Wrocław, 10 X 2004

Protura of the Canary Islands (Arthropoda: Protura)

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ABSTRACT. *Isoentomon serinus* n. sp. from Fuertaventura and *Eosentomon canarinum* n. sp. from Tenerife are described; *E. noseki* Tx. is redescribed. New taxonomical characters, concerning female squama genitalis and penis are introduced. The list of 14 species collected on Canary Islands is made up. New records of *Maderentulus maderensis* (CONDÉ) and *Eosentomon noseki* Tx. (from Spain), *Gracilentulus fjellbergi* Sz. (from Azerbaijan), and *Isoentomon serinus* n. sp. (from Brazil) are given. The data about Protura of Macaronesia are summoned up – the fauna of those islands contains mostly widely distributed (introduced ?) species.

Key words: entomology, taxonomy, zoogeography, Protura, Canary Islands, Spain, Azerbaijan, Brazil, *Isoentomon*, *Eosentomon.*

INTRODUCTION

The Protura of Macaronesia (like those of most of the world's regions) are very poorly known. Four papers concern this area, and only twelve species have been recorded from it: two from Azores, 9 from Madeira and two from the Canary Islands, no data from Selvagens. (CONDÉ 1957, CONDÉ & NOSEK 1970, TUXEN 1982, SZEPTYCKI 1993).

The present paper is based on the large material collected by Dr Arne FJELLBERG on the Canary Islands in 1987 – 1988. It contains 35 samples collected on seven islands, as follows:

	El Hierro	La Palma	Gomera	Tenerife	Gran Canaria	Fuertaventura	Lanzarote
No of samples	2	2	3	21	5	1	1
No of specimens	35	22	56	442	80	5	5
No of species	3	2	4	12	6	1	2

Most of the samples containing Protura (16) were collected in different types of laurisilva. Similar numbers of samples (14) were taken in different non-forest habitats, as tussocks of petrophilous plants, meadows etc. Only a few samples were taken from other types of forest (pine forest, planted cork oak) and from cultivated areas (vineyards, banana plantations).

New data (based on the collection of the Institute of Systematics and Evolution of Animals) about the distribution of some species are given. They concern: *Maderentulus maderensis* and *Eosentomon noseki* (from Spain), *Gracilentulus fjellbergi* (from Azerbaijan), and *Isoentomon serinus* (from Brazil).

All the material, mounted as microscopic slides in Swan's medium (after NOSEK 1973), is preserved in the collection of the Institute of Systematics and Evolution of Animals P.A.S, Kraków, Poland.

SYSTEMATIC PART

Isoentomon serinus n. sp.

(figs 1-22)

DIAGNOSIS

Isoentomon serinus n. sp. belongs to the species with labral seta absent, foretarsal sensilla *e*, *b'1* and *b'2* present; *a'*, *b*, *e* and *g* short, *f1* and *b'2* long, filiform. Empodial appendage of II and III leg long. Urotergite II – III with seta *P4a* present, II-VII with 10 anterior setae, XI with 4 setae. Urosternite VIII with anterior setae present, IX and X with 4 setae. Seta *P1a'* on urotergite VIII at level with seta *P2*. Length of foretarsus 65-69 ěm, BS about 0.7. It is the most similar to *I. pseudosaharense* (TUXEN, 1967) and *I. myrmecobium* TUXEN, 1975.

DESCRIPTION

Head setae short, uniform; subposterior seta 1.1-1.3 times longer than posterior. Anterior additional seta, posterior additional seta, and seta *M4* present, anterior sensillum absent. Pseudoculus small, round, with simple inner line, PR 16-17. Clypeal apodeme distnct. Rostral seta simple, subequal to subrostral. Labrum with round apices, deep, narrow notch, and with indistinct transversal lineation. Labral seta absent. Mandible with two distinct apical teeth. Galea with two digits - median and inner connected together (or one of them reduced?); outer

digit long. Dorsal sensillum of maxillary palp longer than lateral, pointed (nearly seta-like), lateral with rounded tip.

Setae on nota slightly diversified, seta *P1a* situated posteriorly to line of *P1-P2*, *P2* 1.1-1.4 times longer than *P1*. Length ratio of *P1* : *P1a* : *P2* on mesonotum is 1.1-1.2: 1 : 1.4-1.6 (in maturus junior is 1.4 : 1 : 1.6). *P2a* slightly shorter and thinner than *P3a*, *P3a* of normal shape. Base of *P4a* remote from *P5*. Tracheal camerae very long and slender, apically pointed.

Foretarsal sensillum *a* longer than half of *c*; *c* short, reaching base of *γ3*; sensilla *b, e*, *g* and *a'* equal, short, relatively thick; *d* long, reaching level of *t3*, dilated basaly; *e* and *g* short and thick, with no spatulate dilation; *f1* filiform, about two times longer than sensillum *e; t1* situated in equal distance from *α3* and *α3'*; *t3* short; *a'* about half length of *t2;* situated more or less level with *α3*; *t2* and *b'2* subequal, filiform; *b'1* present, equal to *c*, situated near *δ3*'; *c'* distaly to level of *α6*, short but relatively thick. Seta *α3* on exterior side of foretarsus, far from *a'*; seta *δ4'* distaly to level of *δ4*. BS about 0.7, TR 6.2-6.5 (in maturus junior 5.5), EU 0.7-0.8.

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

Chaetotaxy formula of abdomen:

I	II-III	IV-VII	VIII	IX-X	XI	XII
4	10	10	6			
—	—	—	—	8	4	9
12	16	16	9			
4	6	6	2			
—	—	—	—	4	8	12
4	4	10	7			

Chaetotaxy formula of urotergite I: 3, 1, 2. Urotergite II – VII with full set (10) of anterior setae. Seta *P1a* urotergite I-VI long and thin, evidently closer to *P1* than to *P2*; on urotergite VII shorter than half of *P2*, situated on hind margin of tergite (as on preceeding tergites), closer to *P1* than to *P2*; *P2a* on urotergite II-VI as long as *P1a*, situated closer to *P2* than to *P1*, on urotergite VII as on preceeding ones. Seta *P4a* on urotergite II and III presents; on all tergites setiform. Seta *P1a'* on urotergite VIII with indistinct basal dilation, situated level with *P2*. Dorsal setae on urotergite XI absent. Abdominal legs with 5 setae. Seta *P2a'* on urosterite IV – VII anteriorly to *P2a*. Seta *1* on urosternite X longer than half length of seta *2*. Antecostae thin, indistinct; laterostigmae and pores invisible. Lateral sclerotisation of urosternite VIII absent.

Female squama genitalis short, with processi sternales slightly developed; penis with long basiperiphallar setae.

Measurements (in μm) (in brackets – the single specimen of maturus junior): Head 94-100 (91), pseudoculus about 6 (?), subposterior head seta 8-9 (7),

posterior head seta 7-8 (7), mesonotal seta *P1* 8-11 (9), *P1a* 7-9 (6), *P2* 11-12 (10, foretarsus 65-69 (61), claw 10-12 (11, empodial appendage 8-9 (8), maximum body length of expanded specimen about 840 (730).

Chaetal variability: In single specimen asymmetrical lack of seta *A1* on urotergite VII.

TYPE MATERIAL

Holotype: female (collection number 6204), Canary Islands, **Fuerteventura**: Jandia, 6. 04. 1988. Deep litter and soil under *Argyranthemum* on rock shelves, N - slopes. 760 m asl. Leg. A. Fjellberg (sample no 324 – 88).

Paratypes: together with holotype, 1 female, 2 males, 1 maturus junior.

NAME DERIVATION

Named after the bird which has made the Canary Islands so famous.

