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New Onychiurinae (Collembola: Onychiuridae) from Lugo, northwestern Iberian Peninsula.

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Abstract: Two new species of Onychiurinae (Collembola: Onychiuridae) collected in the northwest of the Iberian Peninsula are described and illustrated. *Protaphorura lucense* **sp. nov.** belongs to the *Protaphorura octopunctata* species group with 1,1,1 pseudocelli on subcoxae 1 and characterised by presence of 43/022/33343 dorsal pseudocelli and distinctly differentiated macro and mesochaetae, which are apically capitate. *Deuteraphorura montagudi* **sp. nov.** is characterised by presence of 32/133/33353 dorsal and 2/011/3211 ventral pseudocelli and the particular rod-like shape of dorsal meso and short macrochaetae.

Key words: Collembola, Onychiuridae, taxonomy, species list, new species, *Protaphorura lucense* **sp. nov.**, *Deuteraphorura montagudi* **sp. nov.**, Iberian Peninsula, Galicia.

Resumen: Nuevos Onychiurinae (Collembola: Onychiuridae) de Lugo, noroeste de la Península Ibérica. Se describen e ilustran dos nuevas especies de Onychiurinae (Collembola: Onychiuridae) procedentes del noroeste de la Península Ibérica. *Protaphorura lucense* **sp. nov.** pertenece al grupo de especies de *P. octopunctata* con 1,1,1 pseudocelos en las subcoxas 1 y caracterizado por la presencia de 43/022/33343 pseudocelos dorsales y macro y mesosedas claramente diferenciadas, con el ápice capitado. *Deuteraphorura montagudi* **sp. nov.**, se caracteriza por la presencia de 32/133/33353 pseudocelos dorsales y 2/011/3211 ventrales y por la particular forma de barilla de sus meso y macrosedas cortas dorsales.

Palabras clave: Collembola, Onychiuridae, taxonomía, lista de especies, nuevas especies, *Protaphorura lucense* **sp. nov.**, *Deuteraphorura montagudi* **sp. nov.**, Península Ibérica, Galicia.

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Introduction

The present study is based on the material of Collembola collected by Sergio Montagud in a forest in Baamonde, Lugo (Galicia), northwestern of Iberian Peninsula. The collected specimens belong to the following species: *Ceratophysella armata* (Nicolet, 1842) (Hypogastruridae Börner, 1906), *Protaphorura lucense* **sp. nov.**, *Deuteraphorura montagudi* **sp. nov.** (Onychiuridae Lubbock, 1867), *Paratullbergia callipygos* (Boerner, 1902) (Tullbergiidae Bagnall, 1935), *Folsomia setosa* Gisin, 1953, *Isotomiella madeirensis* (Gama, 1959) (Isotomidae Schäffer, 1896), *Heteromurus major* (Moniez, 1889) (Heteromuridae Mari Mutt, 1980), and *Tomocerus minor* (Lubbock, 1862) (Tomoceridae Schäffer, 1896).

Material and methods

Specimens were collected by Berlese extraction, preserved in alcohol, cleared in Nesbitt solution and then mounted in Hoyer medium on microscope slides.

Morphological terminology. The terminology used in the text and Tables are derived from that of Jordana *et al.* (1997), Pomorski (1998), and Weiner (1996). Labial types are named after Fjellberg (1999). Labium areas and chaetal nomenclature follow Massoud (1967) and D'Haese (2003). Chaetae on anal valves are named following Yoshii (1996). Chaetae on the furcal area are classified in accordance with Weiner (1996). Type of chaetotaxy on Thoracic I tergum follows Gisin (1952). Pseudocellar formulae are the number of pseudocelli by half-tergite (dorsally) or half-sternite (ventrally) as follows: head anterior, head posterior/Th I, Th II, Th III/Abd I, Abd II, Abd III, Abd IV, Abd V. The tibiotarsus chaetotaxy formula is expressed as: total number of chaetae (number of chaetae in distal row A, number of chaetae in row B, number of basal chaetae), for example 19(11,8,0).

Abbreviations.
Body parts. AIIIO—sensorial organ of Ant III, Ant—antennal segments, PAO—postantennal organ, Th—thoracic segments, Abd—abdominal segments, a,m,p chaeta—chaeta of rows a,m,p, pso—pseudocellus, psx— parapseudocellus, AS—anal spines, M chaeta—submedial posterior macrochaeta on Abd V tergum, sp—posterior sensillum on Abd V tergum, s'—additional microchaeta on Abd I–III and Abd V terga, set above the submedial pso.
Types of chaetae. M—long macrochaeta; me—mesochaeta; mi—microchaeta; ms—s-microchaeta (= microsensillum).

Material deposit. MNSV—Entomological collection "Torres Sala", Museum of Natural Sciences, Valencia.

