Stachorutes najtae n. sp., a new psammophile species of Collembola from Italy (Neanuridae, Pseudachorutinae)

Pietro Paolo FANCIULLI
Romano DALLAI
Francesco FRATI
Antonio CARAPELLI
University of Siena, Department of Life Sciences,
via Aldo Moro 2, 53100 Siena (Italy)

Published on 31st March 2017

urn:lsid:zoobank.org:pub:A8480C2E-ECA3-4B95-9D65-2D372935D5E4

Fanciulli P. P., Dallai R., Frati F. & Carapelli A. 2017. — *Stachorutes najtae* n. sp., a new psammophile species of Collembola from Italy (Neanuridae, Pseudachorutinae). *Zoosystema* 39 (1): 31-36. https://doi.org/10.5252/z2017n1a4

ABSTRACT
Stachorutes najtae n. sp. is described from the interstitial sand dunes of central Italy. It has 4 + 4 eyes with a postantennal organ composed of 7-9 simple vesicles and the furcal dens with six chaetae. *Stachorutes najtae* n. sp. appears closely related to *S. gracilis* Smolis & Shvejonkova, 2006 from which it can be separated by the different chaetotaxy of the dens and legs.

KEY WORDS
Stachorutes,
Italy,
littoral sands,
new species.

RÉSUMÉ
Stachorutes najtae *n. sp., une nouvelle espèce de collemboles psammophiles d'Italie (Neanuridae, Pseudachorutinae).*
Stachorutes najtae n. sp. est décrite des dunes de sable interstitiel d'Italie centrale. Elle présente 4 + 4 yeux avec un organe postantennal composé de 7-9 vésicules simples, et une dent furcale avec six soies. *Stachorutes najtae* n. sp. semble étroitement liée à *S. gracilis* Smolis & Shvejonkova, 2006, mais s'en distingue par la chaétoxaxie différente de la dens et des pattes.

MOTS CLÉS
Stachorutes,
Italie,
sables littoraux,
espèce nouvelle.

INTRODUCTION

Psammophile species of Collembola are characterized by several peculiar morphological traits that allow them to live and move in the interstitial spaces of sandy habitats (Thibaud & Christian 1997; Thibaud 2007). In the last few years we begun to characterize the collembological fauna of littoral environments of Italy and a first contribution was the description of a new species of *Isotomodes* Linnaniemi, 1907 (Fanciulli *et al.* 2015). In this paper we further describe a new species of Pseudachorutinae Massoud, 1967 belonging to the genus *Stachorutes* Dallai, 1973 collected in some localities along the sandy coast of Tuscany. The genus *Stachorutes* was described by Dallai (1973) with material collected near Como (Northern Italy) and it was defined as having intermediate characters between the genera *Protachorutes* Cassagnau, 1955 and *Micranurida* Börner, 1901. Thibaud & Palacios Vargas (2000) redefined the Pseudachorutinae characters of the genus while Simón Benito *et al.* (2005) attempted a phylogenetic analysis to further clarify its synapomorphies. The number of species within the genus *Stachorutes* is now 18, including the new one and the more recent descriptions by Smolis & Shvejonkova (2006) and Gao & Yin (2007). The distribution of the species of *Stachorutes* appears very fragmented; most of them (10) are from Europe but four are from East Asia (China and Vietnam), two from Mexico and one from North America (USA and Canada) and Africa (Tanzania) respectively (Bellinger *et al.* 2016).

MATERIAL AND METHODS

The material was collected in the sand dunes in three Parks along the Tuscany coast: Park of Burano lake, Natural Park of Maremma, and Park of S. Rossore. In each locality several soil samples were collected by means of a corer and the mesofauna was first recovered with Berlese funnels and successively sorted through a stereoscopic microscope. Specimens of *Stachorutes najtae* n. sp. were mounted on slides in both lactic acid and Marc André fluid; we described the new species following the terminology as proposed by Dallai (1973); Thibaud & Palacios Vargas (2000); Simón Benito *et al.* (2005); and Smolis & Shvejonkova (2006). Images of scanning electron microscopy were obtained following the standard procedure: specimens preserved in 80% ethanol were completely dehydrated in absolute ethanol, critical-point dried in a Balzer CPD 030 apparatus and coated with gold in a Balzer MED 010 sputter coater. Observations were performed with a Philips XL20 scanning electron microscope.