REMARKS

Isoentomon serinus sp. n. belongs to a group of species with foretarsal sensilla *e*, *b'1* and *b'2* present, with short sensilla *e*, *g* and *a'*, long empodial appendage of legs II and III, filiform sensillum *t2*, peculiar position of foretarsal seta *α3* (which is situated on the exterior side of the foretarsus, not dorsally as in most of Eosentomidae) and seta *P1a'* on urotergite VIII situated at level with seta *P2*. It shares the mentioned characters with *I. myrmecobium* TUXEN, 1975 and *I. pseudosaharense* (TUXEN, 1967) (TUXEN 1975). From both of the mentioned species the new one differs in the foretarsal sensillum *f1* more than two times longer than *g* (in *myrmecobium* and *pseudosaharense* sensillum *f1* is subequal in length, or only slightly longer than *g*), in the number of setae on urotergite XI (4 in *serinus*, 6 in *pseudosaharense* and 8 in *myrmecobium*). From *pseudosaharense* it differs also in the number of setae on urosternite IX (6 in *pseudosaharense*, 4 in *serinus* and *myrmecobium*).

***Eosentomon canarinum* sp. n.**

(figs 23-46)

DIAGNOSIS

Eosentomon canarinum sp. n. belongs to the species with 14 posterior setae on urotergites II and III, full chaetotaxy of head, labral seta lacking, with long, proximally situated foretarsal sensillum *c'* and sensillum *b'1* absent, no anterior setae on urosternite VIII, and with 4 setae on urosternites IX and X. Among such species it is the most similar to *E. noseki* TUXEN, 1982 (as it is discussed below).

DESCRIPTION

Head setae relatively short, slightly differentiated, subposterior seta 1.4-1.9 x length of posterior seta. Anterior additional seta, posterior additional seta, seta *M4* and anterior sensillum present. Pseudoculus large, round or (rarely) elon-

gated, with distinct median line and very indistinct (usually invisible) inner granule, PR 7.5-9.5. Clypeal apodeme indistinct. Rostral seta alate, subequal to subrostral. Labrum with round apices and deep, narrow notch, smooth. Labral seta absent. Mandibles with three indistinct apical teeth. Digits of galea well-developed, median and inner of equal length. Sensilla of maxillary palp short and thick, lateral sensillum shorter than dorsal.

Setae on nota slightly diversified. *P1a* situated posteriorly to line of *P1-P2*, *P2* 1.3-1.5 x length of *P1*. Length ratio of *P1* : *P1a* : *P2* on mesonotum is 0.8-1.1 : 1 : 1.3-1.5. *P2a* subequal to *P3a*; *P3a* of normal shape. Base of *P4a* very close to *P5*. Tracheal camerae short, dilated basally.

Foretarsal sensillum *a* about half length of *c*; *c* short, not reaching base of *γ3*; *b* shorter than *a'*; *d* long, passing base of *t3*; *e* and *g* subequal, with spatulate dilation about half of sensillum length; *f1* filiform; about 3/4 length of sensillum *e; t1* situated closer to *α3* than to *α3'*; *t3* long, extending beyond base of *δ6*; *a'* of medium length, reaching base of *α4*, situated level with *α3*, longer than *t2*; *b'1* absent; *t2* and *b'2* subequal, filiform; *c'* proximally to level of *α6,* close to *δ4'*, long. Seta *α3* on dorsal side of foretarsus; seta *δ4'* slightly distally to level of *δ4*. BS 0.8-0.9, TR 5-6, EU 0.8-0.9.

Empodial appendage of II and III leg short, basal seta of III leg (seta *D2*) spine-like.

Table I. Measurements (in µm) of imagines of *E. canarinum* n. sp. and *E. noseki* Tx.

	E. canarinum	*E. noseki*
head	106-122	122-145
pseudoculus	12-14	16-22
subposterior seta	9-11	14-20
posterior seta	5-7	9-12
mesonotal *P1*	10-12	14-20
mesonotal *P1a*	10-15	19-23
mesonotal *P2*	13-16	23-28
foretarsus	72-80	94-101
claw	13-15	18-20
empodial appendage	11-14	16-19
maximum body length	1040	1160
No of specimens	18	30

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 *A3* on urotergite VI and setae *A1 - A3* on VII absent. Seta *P1a* urotergite on I-VI longer than *P1*, situated slightly closer to *P2* than to *P1*, on urotergite VII short, situated posterior to level of *P2*, in equal distance from *P1* and *P2*, extending beyond hind margin of tergite. *P2a* on urotergite II-VI as *P1a*, situated in half distance *P2-P3*; on urotergite VII as on preceding tergites. Seta *P4a* on urotergite II and III absent, on urotergite IV-VII setiform. *P1a'* on urotergite VIII with indistinct basal dilation, situated nearly at level with *P2*. Dorsal setae on urotergite XI about half length of setae on urotergite X, normal. Seta *1* on urosternite X about 1.5 x length of *P1a*. Central lobes of antecostae invisible. Laterostigma II-IV large, with no inner structure. Lateral sclerotisation of urosternite VIII absent. Dorsal lobe of telson with two central pores.

Female squama genitalis long, with distinct "head" and "beak" perpendicular to body axe; inner margin of processus sternalis smooth. Penis with short basiperiphallar setae and simple distal end of basistulus.

Measurements as in Table I.

Chaetal variability not observed.

TYPE MATERIAL

Holotype: female (collection number 6207), Canary Islands. **Tenerife**: Icod de los Vinos. Warm slopes with thickets of *Hypericum*, *Opuntia*, *Sonchus* etc., 160 m asl.; 28 XI 1987, leg. A. Fjellberg (sample no 268 – 87).

Paratypes: together with holotype: 3 females, 4 males.

Tenerife: Punta del Hidalgo, El Anden Colorado, 25 VII 87. Litter and soil in thickets of *Rubus* and ferns.410 m asl. leg. A. FJELLBERG (sample no 33 - 87): 3 females, 3 males

Tenerife: Ladera de Güimar. Lush slope with annuals, 430 m asl, 2 XI 1987, leg. A. FJELLBERG (sample no 184 - 87): 4 females, 1 male.

NAME DERIVATION

Named after the Canary Islands.

Eosentomon noseki TUXEN, 1982

(figs 47-55)

E. noseki was inadequately described by TUXEN (1982) from Madeira. The present redescription is based on the holotype and 5 paratypes (of the collection of Tuxen) and on the rich material from Tenerife. The measurements, indexes, and data about variability are based on 30 randomly selected (15 females, 15 males) specimens from Pico del Ingles, Tenerife. Many morphological details are identical with *E. canarinum* n. sp. – only the most important ones are illustrated.

REDESCRIPTION

Head setae relatively short, slightly differentiated, subposterior seta 1.3-1.7 x length of posterior seta. Anterior additional seta, posterior additional seta, seta *M4* and anterior sensillum present. Pseudoculus large, more or less elongated, with distinct median line and very indistinct (commonly invisible) inner granule, PR 6-8.5. Clypeal apodeme indistinct. Rostral seta alate, subequal to subrostral. Labrum with round apices and deep, narrow notch, smooth. Labral seta absent. Mandibles with three indistinct apical teeth. Digits of galea well-developed, median and inner of equal length. Sensilla of maxillary palp short and thick, lateral sensillum shorter and thicker than dorsal.

Setae on nota slightly diversified. *P1a* situated posteriorly to line of *P1-P2*, *P2* 1.4-1.6 x length of *P1*. Length ratio of *P1* : *P1a* : *P2* on mesonotum is 0.7-0.9 : 1 : 1.1-1.4. *P2a* subequal or longer than *P3a*; *P3a* of normal shape. Base of *P4a* very close to *P5*. Tracheal camerae short, dilated basally.

Foretarsal sensillum *a* about half length of *c*; *c* short, not reaching base of *γ3*; *b* shorter than *a'*; *d* long, reaching base of *z*; *e* and *g* subequal, with spatulate dilation shorter than half of sensillum length; *f1* filiform;, about 3/4 length of sensillum *e; t1* situated closer to *α3* than to *α3'*; *t3* long, extending beyond base of *δ6*; *a'* of medium length, reaching base of *α4*, situated at level with *α3*, longer than *t2*; *b'1* absent; *t2* and *b'2* subequal, filiform; *c'* proximally to level of *α6,* close to *δ4'*, long. Seta *α3* on dorsal side of foretarsus; seta *δ4'* nearly at level with *δ4*. BS 0.8-0.9, TR 5-6, EU 0.9-1.0.