Taxonomic section

***Protaphorura lucense* sp. nov.**
(Figs. 1–10, Tables I–III, VII)

Type locality.
Baamonde, Lugo, Galicia (Spain). UTM 29TPH08, 400 m a.s.l.

Type material.
Holotype: Female mounted on slide: Spain, Baamonde, Lugo (Galicia), 400 m a.s.l., leaf litter, 12.IX.2003, S. Montagud leg. **Paratypes**: Two females and two juvenile specimens mounted on slides collected together with Holotype. Holotype and Paratypes deposited in MNSV.

Etymology.
The name refers to Lugo, the province of the type locality.

Description.
Colour in alcohol, yellowish white. Length without antennae: females 1.36–1.49 mm. Body shape cylindrical, with anal spines set on distinct papillae.

Antennae approximately as long as head. Granulation more or less uniform, distinct. Base of antenna well marked. Antennal segment IV with subapical organite. Microsensillum on antennal segment IV in latero-external position, ca. 1/3 length from the base. Antennal III sense organ built of 5 papillae, 5 guard chaetae, 2 sensory rods, 2 straight and granulated sensory clubs and lateral microsensillum (ms) (Fig. 9). Ant I with 11 chaetae. Ant II with 19 chaetae.

PAO composed of 28–33 simple vesicles (Fig. 3). 4+4 p-chaetae between postero-internal pso on head (p1', P1, p2, P3; Fig. 1). Mandible with strong molar plate and 4 apical teeth. Maxilla bearing 3

teeth and 6 lamellae. Maxillary palp simple with 1 basal chaeta and 2 sublobal hairs. Labral chaetae formula 4/342. Labium with 6 proximal, 4 basomedian (E, F, G and f) and 6 basolateral chaetae; labial type A. Postlabial chaetae 5–6+5–6 along ventral groove (Fig. 2).

Pseudocellar formula dorsally: 43/022/33343(2), ventrally: 1/000/00000 (Figs. 1 & 2); subcoxa 1 of legs with 1,1,1 pso respectively.

Dorsal chaetotaxy as in Fig. 1 and Tables I–III, usually with some asymmetry, well differentiated into acuminate micro and capitate meso and macrochaetae (Fig. 4). Sensilla weakly marked, with blunt apex (Fig. 4). Th II and III terga with microsensillum laterally. Th I tergum with 10–13 chaetae (chaetotaxy type i(1)3m). Abd I–III and V terga without s' (Fig. 1). Abd IV and V terga with p0 axial chaeta, Abd VI tergum with p0 and generally a0 axial chaetae (Figs. 1 & 7). Ratio M/sp on Abd V as 2.4–3.1 (Fig. 7). Ratio M/AS as 1.7–2.0. Straight lines, passing through the bases of chaetae a1 and m1 situated above anal spines, subparallel (Fig. 7).

Ventral body chaetotaxy as in Fig. 2. Between legs on pro-, meso- and metathorax 1+1, 1–2+1–2 and (1)2+2 chaetae respectively. Ventral tube with about 9+9 distal chaetae and 2+2 chaetae at the base. Furca reduced to cuticular pocket with 2+2 setulae – 1+1 setulae located on a cuticular fold, remaining 1+1 setulae set located distinctly below of the fold; three manubrial rows of chaetae present posteriorly to dental chaetae (Fig. 1). Anal valves with numerous acuminate chaetae; each lateral valve with a0, 2a1 and 2a2; upper valve with chaetae a0, 2a1, 2b1, 2b2, c0, 2C1 and 2c2 (Fig. 8).

Appendages. Subcoxa 1 of legs I–III with 6, 6 and 5–6 chaetae, subcoxa 2 with 1, 5 and (4)–5 chaetae, respectively. Tibiotarsi of legs I–III with 21 (11, 8, 2), 22–23 (11, 8, 3–4) and 23–24 (11, 8, 4–5) chaetae, respectively, of wich 2,2,2 slightly capitate macrochaetae on basal row (R chaetae). Claws with inner denticle (Fig. 10). Empodial appendage slender and pointed, without basal lamella, as long as inner edge of the claw. Anal spines set on distinct papillae, 0.9–1.0 times as long as inner edge of unguis.

Male ventral organ is absent.

Discussion.

P. lucense **sp. nov.** belongs to the *octopunctata*-group defined by Pomorski & Kaprus' (2007) and Kaprus' & Pomorski (2008), characterised by presence of four or more pso at antennal base. Within this group is characterised by presence of distinctly differentiated macro and mesochaetae, which are apically capitate. It has the same formula of dorsal pso on head to Abd III (43/022/333) (taking variability into account) as *P. eichhorni* (Gisin, 1954), *P. ianstachi* (Yosii, 1972), *P. licheniphila* Kaprus' & Pomorski, 2008, *P. mongolica* (Martynova, 1970), *P. nutak* (Yosii, 1972), *P. octopunctata* (Tullberg, 1876), *P. quadriocellata* (Gisin, 1947), *P. sakatoi* (Yosii, 1966), *P. saltuaria* Pomorski & Kaprus', 2007, *P. tetragrammata* (Gisin, 1964), and *P. valsainensis* (Acon, 1981). They can be separated by the combined characters in Table VII.