Abbreviations

Abd.	abdomen, abdominal;
Ant.	antennal segment;
d1	unpaired dorsal chaeta of the head;
PAO	postantennal organ;
s	sensorial chaetae;
Th.	thorax, thoracic;
VT	ventral tube.

Institutions

DSV	Department of Life Sciences, University of Siena;
MNHN	Muséum national d'Histoire naturelle, Paris.

SYSTEMATICS

Family Neanuridae Börner, 1901
Genus *Stachorutes* Dallai, 1973

Stachorutes najtae n. sp.
(Figs 1-3; Table 1)

Type material. — **Holotype**. Italy, Park of Burano Lake (42°24'4.141"N, 11°21'35.662"E) (5.IV.2011) preserved in DSV. **Paratypes**. 15 paratypes mounted on slides same localities of holotype (12 ♀, 3 ♂); other paratypes from the Natural Park of Maremma (42°38'36.1"N, 11°03'27"E) (16.III.2013) (9 specimens mounted on slides, 6 ♀ and 3 ♂) and 3 specimens (♀) on slides from the Park of S. Rossore (43°47'13.1"N, 10°16'11.1"E) (22.V.2013). 17 paratypes deposited in the DSV (8 ♀ and 2 ♂ from the Park of Burano Lake; 4 ♀ and 1 ♂ from the Natural Park of Maremma; 2 ♀ from the Park of S. Rossore); 10 paratypes deposited in the MNHN (4 ♀ and 1 ♂ from the Park of Burano Lake; 2 ♀ and 2 ♂ from the Natural Park of Maremma; 1 ♀ from the Park of S. Rossore).

Habitat. — Specimens were collected by means of a corer in the coastal sandy dunes of three Tuscany Parks: Burano Lake, Maremma and S. Rossore; collecting areas are covered by herbaceous and shrubby vegetation mainly represented by psammophile and halophile plants, such as: *Ammophila arenaria* (L.), *Echinophora spinosa* (L.), *Euphorbia peplis* L., and *Othantus maritimus* (L.).

Type locality. — Italy, Park of Burano lake (42°24'4.141"N, 11°21'35.662"E).

Diagnosis. — Habitus typical of the genus with 4 + 4 eyes, dens with six chaetae and mucro well separated from dens.

Etymology. — The new species is named in the memory of our dear friend Judith Najt for her valuable contribution to the knowledge of springtails.

Description

Habitus (Figs 1A; 3A)

Length of body 0.6-0.7 mm. White body colour with minute granules of blue pigment uniformly distributed. Tegument granulation fine and uniform.

Antennae

Antennae slightly shorter than the cephalic diagonal. Ant. l with 7 chaetae, Ant. II with 11 chaetae (Fig. 2C). Ant. III and IV dorsally fused; chaetotaxy as in Figures 2A, B; 3C. Sensory organ of antennal segment III consisting of two small sensilla inside a cuticular pocket protected by two cylindrical guard sensillae (Fig. 2A, B). Apex of Ant. IV with a simple vesicle (Figs 2A, B; 3C), subapical organite, microsensillum, i chaeta and 5 cylindrical sensilla (Fig. 2A, B). Ocular plate with 4 + 4 ocelli strongly pigmented; post antennal organ constituted by 7-9 simple vesicles (Figs 1D; 3B). Buccal cone short, maxilla styliform, mandible not well visible in the slides, probably with two distal teeth. Labium with 9 chaetae (A, B, C, D, E, F, G, e, f) (Fig. 1C); labrum with 2/2,4 chaetae.