Empodial appendage of II and III leg short, basal seta of III leg (seta *D2*) 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 *A3* on urotergite VI, and setae *A1 - A3* on VII absent. Seta *P1a* on urotergite I-VI longer than *P1*, situated slightly closer to *P1* than to *P2*; on urotergite VII short, situated posterior to level of *P2*, in equal distance from *P1* and *P2*, extending beyond hind margin of tergite. *P2a* on urotergite II-VI as *P1a*, situated in half distance *P2-P3*, on urotergite VII as on preceding tergites. Seta *P4a* on urotergite II and III absent, on urotergite IV-VII setiform. *P1a'* on urotergite VIII with indistinct basal dilation, situated nearly level with *P2*. Dorsal setae on urotergite XI about half length of setae on urotergite X, normal. Seta *1* on urosternite X about 1.5 x length of *P1a*. Central lobes of antecostae invisible. Laterostigma II-IV large, with no inner structure. Lateral sclerotisation of urosternite VIII absent. Dorsal lobe of telson with two central pores.

Female squama genitalis long, with distinct "head" and "beak" perpendicular to body axe; inner margin of processus sternalis with distinct striation. Penis with short basiperiphallar setae and distal end of basistulus with distinct "fold" on inner side.

Measurements as in Table I.

Chaetal variability little, among 30 adult specimens only one specimens with asymmetrical presence of seta *A3* on urotergite VI, and another one with asymmetrical lack of seta *A5* on VII were found.

REMARKS

Contrary to the original description (TUXEN 1982) – the labral seta in *Eosentomon noseki* is lacking and the foretarsal sensilla *d* and *c'* are long (it was established in the study of the type material). In the other details of body morphology *E. noseki* is very similar (or identical) with *E. canarinum.* The most important differences concern body measurements (see Table I) and the structure of genital organs. In the females it is the striation (or ciliation?) on the inner side of processus sternalis in *E. noseki*, absent in *E. canarinum* (where the inner side of the processus is smooth). In males it is a peculiar "lobe" (or "fold") on the inner side of the distal end of basistylus (present in *E. noseki*, absent in *E. canarinum*). Both mentioned structures have never been described in any *Eosentomon* species, but they have been probably overlooked in many former descriptions.

Till now, I have found the striation on the inner side of processus sternalis only in two species – in *E. noseki*, and in *E. yezoense* NAKAMURA, 1983 (unpublished data based on the paratype no 812). The latter species differs in the presence of labral seta and relatively smaller pseudoculus. (NAKAMURA 1983).

Eosentomon noseki and *E. canarinum* are very similar to *E. christianseni* BONET, 1950 and *E. westraliense* WOMERSLEY, 1932 (placed by TUXEN 1964 into his "*westraliense*" group). All the mentioned species are characterized by the lack of seta *P4a* on urotergite II and III, the lack of labral seta, large pseudoculus and the proximal position of foretarsal sensillum *c'*. They differ mostly in the structure of the female squama genitalis – in *E. westraliense* and *E. christianseni* the "beak"

is distinctly bent (TUXEN 1964, figs 144, 147), while in *E. noseki* and *E. canarinum* it is right, more or less perpendicular to the body axe. In *E. westraliense* seta *P4a* on urotergite IV is in the shape of delicate seta (TUXEN 1964, fig. 143) while in the both of species described here it is a normal seta (no data about the shape of it in *E. christianseni*).

LIST OF SPECIES
(all material: leg. A. FJELLBERG)

The abbreviation: f – female, m – male, mj – maturus junior, lv2 – larva II, lv1 – larva I.

Acerentulus confinis ssp. *maderensis* TUXEN, 1982

Known only from Madeira (TUXEN 1982).

Tenerife: Punta del Hidalgo, 14 06 1987, rotten trunks of bananas in plantation, 50 m asl.: 2 f; Chamorga (Anaga), 15 10 1987, under *Salix canariensis*, 390 m asl.: 3 f, 1 m.

Gran Canaria: Juncalillo (Artenara), 10 01 1988, under *Salix canariensis*, 1540 m asl.: 3 f, 3 m, 1 mj.

Acerentulus cunhai CONDÉ, 1950

Widely distributed in the Middle and Western Europe (NOSEK 1973; SZEPTYCKI 1991); recorded from Madeira (TUXEN 1982).

Tenerife: Tegueste, 2 07 1987, under planted cork-oak, 440 m asl.: 10 f, 1 mj.

Acerentulus silvanus SZEPTYCKI, 1991

Known from some localities in Poland, Germany and Luxembourg (SZEPTYCKI 1991; BALKENHOL & SZEPTYCKI 2003; SZEPTYCKI & all. 2003).

Tenerife: Tegueste, 2 07 1987, under planted cork-oak, 440 m asl.: 2 f, 1 lv2; Hoya Ijuana (Anaga), 14 07 I 1987, stony depression in laurisilva, 720 m asl.: 1 lv2.

Gran Canaria: Bco. Oscuro (Bco. de la Virgen), 8 01 1988, base of cliff in laurisilva, 540 m asl.: 14 f, 1 mj, 1 lv2; El Brezal del Palmital, 9 01 1988, pine forest with *Asphodelus*, *Arisarum* etc, 630 m asl.: 1 f; Juncalillo (Artenara), 10 01 1988, under *Salix canariensis*, 1540 m asl.: 1 f.

Lanzarote: La Geria. 21 01 1988, vineyard in depression on black lava gravel, 320 m asl.: 1 f.

Gomera: Road La Laguna Grande - Las Rosas, 26 03 1988, shady fern – laurisilva, 980 m asl.: 2 f, 3 mj, 1 lv2.

Gracilentulus atlantidis Szeptycki, 1993

Till now, known from Portugal and Canary Islands (Tenerife) (Szeptycki 1993).

El Hierro: La Frontera, 17 03 1988, litter from banana plantation, 90 m asl.: 10 f, 1 mj; ca 1 km E of Sabinosa, 17 03 1988, under *Juniperus phoenicea* and *Myrica faya*, 370 m asl.: 14 f, 2 mj.

La Palma: Roque Teneguia, Fuencaliente, 25 02 1988, under *Centaurea / Paronychia* on rocks, 400 m asl.: 11 f, 2 mj.

Gomera: Vallehermoso, Roque Cano, 3 12 1987, under *Juniperus phoenicea*, 530 m asl.: 7 f, 1 mj.

Gran Canaria: El Brezal del Palmital, 9 01 1988, pine forest with *Asphodelus*, *Arisarum* etc, 630 m asl.: 28 f, 1 mj.

Gracilentulus fjellbergi Szeptycki, 1993

Known from Poland, Portugal, Canary Islands (El Hierro, Tenerife, Gran Canaria, and Lanzarote) (Szeptycki 1993), and from Azerbaijan (south Azerbaijan, between villages Lenkoran and Astara, salt meadow on sea shore, 29 01 1982, 2 f, leg. M. Potapov).

Maderentulus maderensis (Condé, 1957)

Known from Madeira and Azores (Condé 1957; Condé & Nosek 1970; Tuxen 1982), found also in Spain (prov. Pontevedra, ca 10 km S of Santiago, pine forest, 9 10 1983, 2 f, 1 m, leg. W. Niedbała)

Tenerife: Monte del Agua, 17 07 1987, bottom of barranco, tall laurisilva, 880 m asl.: 1 f.

Berberentulus capensis (Womersley, 1931)

Widely distributed in the warmer regions of the world. Till now recorded from the Mediterranean Europe, Northern America (USA – Massachusetts), Southern Africa, Pacific Islands (New Hebrides) and Australia (Nosek 1973; Tuxen 1967; 1977; Imadaté 1980)

Tenerife: Monte de las Mercedes, Casa Forestal, 1 07 1987, laurisilva, 860 m asl.: 4 f, 2 mj.