***Deuteraphorura montagudi* sp. nov.**
(Figs. 11–20, Tables IV–VI, VIII)

Type locality.
Baamonde, Lugo, Galicia (Spain). UTM 29TPH08, 400 m a.s.l.

Type material.

Holotype: Female mounted on slide: Spain, Baamonde, Lugo (Galicia), 400 m a.s.l., leaf litter, 12.IX.2003, S. Montagud leg. **Paratypes**: One male, three females, and two juvenile specimens mounted on slides collected together with Holotype. Holotype and Paratypes deposited in MNSV.

Etymology.

The species is cordially dedicated to Sergio Montagud, University of Valencia, responsible for the sampling of this new species.

Description.

Colour in alcohol, white. Body length (excluding antennae) of adults: male 1.03 mm, females 1.12-1.43 mm. Cuticle granulation more or less uniform and fine, somewhat coarser on terga and head capsule.

Antennal bases well marked. Antennae slightly shorter than head; ratio antennae/head diagonal = 0.60–070. Ant IV with subapical organite; microsensillum in latero-external position, approximately two-fifths length from the base; sensilla not well distinguishable from ordinary chaetae, except one latero-internal and one apical sensilla (Fig. 11). Ant I, II and III with 8, 13–14 and 18–19 chaetae respectively. AIIIO as in Fig. 12, with five papillae, five guard chaetae, two small sensory rods, two bent and smooth sensory clubs and lateral microsensillum (ms).

PAO consists of 12−14 finely granulated vesicles (Fig. 13). Labrum with 5,4,2 chaetae. Labial palp of type AB with five proximal chaetae; chaetotaxy of the basomedian field (submentum) with 4+4 chaetae, basolateral field (mentum) with 5 chaetae; outer maxillary lobe with one basal chaeta and with one sublobal hair. Mandible with strong molar plate and four apical teeth; maxilla bearing three teeth and six lamellae. Postlabial chaetae 4+4 along ventral groove (Fig. 16).

Pseudocellar formula dorsally: 32/133/33353, ventrally: 11/011/3211; all subcoxa I with two pso. Psx not visible on the body.

Dorsal chaetotaxy as in Fig. 15 and Tables IV−VI; nearly symmetrical, well differentiated into acuminate micro and blunt rod-like meso and short macrochaetae, sometimes extra chaetae and asymmetries have been observed; macrochaetae only differentiated on the two last Abd terga. Th II and III with microsensilla located laterally. Body sensilla short, rod-like, well differentiated on Abd V as 2+2 (Fig. 17). Head with unpaired dorsal chaeta d0. Th I with 7−9+7−9 chaetae. Th II to Abd III with 4,4,3,3,3 chaetae respectively on both sides of axial line and without unpaired axial chaetae. Abd IV with unpaired axial chaeta (p0); Abd V without unpaired axial chaetae. Ratio chaetae M/sp = 0.5 on Abd V. Abd VI with 2 unpaired axial chaetae: a0 and p0 (Fig. 17). Anal spines absent.

Ventral body chaetotaxy as in Fig. 16. Ventral chaetae acuminate. Without ventral chaetae on Th sterna. VT with 6+6 apical chaetae and without basal chaetae. Furca reduced to a finely granulated area, with 2+2 posterior setulae arranged in one row (Fig. 20). Anal valves with numerous acuminate chaetae; each lateral valve with a0 and 2a1; upper valve with chaetae a0, 2b1, 2b2, c0, 2C1 and 2c2 (Fig. 18).

Appendages. Subcoxa 1 of I, II, III pairs of legs with 4–5,5,5 chaetae, subcoxa 2 with 0,4,3 chaetae, respectively. Tibiotarsi I, II, and III with 18(9, 8,1), 19(9, 8,2) and 17(9,7,1) chaetae respectively, of which 1,2,1 blunt macrochaetae on basal row (R chaetae). Claws without teeth. Empodial appendage slender, slightly shorter than inner edge of a claw, without basal lamella (Fig. 19) (appendage length about 0.72 inner edge of claw).

Male ventral organ present as a group of rod-like chaetae on Abd III sterna (Fig. 14).

Discussion.

The new species, belonging to the *Deuteraphorura* group of species with 1+1 pso on Th I, forms part of species with 2+2 pso on the posterior part of head and 3+3 pso on Th II-III (Jordana *et al.* 2012). Main differences between *D. montagudi* **sp. nov.** and these species are summarized in Table VIII. The new species differs from other ones by different formula of the ventral pso and the particular shape of dorsal meso and short macrochaetae (rod-like in the new species, acuminate or slightly capitate in other species).