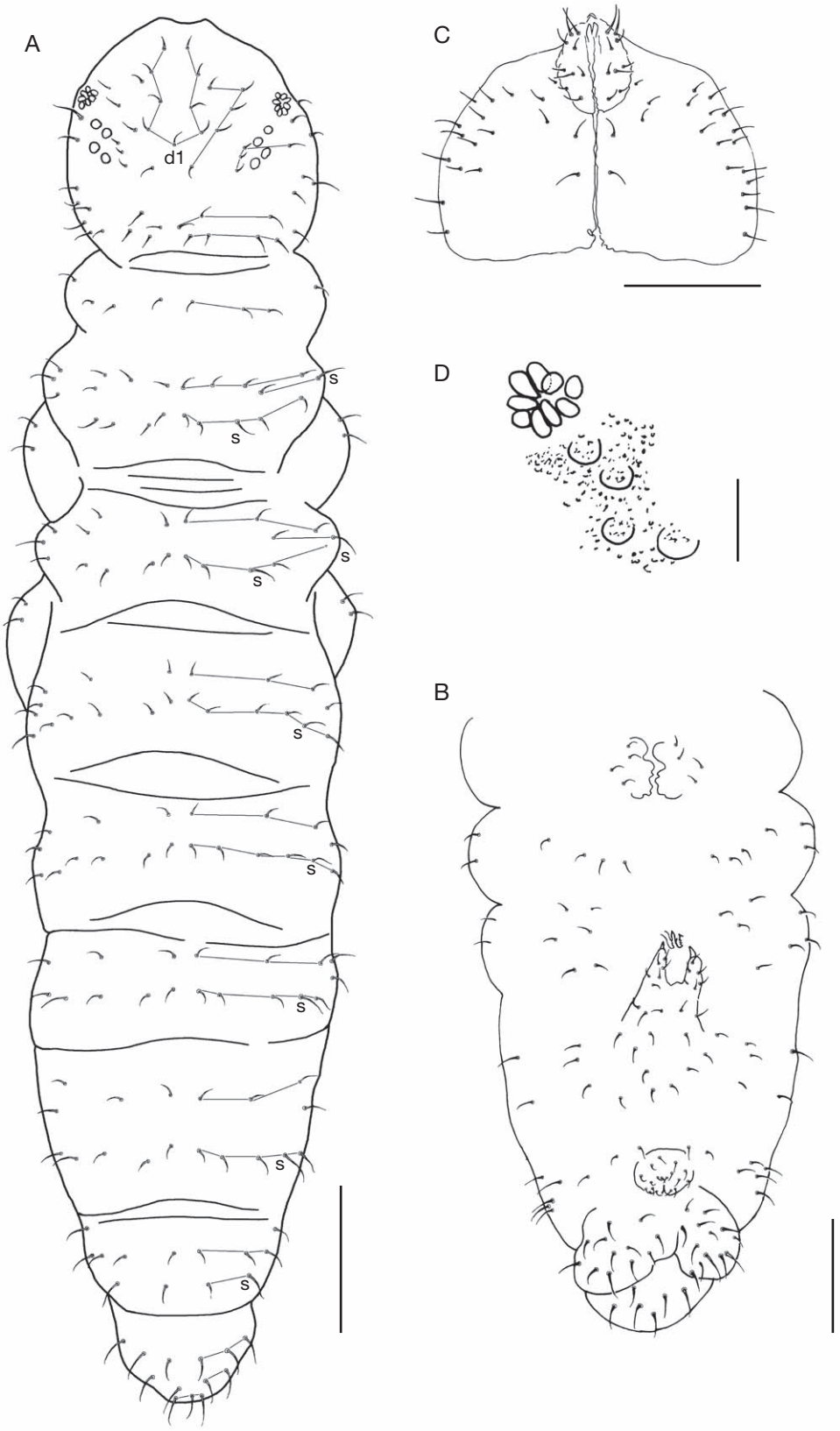

FIG. 1. — *Stachorutes najtae* n. sp.: **A**, dorsal chaetotaxy; **B**, ventral chaetotaxy of abdomen; **C**, ventral cephalic chaetotaxy; **D**, PAO and eyes. Abbreviations: see Material and methods. Scale bars: A-C, 50 µm; D, 10 µm.