Gomera: El Cedro, 24 03 1988, accumulation slope in laurisilva, 1010 m asl.: 2 f.

Baculentulus macqueeni (Bernard, 1975)

Known only from the type locality: “Central Lake, Antrim County, Michigan”,USA (Bernard 1975).

Tenerife: Punta del Hidalgo, El Anden Colorado, 25 07 1987, in thickets of *Rubus* and ferns, 410 m asl.: 1 f, 1 mj; Faro de Anaga, 23 11 1987, grassy meadow with *Arisarum* etc, 330 m asl.: 1 f.

Silvestridia artichaeta Bonet, 1942

Known from Middle and South America (Mexico and Brasil) (Tuxen & Imadaté 1974)

Tenerife: Punta del Hidalgo, 14 06 1987, rotten trunks of bananas in plantation, 50 m asl.: 1 f.

Isoentomon serinus n. sp.

Known from the Canary Islands (Fuertaventura, as above) and from Brazil ("40 km NNE Linhares, forêt semi-décidue "Mata Alta", 19-20 10 1999, 2 f, 1 m, leg. E. Guilbert).

Eosentomon canarinum n. sp.

Known from the Canary Islands (Tenerife, as above).

Eosentomon delicatum Gisin, 1945

Widely distributed in Middle and Western Europe, and in Northern Africa. Recorded also from Madeira (Nosek 1973; Tuxen 1982)

Gran Canaria: Los Tiles de Moya; 9 01 1988, laurisilva, 540 m asl.: 1 f, 3m, 5 mj.

Eosentomon mirabile Szeptycki, 1984

Till now, known only from Middle Europe (Poland, Germany, Austria) (Szeptycki 1984; Ehrnsberger & all. 1997; Christian & Szeptycki, in print).

Tenerife: Monte de las Mercedes, Casa Forestal, 1 08 1987, laurisilva, 860 m asl.: 6 f, 7 m, 1 mj, 1 lv1; Pico del Ingles, Bco. de Valle Vega, 7 08 1987, in rather dry laurisilva, 890 m asl.: 4 f, 1 m, and under big tree in dry laurisilva, 870 m asl.: 2 m, 1 lv2; Pico del Ingles, Hoya Larga – trail, 24 08 1987, open dry laurisilva, 750 m asl.: 1 f, 1 mj; N slopes below Cabezo de Zapata (Mt. Mercedes), 8 08 1987, soil and roots under tree in laurisilva, 840 m asl.: 1 m, 1 lv2; Hoya Ijuana (Anaga), 14 08 1987, stony depression in laurisilva, 720 m asl.: 2 f, 2 mj, 2 lv2, 1 lv1; Monte del Agua, 17 08 1987, in bottom of barranco tall laurisilva, 880 m asl.: 5 f, 1 m, 2 mj, 1 lv2, 1 lv1, and at foot of cliff, laurisilva, 1000 m asl.: 3 f, 7 m, 3 mj, 5 lv2; Faro de Anaga, above light-house, 13 10 1987, grass meadow, 310 m asl.: 2 f, 2 m; Teno, 14 10 1987. N-facing rocks, moss and *Monanthes*, 220 m asl.:

1 f; Ladera de Güimar, 2 11 1987, lush slope with annuals, 430 m asl.: 1 m; Faro de Anaga. 23 11 1987, grassy meadow with *Arisarum* etc, 330 m asl.: 4 f, 5 m, 2 mj; Icod de los Vinos, 28 11 1987, warm slopes with thickets of *Hypericum*, *Opuntia*, *Sonchus* etc, 160 m asl.: 1 f, 1 m; Cabezo de Tejo - road (Anaga), 27 01 1988, under *Ocotea foetus* in bco, laurisilva, 760 m asl.: 3 f, 2 m, 2 lv2.

Gomera: Vallehermoso, Roque Cano, 3 12 1987, under *Juniperus phoenicea*, 530 m asl.: 1 f, 2 m; El Cedro, 24 03 1988, accumulation - slope in laurisilva. 1010 m asl.: 13 f, 9 m, 3 mj; road La Laguna Grande - Las Rosas, 26 03 1988, shady fern - laurisilva. 980 m asl.: 4 f, 1 m, 5 mj, 1 lv1.

Gran Canaria: El Brezal del Palmital, 9 01 1988, young *Illex*- laurisilva, 550 m asl.: 4 f, 7 m, 1 lv2.

La Palma: Bco. de las Angustias, 28 02 1988, under *Greenovia*, *Carlina*, *Convolvulus* etc. among rocks. 380 m asl.: 1 f, 6 m, 1 lv2, 1 lv1.

El Hierro: ca 1 km E of Sabinosa, 17 03 1988, under *Juniperus phoenicea* and *Myrica faya*, 370 m asl.: 2 f.

Eosentomon noseki TUXEN, 1982

Known from Madeira (TUXEN 1982) and Spain (10 km S of Vigo, eucalyptus – alder forest, 5 10 1983, 1 m, leg. W. NIEDBAŁA)

Tenerife: 47 - 87. Pico del Ingles, 7 08 1987, Bco. de Valle Vega, rather dry laurisilva, 890 m asl.: 36 f, 32 m, and under big tree in dry laurisilva, 870 m asl.: 23 f, 25 m; at view point, under *Luzula canariensis* in laurisilva, 940 m asl.: 4 f, 9 m; Pico del Ingles, 24 08 1987, open laurisilva, dry, 750 m asl.: 10 f, 20 m, and Hoya Larga - trail, in depression in laurisilva. 890 m asl.: 36 f, 41 m; N slopes below Cabezo de Zapata (Mt. Mercedes), 8 VIII 87, soil and roots under tree in laurisilva, 840 m asl.: 7 m.

GENERAL REMARKS

Actually, 19 species of Protura were recorded from Macaronesia (there are no data from Selvagens), 14 of them were found on the Canary Islands (Table II). Only two species were not found out of the region: *Acerentulus confinis maderensis*[1] and *Eosentomon canarinum.* The poor knowledge of the Protura of the surrounding areas (especially Iberian Peninsula and North Africa) do not allow to establish if they are true endemics.

Lack of the species common with Africa is probable due to very poor knowledge of the fauna of this continent.

Other species of the Macaronesian fauna are known from many areas of the world, both temperate (Middle Europe, North America) and warmer (Mediterranean Europe, South America). Some of them seem to be introduced in some part

[1] It is probably a good species, but till the formal decision I prefer to use the original name of TUXEN (1982)

of their range (*Acerentulus cunhai* and *Gracilentulus fjellbergi* in Poland, *Berberentulus capensis* in many subtropical areas).

The lack of endemic species allow to suppose that the fauna of Protura of Macaronesia is a very young one. Perhaps it contains mostly species introduced by human activity.

ACKNOWLEDGEMENTS

I am very grateful to Dr Arne FJELLBERG (Tjöme, Norway) for all the material of Protura used in the present paper; to Prof. Wojciech NIEDBAŁA (A. Mickiewicz University, Poznań) and Dr Mikhail POTAPOV (Moscow State Pedagogical Institute) and dr Eric GUILBERT (Muséum National d'Histoire Naturelle, Paris) for the collections of Protura from Spain, Azerbaijan and Brasil, and to Prof. Henrik ENGHOFF (Zoological Museum of the University of Copenhagen) for lending me the type material of *Eosentomon noseki*.