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References

D'Haese, C. 2003. Homology and morphology in Poduromorpha (Hexapoda, Collembola). *European Journal of Entomology*, **101**: 385-407.

Fjellberg, A. 1999. The labial palp in Collembola. *Zoologischer Anzeiger*, **237**: 309-330.

Gisin, H. 1952. Notes sur les Collemboles, avec démembrement des *Onychiurus armatus*, *ambulans* et *fimetarius* auctorum. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, **25**(1): 1-22.

Jordana, R.; Arbea, J.I.; Simón, C. & Luciáñez, M.J. 1997. *Collembola, Poduromorpha. In:* Ramos, M.A. & al. (Eds.). *Fauna Ibérica*, vol. 8. Museo Nacional de Ciencias Naturales, CSIC, Madrid, 807 pp.

Jordana, R.; Baquero, E.; Reboleira, S. & Sendra, A. 2012. Reviews of the genera *Schaefferia*, *Deuteraphorura*, *Plutomurus* and the *Anurida* species group without eyes, with the description of four new species of cave springtails (Collembola) from Krubera-Voronya cave, Arabika Massif, Abkhazia. *Terrestrial Arthropod Reviews*, **5**: 35-85.

Kaprus', I.J. & Pomorski, R.J. 2008. Review of the palaearctic *Protaphorura* Absolon, 1901 species of *octopunctata* group (Collembola: Onychiuridae). *Annales Zoologici (Warszawa)*, **58**(4): 667-688.

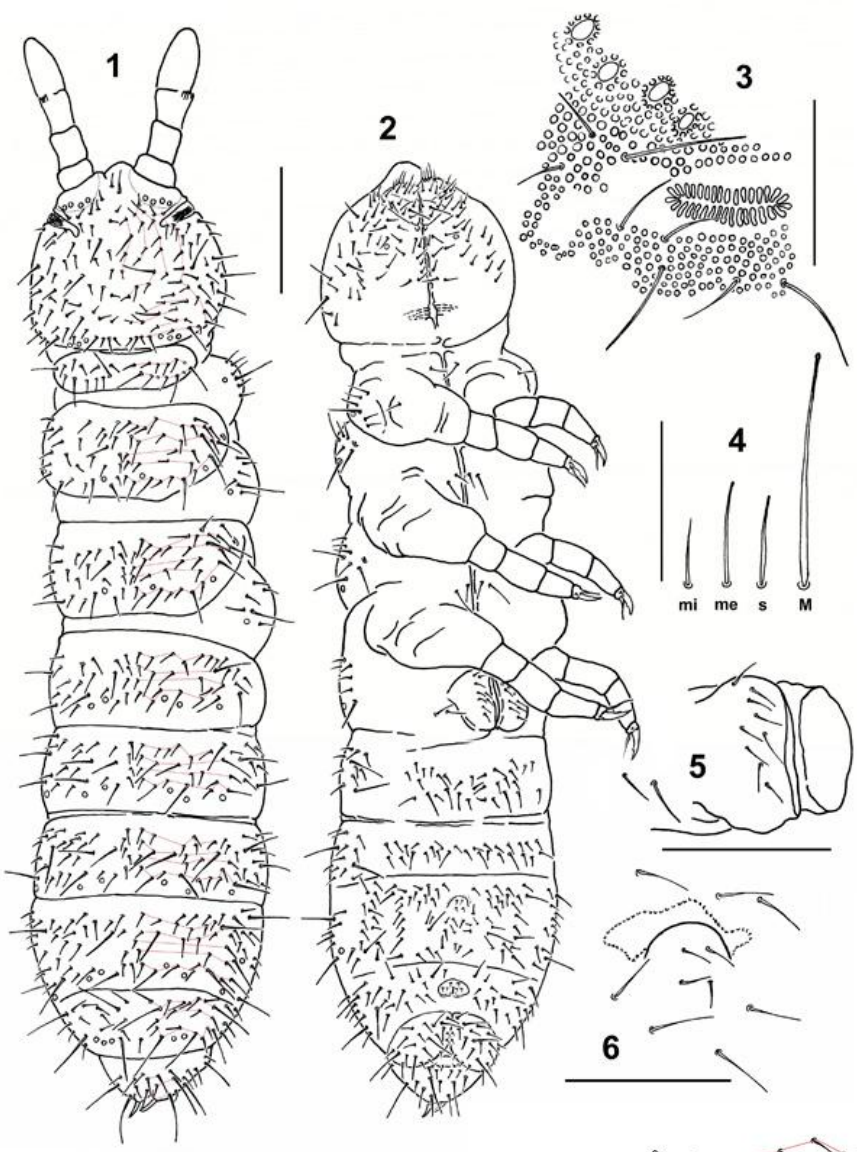
Massoud, Z. 1967. *Monographie des Neanuridae, Collemboles Poduromorphes à pièces buccales modifiées.* In: Delamare Deboutteville, C. & Rapoport, E.H. (Eds.). *Biologie de l'Amérique Australe*. Paris, CNRS, III, 7–399.