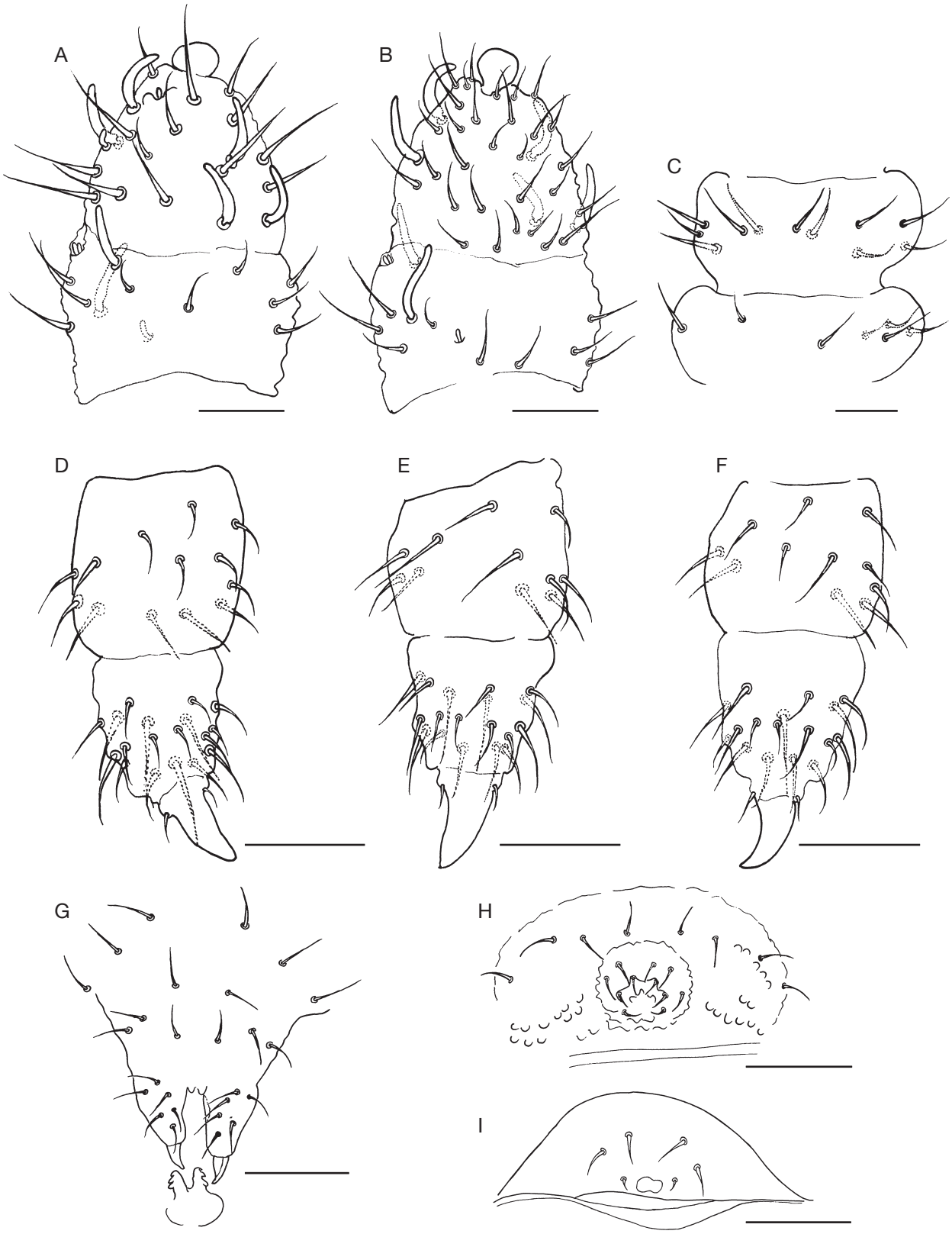

FIG. 2. — *Stachorutes najtae* n. sp.: **A**, **B**, dorsal and ventral chaetotaxy of Ant. III-IV; **C**, chaetotaxy of Ant. I-II; **D**-**F**, chaetotaxy of femora and tibiotarsi of leg I, II and III respectively; **G**, chaetotaxy of furca and retinaculum; **H**, male genital opening; **I**, female genital opening. Scale bars: A-F, 10 µm; G-I, 25 µm.