Table II Protura of Macaronesia

Species	Canary Islands							Madeira	Azores	Out of Macaronesia
	El Hierro	La Palma	Gomera	Tenerife	Gran Canaria	Fuertaventura	Lanzarote			
Proturentomon barandiarani								+		West Europe
Acerentulus conf. maderensis				+	+			+		not found
Acerentulus cunhai				+				+		Middle and West Europe
Acerentulus gerezianus[2]									+	Iberian Peninsula
Acerentulus ladeiroi								+		Iberian Peninsula
Acerentulus silvanus			+	+	+		+			Middle and West Europe
Gracilentulus atlantidis	+	+	+	+	+					Iberian Peninsula
Gracilentulus fjellbergi	+			+	+		+			Middle and West Europe, Azerbaijan
Gracilentulus gracilis[3]								+		Cosmopolite (?)
Berberentulus capensis			+	+						Warmer regions of whole world
Baculentulus macqueeni				+						North America (Michigan)
Maderentulus maderensis				+				+	+	Iberian Peninsula
Silvestridia artiochaeta				+						South and Middle America
Isoentomon serinus						+				South America (Brazil)
Eosentomon canarinum				+						not found
Eosentomon delicatum					+			+		Europe, North Africa
Eosentomon mirabile	+	+	+	+	+					Middle Europe
Eosentomon mixtum								+		Middle and West Europe
Eosentomon noseki				+				+		Iberian Peninsula

[2]CONDÉ (1957) recorded it as *Acerentulus* cf *gerezianus*.

[3]Recorded by TUXEN (1982) - in this time it was not distinguished from *G. atlatidis* and *fjellbergi* - possible misidentification.

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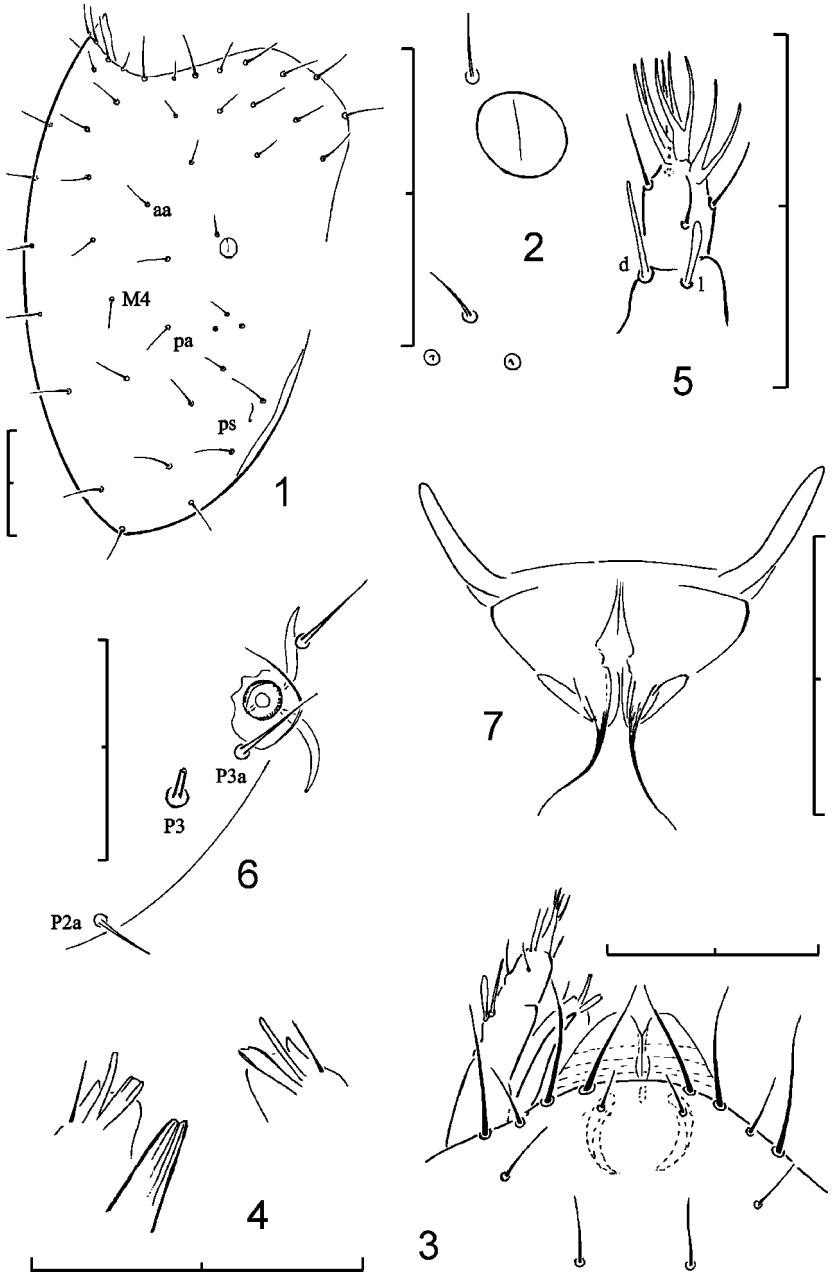
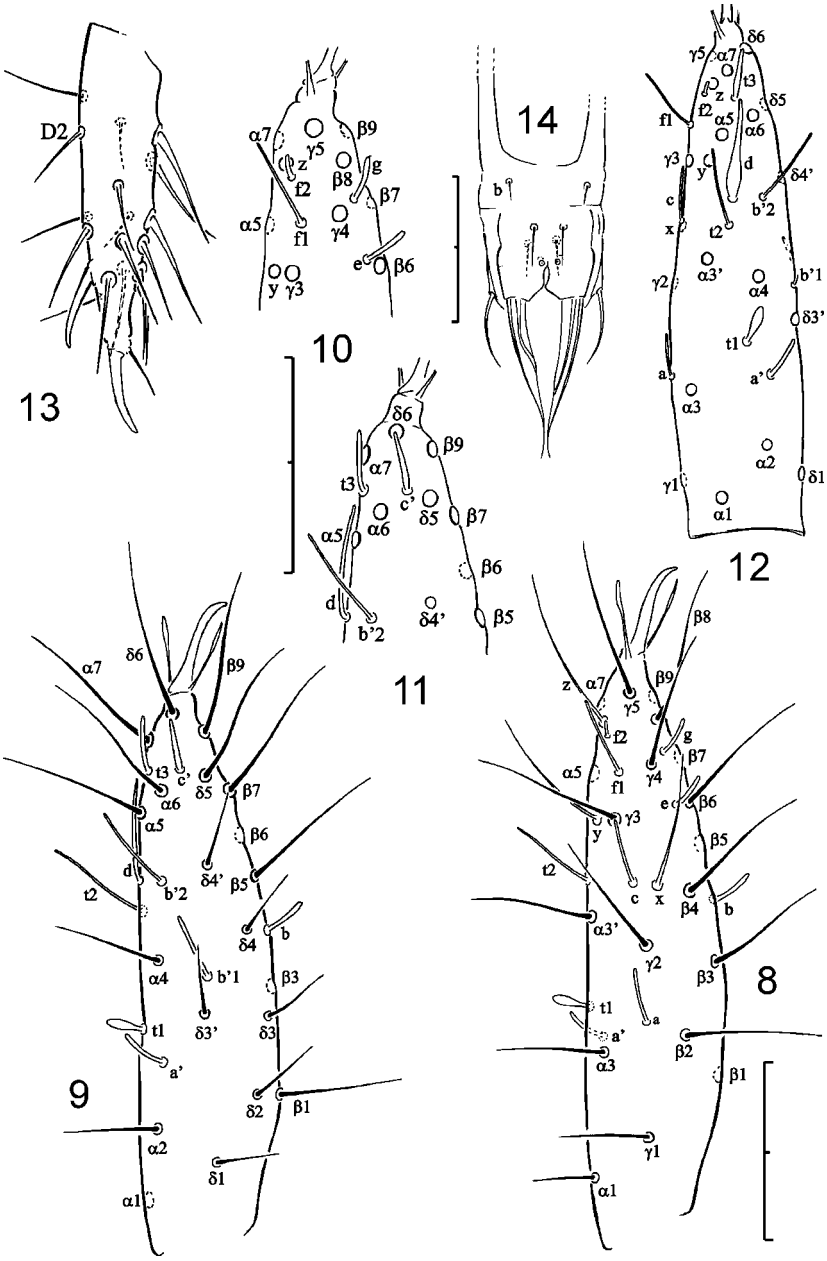
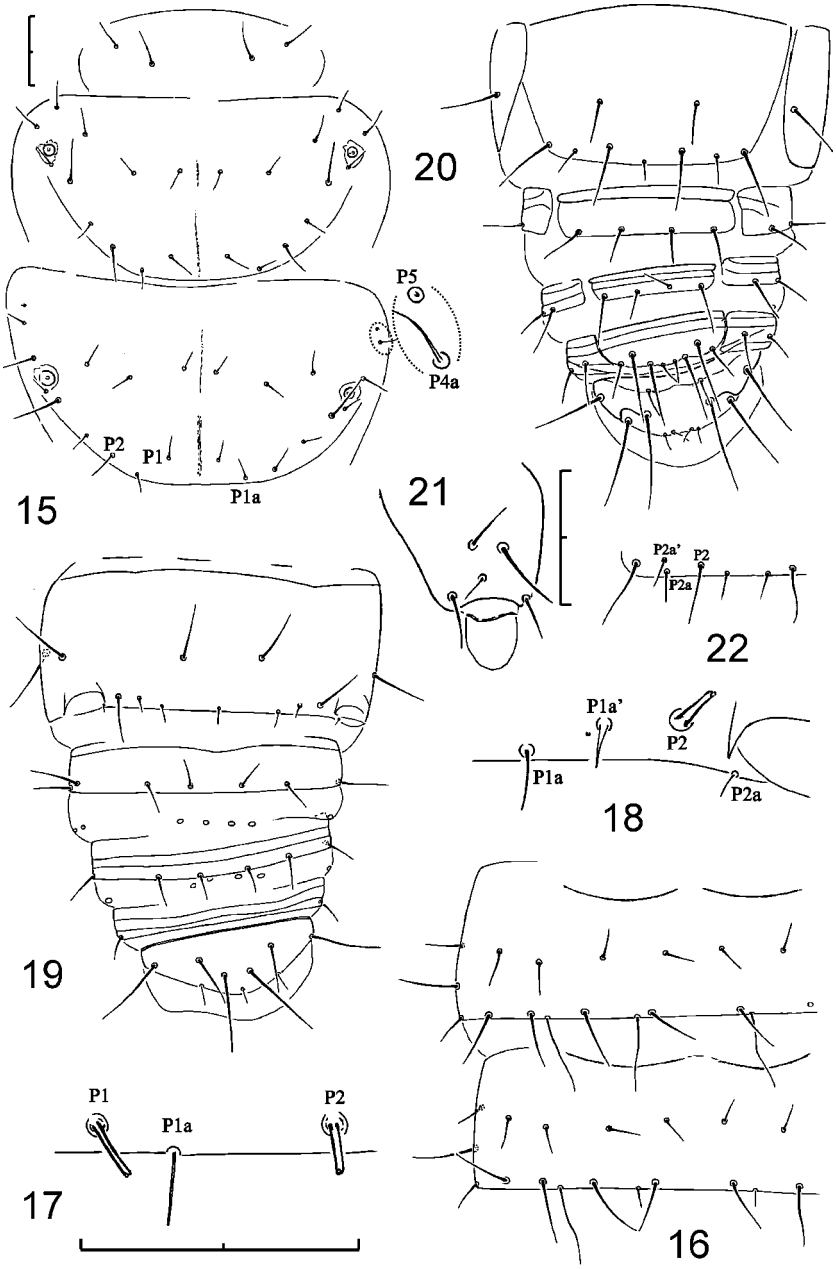