Pomorski, R.J. 1998. Onychiurinae of Poland (Collembola: Onychiuridae). *Genus, International Journal of Invertebrate Taxonomy (Supplement)*: 1-201.

Pomorski, R.J. & Kaprus', I.J. 2007. Redescription of *Protaphorura octopunctata* (Tullberg, 1876) and *Protaphorura quadriocellata* (Gisin, 1947) with description of two new related species from Siberia and Europe (Collembola: Onychiuridae). *Revue suisse de Zoologie*, **114**(1): 127-139.

Weiner, W.M. 1996. Generic revision of Onychiurinae (Collembola: Onychiuridae) with cladistic analysis. *Annales de la Société Entomologique de France (N.S.)*, **32**: 163-200.

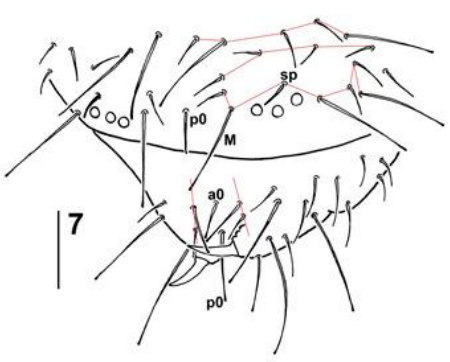
Yoshii, R. 1996. Identity of some Japanese Collembola IV. *Deuteraphorura* group of *Onychiurus* – continued. *Annales of the Speleological Institute of Japan (Iwaizumi)*, **14**: 1–15.

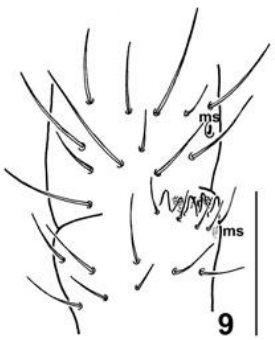


Figs. 1-10.- *Protaphorura lucense* **sp. nov.**:

1.- Dorsal chaetotaxy.
2.- Ventral chaetotaxy.
3.- PAO and anterior cephalic pso.
4.- Types of dorsal chaetae: mi, acuminate microchaeta; me, capitate mesochaeta; s, blunt sensillum; M, capitate macrochaeta.
5.- Ventral tube.
6.- Remnant of furca.

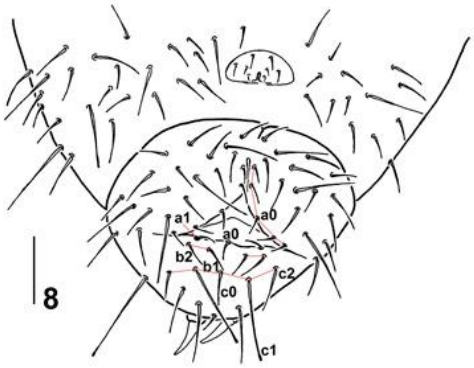
Scales: 0.2 mm (1, 2), 0.05 mm (3–6).

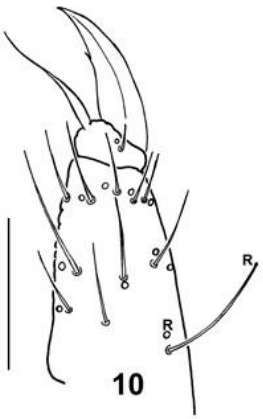




7.- Chaetotaxy of Abd IV and V terga.
8.- Chaetotaxy of Abd IV and V sterna.
9.- Ant III sensory organ.
10.- Distal part of leg III.

Scales: 0.1 mm (7–9), 0.05 mm (10).





Figs. 11-20.- *Deuteraphorura montagudi* **sp. nov.**:

11.- dorsal chaetotaxy of Ant III–IV.
12.- Ant III sensory organ.
13.- PAO and anterior cephalic pso.
14.- Abd II and III sterna of a male.

Scales: 0.1 mm (11), 0.05 mm (13–14).

15.- dorsal chaetotaxy.
16.- ventral chaetotaxy.

Scale: 0.2 mm.

17.- chaetotaxy of Abd IV–VI terga.
18.- chaetotaxy of Abd IV and V sterna.
19.- distal part of leg III.
20.- Remnant of furca.

Scales: 0.1 mm (17–18), 0.05 mm (19–20).