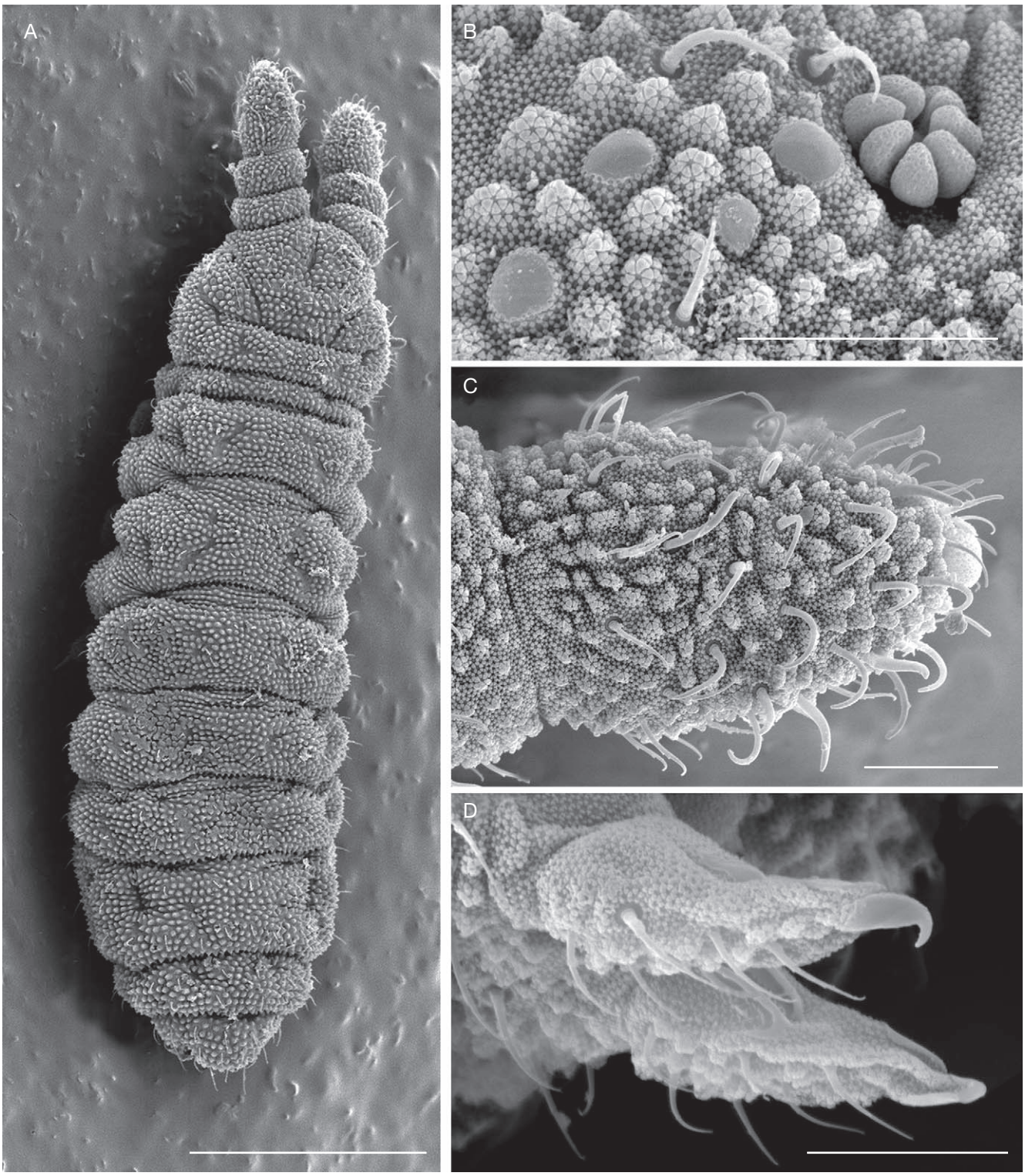

FIG. 3. — *Stachorutes najtae* n. sp. scanning electron microscopy: **A**, habitus; **B**, PAO and eyes; **C**, Ant. III-IV; **D**, dens with mucro. Scale bars: A, 100 µm; B-D, 10 µm.

Dorsal chaetotaxy (Fig. 1A; Table 1)
Chaeta a0 absent on the head, unpaired chaeta d1 present. Th. III without m3. Ventral chaetotaxy of the head as in Fig. 1C. Sensillar formula 022/11111; sensilla are thicker and longer than ordinary chaetae. Thoracic sterna without chaetae; ventral tube with 4 chaetae. Ventral chaetotaxy of abdomen as in Fig. 1B. Furca relatively short, dens with 6 chaetae, mucro clearly distinct from the dens about ⅓ of its length (Figs 2G; 3D). Retinaculum with 3 + 3 teeth without accessory chaetae (Fig. 2G). Male and female genital openings as in Figure 2H, I. Tibiotarsi I, II, III with 18, 18 and 17 chaetae respectively; femora I, II, III with 13, 11, 11

TABLE 1. — *Stachorutes najtae* n. sp.: distribution of dorsal chaetotaxy. Abbreviations: see Material and methods.

Dorsal chaetotaxy of the head						
Chaetae d	d1	d2	d3	d4	d5	
Chaetae sd	sd1	sd2	sd3	sd4	sd5	