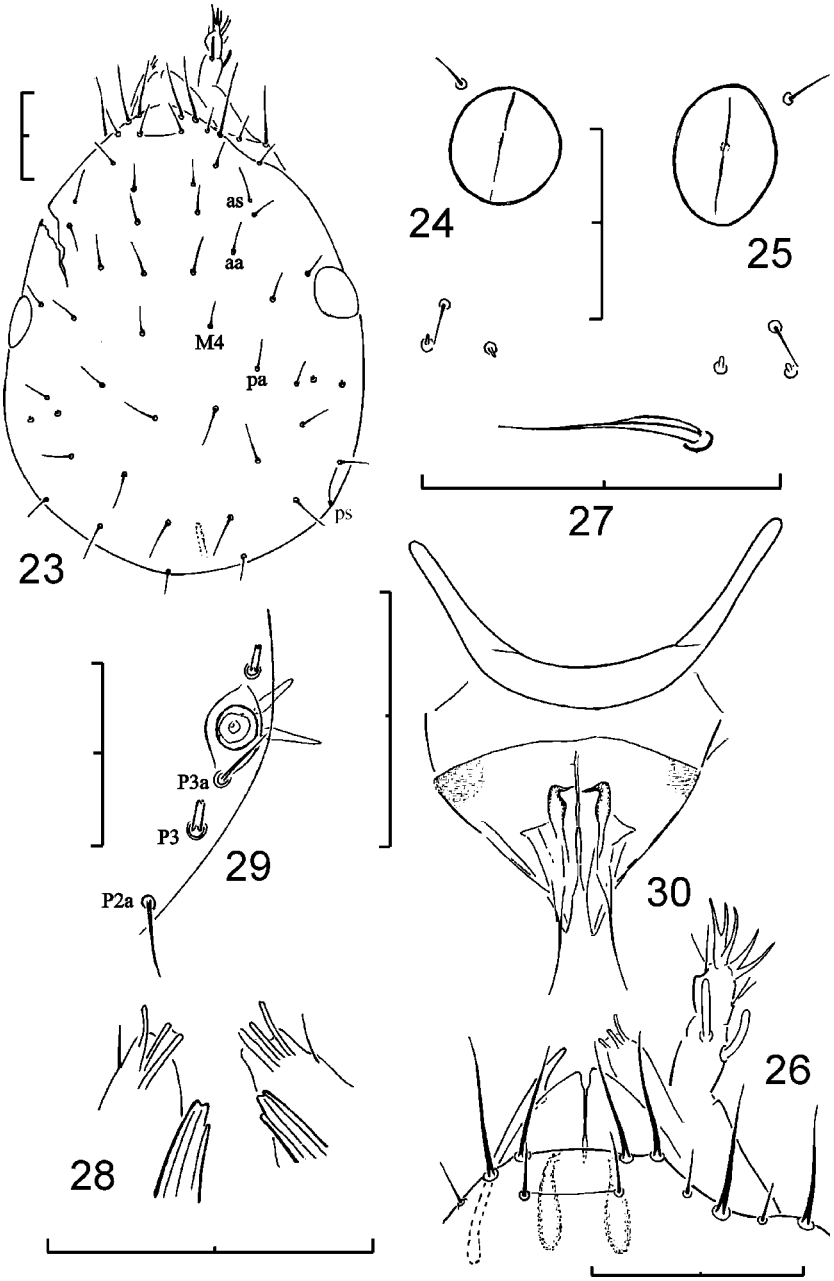
1-7. *Isoentomon serinus* n. sp.: 1 - head (aa – anterior additional seta, pa – posterior additional seta, ps – posterior sensillum) (paratype 6203); 2 - pseudoculus (paratype 6203); 3 - anterior part of head, dorsal view (paratype 6202); 4 - galea and mandible (paratype 6202); 5 - distal part of palpus maxillaris (d – dorsal sensillum, l – lateral sensillum) (paratype 6203); 6 - tracheal camerae (paratype 6202); 7 - female squama genitalis (holotype). Scale: 20 μm