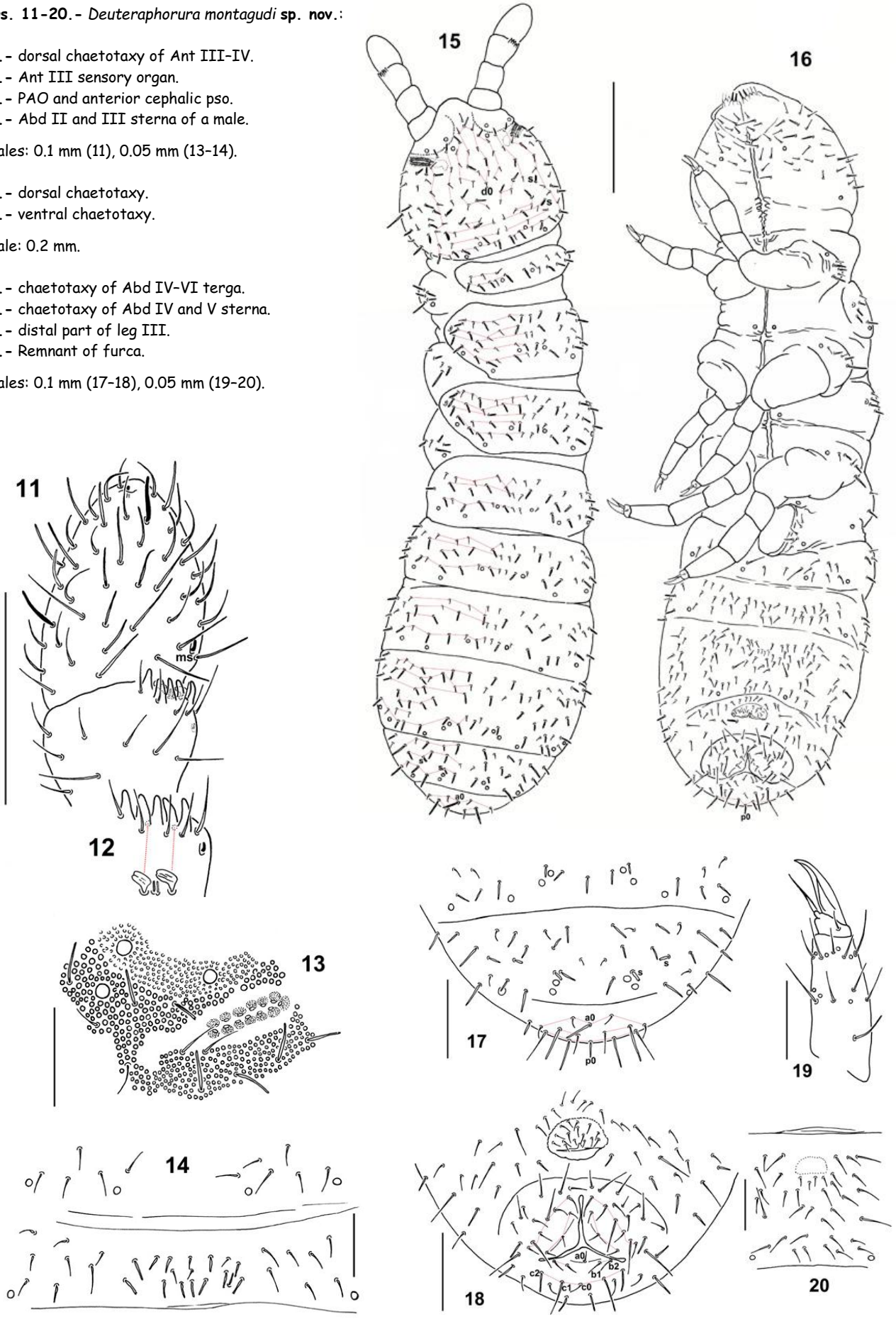


Table I.- *Protaphorura lucense* **sp. nov.** Head chaetotaxy. Abbreviations: me, mesochaeta; mi, microchaeta; M, macrochaeta; z, chaeta z; "-" denotes absence of chaeta; "( )" denotes chaeta present or absent.

Chaeta number/serie	0	1	2	3	4	5	6	7
a	me+M							
d	-	mi	mi	M	mi	-	-	-
sd	-	mi	mi	mi	me	mi	-	-
sd'	-	mi	mi	me	mi	me	-	-
v	-	mi	me	mi	M	-	-	-
ca	-	-	-	-	-	mi	-	-
cm	-	-	-	mi	mi	me	-	-
cb	-	mi	me	-	M	mi	-	-
cp	-	-	-	-	mi	(mi)	mi	-
p	-	mi+M	mi	M	mi(z)	M	mi	-
g	11 chaetae							

Table II.- *Protaphorura lucense* **sp. nov.** Dorsal thoracic chaetotaxy. Abbreviations: me, mesochaeta; mi, microchaeta; M, macrochaeta; ms, microsensillum; "-" denotes absence of chaeta; "( )" denotes chaeta present or absent.