Chaetae oc	oc1	oc2	oc3	oc4	–	
Chaetae c	c1	c2	–	c4	–	
Chaetae p	p1	p2	p3	p4	–	
Dorsal chaetotaxy of the body						
Th. I chaetae m	m1	–	m3	m4	–	–
Th. II chaetae a	a1	a2	–	a4	–	a6
Th. II chaetae m	–	–	–	–	m5	m6s
Th. II chaetae p	p1	p2	–	p4s	p5	p6
Th. III chaetae a	a1	–	–	a4	–	a6
Th III chaetae m	–	–	–	–	m5	m6s
Th. III chaetae p	p1	p2	–	p4s	p5	p6
Abd. I chaetae a	a1	–	–	a4	a5	–
Abd. I chaetae m	–	–	–	–	m5	–
Abd. I chaetae p	p1	p2	p3	p4	p5s	p6
Abd. II chaetae a	a1	–	–	a4	a5	–
Abd. II chaetae m	–	–	–	–	m5	–
Abd. II chaetae p	p1	p2	p3	p4	p5s	p6
Abd. III chaetae a	a1	–	–	a4	a5	–
Abd. III chaetae m	–	–	–	–	m5	–
Abd. III chaetae p	p1	p2	–	p4	p5s	p6
Abd. IV chaetae a	a1	–	–	a4	a5	–
Abd. IV chaetae m	–	–	–	–	m5	–
Abd. IV chaeta p	p1	p2	p3	p4	p5s	p6
Abd. V chaetae a	a1	–	a3	a4	–	–
Abd. V chaetae p	p1	–	p3s	–	–	–
Abd. VI chaetae a	a1	a2	a3	–	–	–
Abd. VI chaetae m	m1	m2	–	–	–	–
Abd. VI chaetae p	p0+p1	p2	–	–	–	–

chaetae respectively (Fig. 2D-F). Trochanters I, II, III with 6, 6, 5 chaetae, coxae I, II, III with 3, 7, 7/8 chaetae respectively and subcoxae with 2 chaetae each. Claw without internal teeth, empodial appendage absent.