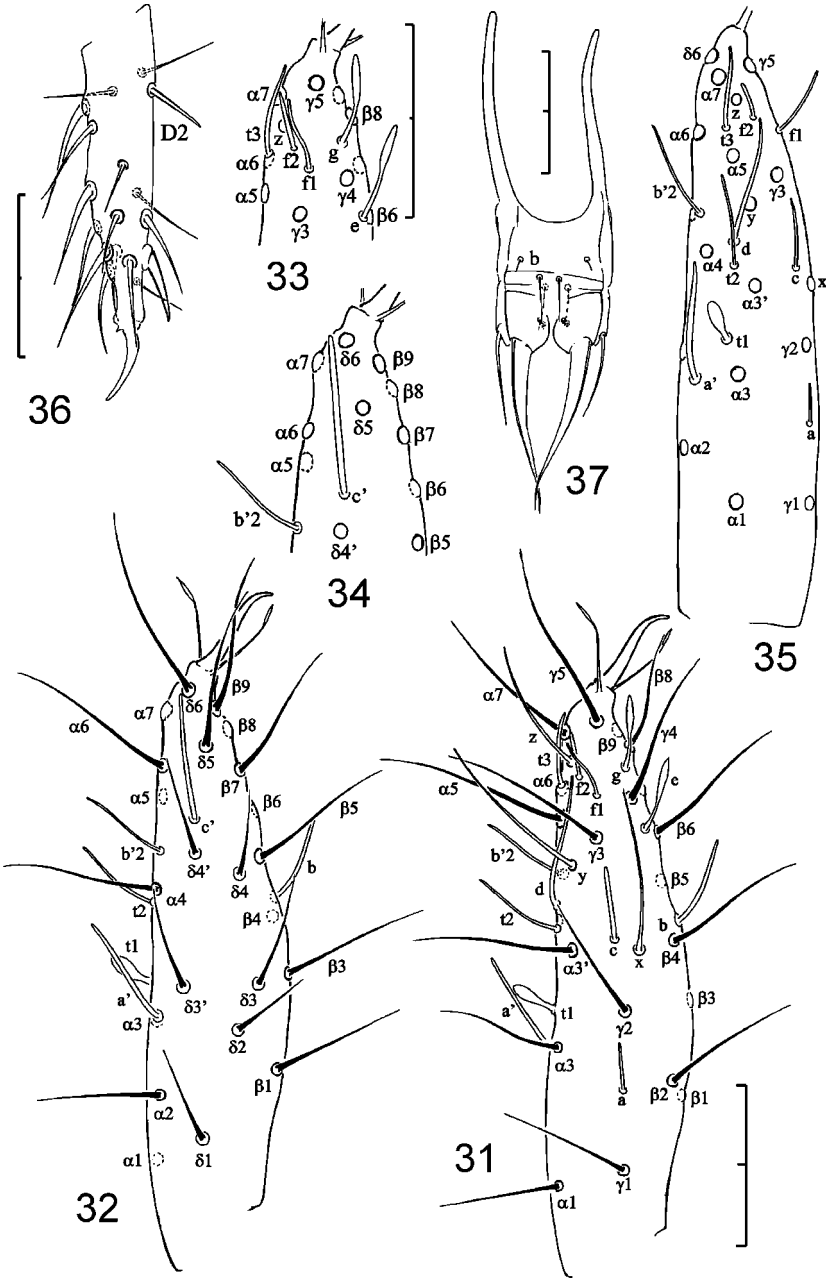
8-14. *Isoentomon serinus* n. sp.: 8 - foretarsus, exterior view (holotype); 9 - foretarsus, interior view (holotype) (magnification as 8); 10 - distal part of foretarsus, exterior view (holotype) (magnif. as 11); 11 - distal part of foretarsus, interior view (holotype); 12 - foretarsus, dorsal view (paratype 6203) (magnif. as 8); 13 - leg III (paratype 6203) (magnif. as 8); 14 - penis (b – basiperiphallar seta) (paratype 6202). Scale: 20 µm



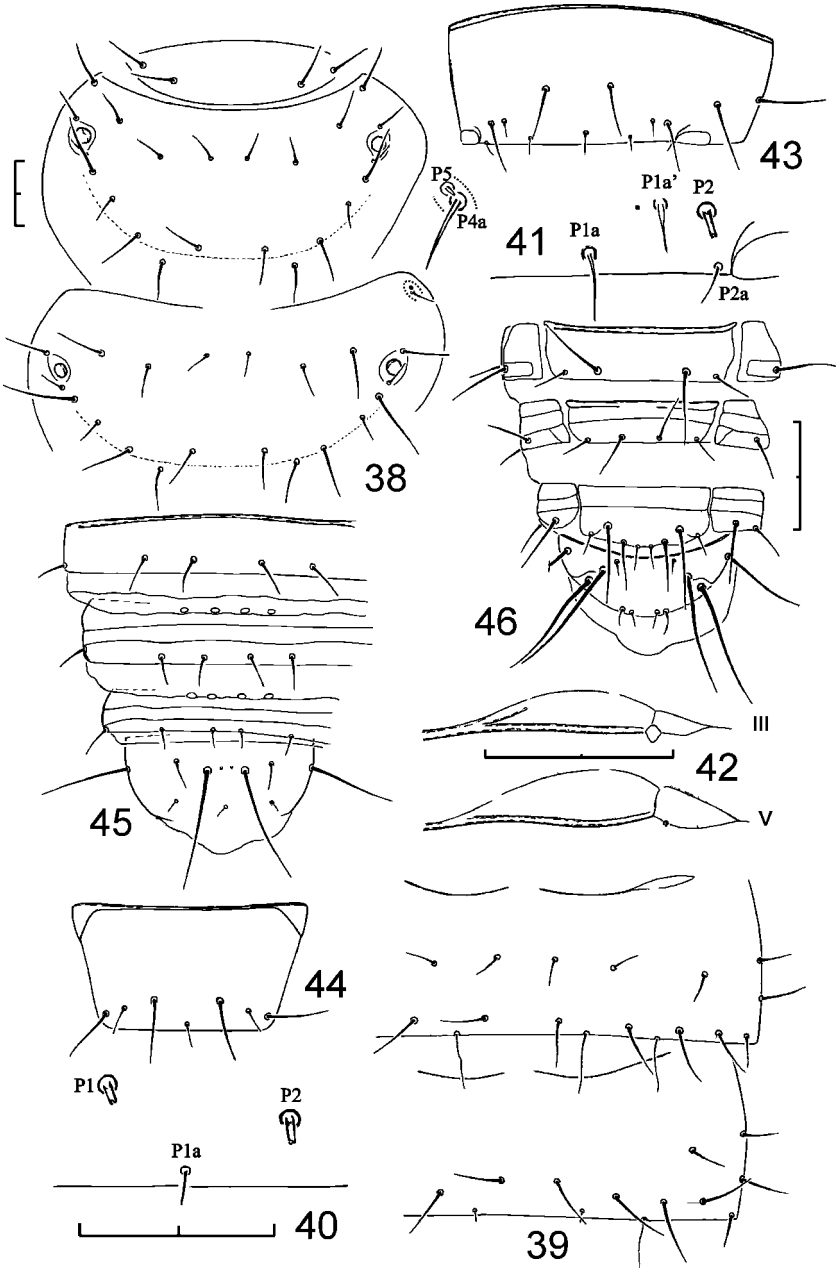
15-22. *Isoentomon serinus* n. sp.: 15 - pro-, meso- and metanotum (paratype 6202); 16 - urotergite VI and VII (paratype 6202) (magnif. as 15); 17 - seta *P1a* on urotergite VII (paratype 6202); 18 - seta *P1a'* on urotergite VIII (paratype 6202) (magnif. as 17); 19 - urotergite VIII-XII (paratype 6202) (magnif. as 15); 20 - urosternite VIII-XII (paratype 6202) (magnif. as 15); 21 - abdominal leg I (paratype 6203); 22 - hind margin of urosternite VII (paratype 6202) (magnif. as 15). Scale: 20 µm