Chaeta number/serie		1	2	3	4	5	6	7
Th I	m	mi	mi	mi	(mi)	mi	(mi)	-
	p	M	(me)	me	(me)	M	me	M
Th II-III	a	me	mi	me+(me)	mi	me+(me)	mi	me+(me)
	m	mi	M	mi	me	M	me	M+ms
	ca	mi	-	-	mi	me	-	-
	cp	(mi)	mi	mi	-	mi	-	-
	P	mi	M	M	mi+mi	M	me	M

Table III.- *Protaphorura lucense* **sp. nov.** Dorsal abdominal chaetotaxy. Abbreviations: me, mesochaeta; mi, microchaeta; M, macrochaeta; s, sensilla ; AS: anal spines; "-" denotes absence of chaeta; "( )" denotes chaeta present or absent.

Chaeta number/serie		0	1	2	3	4	5	6	7
Abd I	a		me	me	mi	mi	mi	mi	me
	m		mi	M	-	me	-	-	M
	ca		mi	-	-	-	mi	-	me
	p		mi	me	s	M	me	me	M
Abd II-III	a		me	me	(mi)	mi	mi	mi	-
	m		mi	M	-	M	-	-	M
	ca		mi	-	-	mi	mi	-	me
	p		mi	M	s	M	me+(me)	me+(me)	M
Abd IV	a		me	me	mi	me+me	mi+mi	me+me	-
	m		mi	M	me	me	me	M	-
	ca		me	-	-	-	-	(me)	me
	cp		(mi)	-	-	me	-	me	M
	p	me	mi	M	s	me	me	M	me+me
Abd V	a		me	M	me	me+(me)	me	me	M
	m		me	-	mi	-	mi	-	me
	p	me	mi	M	s	M	me	me	M
Abd VI	a	(me)	me	mi					
	m	-	mi	M					
	p	me	AS	M					

Table IV.- *Deuteraphorura montagudi* **sp. nov.** Head chaetotaxy. Abbreviations: mi, microchaetae; me, mesochaeta; s, sensilla ; z, chaeta z; "-" denotes absence of chaeta; "( )" denotes chaeta present or absent.

Chaeta number/serie	0	1	2	3	4	5	6	7
a	me+mi							
d	mi	mi	me	mi	mi	-	-	-
sd	-	mi	mi	mi	mi	me	-	-
sd'	-	mi	me	-	mi	me	-	-
v	-	mi	me	mi	me	-	-	-
ca	-	-	-	-	-	-	s	-
cm	-	-	-	mi	mi	me	-	-
cb	-	mi	-	me	-	mi	me	-
cp	-	mi	-	-	mi	-	mi	-
p	-	(me)	mi	me	mi(z)	me	me	-
g	10 chaetae; g1, g8, g10 me							

Table V.- *Deuteraphorura montagudi* **sp. nov.** Dorsal thoracic chaetotaxy. Abbreviations: mi, microchaeta; me, mesochaeta; s, sensilla; ms, microsensilla; "-" denotes absence of chaeta.

Chaeta number/serie		1	2	3	4	5	6	7
Th I	m	-	mi	-	mi	-	mi	-
	p	me	mi	me	-	me	me	me
Th II	a	me	me	mi	me	mi	mi	me
	m	-	me	mi	mi	-	me	s+ms
	ca	mi	-	-	-	me	-	me
	cp	me	mi	-	mi	-	mi	-
	p	mi	me	-	mi	me	me	me
Th III	a	mi	mi	mi	me	mi	mi	me
	m	-	me	me	mi	-	me	s+ms
	ca	mi	-	-	-	me	-	me
	cp	me	mi	-	me	-	mi	-
	p	mi	me	-	mi	me	me	me

Table VI.- *Deuteraphorura montagudi* **sp. nov.** Dorsal abdominal chaetotaxy. Abbreviations: mi, microchaeta; me, mesochaeta; M, macrochaeta; s, sensilla; "-" denotes absence of chaeta; "( )" denotes chaeta present or absent.

Chaeta number/serie		0	1	2	3	4	5	6	7
Abd I	a		mi	me	mi	-	mi	mi	mi
	m		mi	-	-	me	-	-	me
	ca		-	-	-	(me)	me	-	-
	p		mi	me	s	me	me	mi	me
Abd II–III	a		mi	me	mi	-	mi	mi	mi
	m		mi	-	-	me	-	-	me
	ca		-	-	-	me	me	-	-
	p		mi	me	s	me	me	mi	me
Abd IV	a		-	me	me	me	mi	mi	mi
	m		mi	mi	me	mi	me	me	me
	ca		-	me	-	me	me	-	me
	cp		-	-	-	me	me	me+mi	me+mi
	p	me	mi	me	s	me	me+me	mi	me
Abd V	a		-	me	mi	me	mi	-	M
	m		mi	me	me	s	me	-	-
	p		-	M	s	M	me	mi	M
Abd VI	a	M	mi	mi					
	m	-	mi	M					
	p	me	M	M					

Table VII.- Main diagnostic characters of *Protaphorura lucense* **sp. nov.** and related species of *Protaphorura* with 4 or more pso at base of antenna (*octopunctata* group *sensu* Pomorski & Kaprus', 2007 and Kaprus' & Pomorski, 2008). PAO, number of vesicles on PAO; S', s' chaeta on Abd I–III and V present (+) or absent (–); M/Sp, ratio chaetae M/sp on Abd V; PSP, straight lines, passing through the bases of chaetae a1 and m1 situated above anal spines, convergent (C) or parallel (P); X0, number of axial chaetae on Abd VI; MVO, male ventral organ present (+) or absent (–).