REMARKS

Stachorutes najtae n. sp. is characterized by the presence of 4 + 4 eyes in the ocular plate, six chaetae on dens; chaetae a0 on head absent, d1 present. The new species is similar to *Stachorutes gracilis* Smolis & Shvejonkova, 2006 with which it shares the same number of eyes, 4 + 4. However they differ for the number of chaetae on dens, four in *S. gracilis* and six in *S. najtae* n. sp. and for the different chaetotaxy of the legs; in particular there are 13, 13, 12 chaetae on tibiotarsi I, II, III of *S. gracilis* while there are 18, 18, 17 on those of *S. najtae* n. sp.; femora I, II, III with 10, 10, 9 in *S. gracilis* vs 13, 11, 11 in *S. najtae* n. sp.; trochanters with five chaetae each in *S. gracilis* vs 6, 6, 5 chaetae on trochanters I, II, III of the new species. Six species of *Stachorutes* (*S. longirostris* Deharveng & Lienhard, 1983; *S. navajellus* Fjellberg, 1984; *S. ruseki* Kovác, 1999; *S. scherae* Deharveng & Lienhard, 1983; *S. tatricus* Smolis & Skarzynski, 2001; *S. cuihuaensis* Gao & Yin, 2007) as well as *S. najtae* n. sp. share six chaetae on dens, however the new species can be easily recognized from all of them for several different features including the number of eyes that appears the most simple and effective diagnostic character.

Acknowledgements

We wish to thank Dr Migliorini M., Dr Meneguz M. and Dr Checcuci C. for helping us in collecting materials. We thank Dr Dariusz Skarzynski and Dr Javier Arbea, for giving helpful comments on the first version of the manuscript.

REFERENCES

BELLINGER P. F., CHRISTIANSEN K. A. & JANSSENS F. 2016. — Checklist of the Collembola of the World. Available from: http:// www.collembola.org Last updated on 30.VI.2016 by Frans Janssens (date of access VI.2016)

DALLAI R. 1973. — Ricerche sui collemboli. XVI. *Stachorutes dematteisi* n. gen., n. sp., *Micranurida intermedia* n. sp. e considerazioni sul genere *Micranurida*. *Redia* 54: 23-31.

FANCIULLI P. P., DALLAI R. & MENEGUZ M. 2015. — A new littoral interstitial species of the genus *Isotomodes* (Collembola, Isotomidae) from Italy. *Zootaxa* 3931: 293-297. https://doi.org/10.11646/zootaxa.3931.2.9

GAO Y. & YIN W. Y. 2007. — A new species of the genus *Stachorutes* Dallai, 1973 from China (Collembola, Neanuridae). *Zootaxa* 1469: 65-68.

SIMÓN BENITO J. C., ESPANTALEÓN D. & GARCÍA-BARROS E. 2005. — *Stachorutes cabagnerensis* n. sp. Collembola (Neanuridae) from Central Spain, and a preliminary approach to phylogeny of genus. *Animal Biodiversity and Conservation* 28: 149-157.

SMOLIS A. & SHVEJONKOVA J. B. 2006. — A new species of the genus *Stachorutes* Dallai, 1973 from Russia (Collembola, Neanuridae). *Animal Biodiversity and Conservation* 29: 43-47.

THIBAUD J.-M. 2007. — Recent advances and synthesis in biodiversity and biogeography of arenicolous Collembola. *Annales de la Societé Entomologique de France* 43: 181-185. https://doi.org/10.1080/00379271.2007.10697509

THIBAUD J.-M. & CHRISTIAN E. 1997. — Biodiversity of interstitial Collembola (Insecta) in sand sediments. *European Journal of Soil Biology* 33: 123-127.

THIBAUD J.-M. & PALACIOS VARGAS J. G. 2000. — Remarks on *Stachorutes* (Collembola: Pseudachorutidae) with a new Mexican species. *Folia Entomologica Mexicana* 109: 107-112.

Submitted on 25 July 2016;
accepted on 14 December 2016;
published on 31st March 2017.