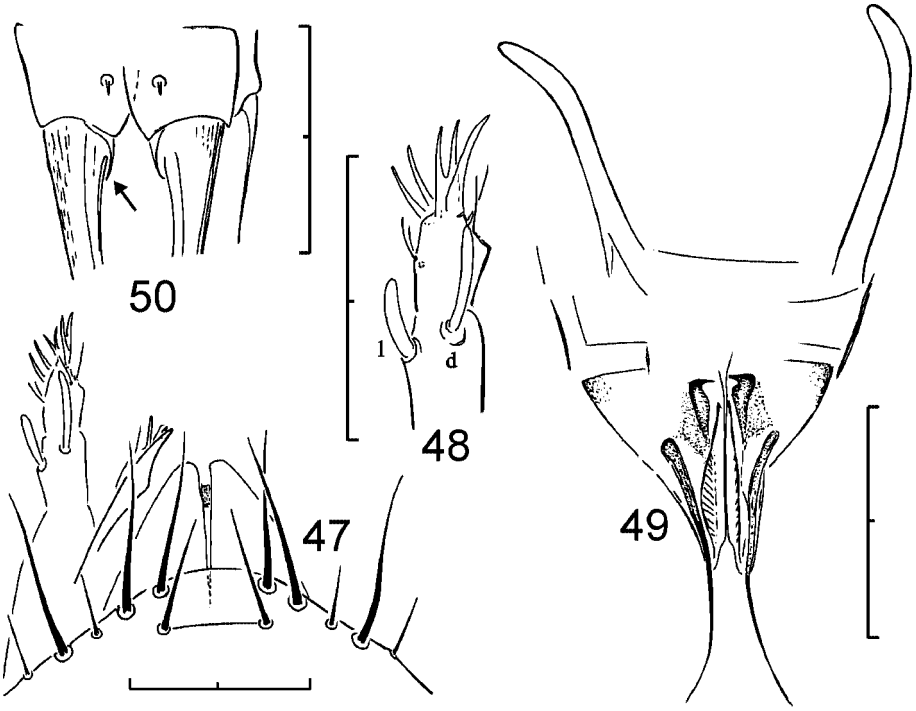
23-30. *Eosentomon canarinum* n. sp.: 23 - head (as – anterior sensillum, others – as fig. 1) (holotype); 24 - pseudoculus (paratype 6208); 25 - ditto (paratype 6211); 26 - anterior part of head, dorsal view (holotype); 27 - rostral seta (paratype 6218); 28 - mandible and galea (paratype 6218); 29 - tracheal camerae (paratype 6218); 30 - female squama genitalis (paratype 6208). Scale: 20 µm



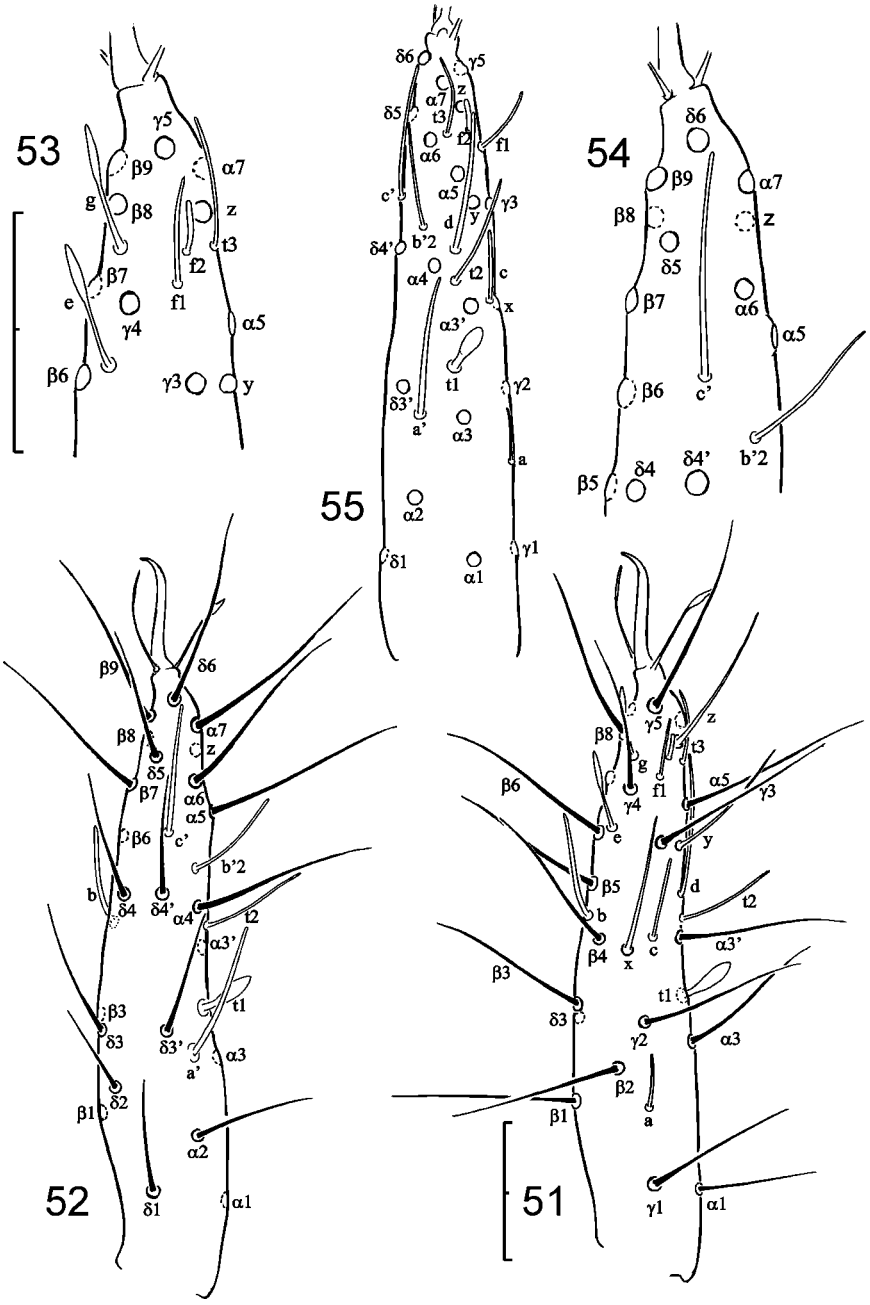
31-37. *Eosentomon canarinum* n. sp.: 31 - foretarsus, exterior view (holotype); 32 - foretarsus, interior view (holotype) (magnif. as 31); 33 - distal part of foretarsus, exterior view (holotype); 34 - distal part of foretarsus, interior view (holotype) (magnif. as 33); 35 - foretarsus, dorsal view (holotype) (magnif. as 31); 36 - leg III (paratype 6209); 37 - penis (b – basiperiphallar seta) (paratype 6218). Scale: 20 μm



38-46. *Eosentomon canarinum* n. sp.: 38 - nota (holotype); 39 - urotergite VI and VII (holotype) (magnif. as 38); 40 - seta *P1a* on urotergite VII (holotype); 41 - seta *P1a'* on urotergite VIII (holotype) (magnif. as 40); 42 - laterostigma III and V (paratype 6208); 43 - urotergite VIII (paratype 6208) (magnif. as 38); 44 - urosternite VIII (holotype) (magnif. as 38); 45 - urotergite IX-XII (paratype 6209) (magnif. as 46); 46 - urosternite IX-XII (paratype 6209). Scale: 20 µm



47-50. *Eosentomon noseki* Tx.: 47 - anterior part of head, dorsal view; 48 - maxillary palp (symbols as fig. 5); 49 - female squama genitalis; 50 - distal part of penis (arrow – peculiar "fold" on basistylus). Scale: 20 μm



51-55. *Eosentomon noseki* Tx.: 51 - foretarsus – exterior view; 52 - foretarsus – interior view (magnif. as 51); 53 - distal part of foretarsus – exterior view; 54 - distal part of foretarsus – interior view (magnif. as 53); 55 - foretarsus – dorsal view (magnif. as 51). Scale: 20 μm