Species	Dorsal pso	Coxa pso	Ventral psx	PAO	S'	M/sp	PSP	X0	MVO	Distribution
eichhorni	44-3/022/ 3335(4,6)3	111	1/000/10010	?	+	2	C	?	+	Luxembourg
ianstachi	43/022/ 3334-33	111	?	28-33	?	?	?	?	+	Russia: Caucasus
licheniphila	43/022/ 33342	111	1/000/11000	24–30	-	1.4-1.6	P	1	-	Middle Siberia
mongolica	43/022/ 33342	100	invisible?	26–27	-	1.7	P	1	-	Mongolia
nutak	43/022/ 33353(4)	111	1/000/11110	42–46	-	1.4	P	1	-	Far East of Russia, Korea, Japan
octopunctata	4(5-6)3(4)/022/ 3335(4)3(4-5)	000	1/000/111(0)10	30-40	-	1.2-1.3	P	2(3)	-	North Asiatic part of Russia
quadriocellata	43(4)/022/ 33333	111	1/000/11110	28-36	-	3-4	P	2	-	Europe, South Russia
sakatoi	43/022/ 33343	100	1/000/1101(0)1	30-38	-	1.4	C	1	-	Central and South East Europe, South Russia, Afghanistan
saltuaria	4(3)3/022/ 33333	111	1/000/10000	35-42	-	3.7-3.8	P	1	-	Ukraine, Poland
tetragrammata	43/022/ 3333(4)3	111	1/000/11110	30–40	-	2.6-3.3	C	1	-	Bosnia-Herzegovina, Poland
valsainensis	43/022/ 33353	111	?	22-30	-	1.2	C	1	-	Central Spain
lucense **sp. nov.**	43/022/ 33343(2)	111	invisible?	28-33	-	2.4-3.1	P	2(1)	?	Northwestern Spain

Table VIII.- Main diagnostic characters of *D. montagudi* **sp. nov.** and related species with 32/133 pso on head and Th.

Species	Dorsal pso	Ventral pso	Distribution	Habitat
angelieri (Izarra, 1968)	32/133/33342	3/011/1212	France	Soil
antheuili (Denis, 1936)	32/133/33354	2/011/0000	Europe	Soil & cave
banatica (Gruia, 1965)	32/133/33354	3/0--/3222	Romania	Cave
bergamaria (Gisin, 1956)	32/133/34454	2/000/2212	Italy	Cave
cebennaria (Gisin, 1956)	32/133/33354	3/011/3212	Europe	Cave& soil
defensaria (Gisin, 1964)	32/133/33354	2/011/1212	Italy	Cave
dunaria (Gisin, 1956)	32/133/33354	3/011/2212	Europe	Cave
eduardi (Denis, 1937)	32/133/33353	2/000/1212	Italy & France	Soil & cave
gemae (Simón *et al.*, 1994)	32/133/33353	3/011/3212	Spain	Soil
gigoni (Gisin, 1962)	32/133/33354	3/011/0111	Europe	Cave
haybachae (Gisin, 1962)	32/133/33354	3/011/3222	Austria	Cave
imperfecta (Denis, 1938)	32/133/33354	3/011/2212	Europe	Soil & cave
insubraria (Gisin, 1952)	32/133/33353	3/011/2212	Europe	Soil & cave
jana (Christiansen & Bellinger, 1980)	32/133/23332-3	2/000/1101-2	USA & New Mexico	Cave?
koreana Arbea & Lee, 2015	32/133/33332	3/011/2212	South Korea	Cave
mangazeya Babenko, 2007	32/133/33353	3/011/3212	Russia, Siberia	Soil
opa (Christiansen & Bellinger, 1980)	32/133/33343-4	2-3/011/0-1112	USA & New Mexico	Soil & cave
paro (Christiansen & Bellinger, 1980)	32/133/3333-42-3	2/000/2111	USA & Canada	Cave & soil
pseudoinsubraria (Dallai, 1970)	32/133/33353	3/011/1212	Italy	Soil
silvaria (Gisin, 1952)	32/133/33353	3/011/3222	Europe	Soil & cave
traiani Gruia & Popa, 2005	32/133/33343	3/000/0112	Romania	Cave
variabilis (Stach, 1954)	32/133/33343	2/---/1112	Europe	Soil
vercoraria (Gisin, 1963)	32/133/33354	3/011/3222	Europe	Soil
montagudi **sp. nov.**	32/133/33353	2/011/3211	Northwestern Spain	Soil