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The Genus *Pseudachorutes* (Collembola, Neanuridae) from Navarra (Northern Iberian Peninsula), with description of a new species and a new subspecies

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The species of the genus *Pseudachorutes* TULLBERG, 1871 from Navarra (Northern Iberian Peninsula) are studied in this work. Four species and one subspecies are cited, two of which are new for science. *Pseudachorutes laricis* n. sp. relates closely to *Pseudachorutes parvulus* BOERNER, 1901, but differs from this in the chaetotaxy of the thoracic tergite II (seta *a2* absent) and of the abdominal tergite V (setae *a1* and *p1* present, *p2* absent). *Pseudachorutes romeroi agrensis* n. ssp., is closely related to the principal species, but can be identified by the number of sensillae on the antennal segment IV (6 in *agrensis* n. ssp. instead of 5 in the principal species) and by the number of dental setae (6 in principal species, instead of 5 in the new subspecies). *Pseudachorutes guadalajarensis* SIMON, 1985, is redescribed and its new localities are recorded.

INTRODUCTION

Since 1976, the Department of Zoology (University of Navarra) has been working about the soil fauna. In this paper we study the genus *Pseudachorutes* TULLBERG, 1871 from samples of different localities and habitats in Navarra (Spain) (Tab. 1).

Five species have been identified, one of them being a new species for the science, and another one being a new subspecies.

The types are deposited in the Zoology Museum, University of Navarra.

LIST OF SPECIES

Pseudachorutes parvulus BOERNER, 1901
Pseudachorutes palmiensis BOERNER, 1903
Pseudachorutes guadalajarensis SIMON, 1985
Pseudachorutes romeroi SIMON, 1985 *agrensis* n. ssp.
Pseudachorutes laricis n. sp.

DESCRIPTION OF SPECIES

Pseudachorutes parvulus BOERNER, 1901

Localities: 1a, 1b, 1c, 1d, 1e, 2, 4a, 4b, 5, 6, 8, 10, 11, 12, 13, 14, 16, 17, 21a, 21b.

Distribution and ecology

Holarctic species, widely represented in the Iberian Peninsula. Habitat: from mountainous to subalpine levels it can be found in litter, humus, moss and bark.

Tab. 1. Survey of localities and habitat.

LOCALITY		HABITAT	ALTITUDE (m)	U.T.M. 30T	AUTHOR
1a.	Quinto Real (Adi)	Beech forest *(Fagus sylvatica)*	1100	XN26	ARBEA & JORDANA (1985a)
1b.	Quinto Real (Adi)	Pine grove *(Pinus sylvestris)*	1200	XN26	ARBEA & JORDANA (1985a)
1c.	Quinto Real (Adi)	Grass land *(Nardo-Galium saxatile)*	1000	XN26	ARBEA & JORDANA (1985a)
1d.	Quinto Real (Zuraun)	Beech forest *(Fagus sylvatica)*	1000	XN26	ARBEA & JORDANA (1985a)
1e.	Quinto Real (Zuraun)	Bush land *(Vaccinium myrtillus)*	1100	XN26	ARBEA & JORDANA (1985a)
2.	Beunza, Atez Valley	Oak forest *(Quercus robur & Q. pyrenaica)*	600	XN05	ARBEA & JORDANA (1985b)
3.	Erice, Atez Valley	Larch tree *(Larix kaempferi)*	458	XN05	ARBEA & JORDANA (1985b)
4a.	Echauri	Beech forest *(Fagus sylvatica)*	1100	WN94	ARDANAZ & JORDANA (1986)
4b.	Echauri	Evergreen oak forest *(Quercus rotundifolia)*	800	WN94	ARDANAZ & JORDANA (1986)
4c.	Echauri	Bush land *(Meso-* and *Xero-bromion)*	750	WN94	ARDANAZ & JORDANA (1986)
5.	Carrascal	Evergreen oak forest *(Quercus rotundifolia)*	550	XN12	VILLANUEVA (1986)
6.	Elzaburu	European oak forest *(Quercus robur)*	350	XN06	VILLANUEVA (1986)
7.	Garralda	Sessile oak forest *(Quercus petraea)*	700	XN45	VILLANUEVA (1986)
8.	Monreal	Pubescent oak forest *(Quercus pubescens)*	450	XN23	VILLANUEVA (1986)
9.	Ripa	Pyrenean oak forest *(Quercus pyrenaica)*	350	XN15	VILLANUEVA (1986)
10.	Irati	Beech forest *(Fagus sylvatica)*	870	XN56	ARBEA & JORDANA (1987)
11.	Quinto Real	Larch tree *(Larix kaempferi)*	1000	XN26	ARBEA & JORDANA (1987)
12.	Quinto Real	Grass land	850	XN26	ARBEA & JORDANA (1987)
13.	Caparroso (Bardenas)	Mediterranean bush land *(Rosmarino-Ericion)*	320	XM18	JORDANA et al. (1987)
14.	Beunza	Forest with oak and chestnut	600	XN05	This paper
15a.	Bigüezal	Scots pine grove *(Pinus sylvestris)*	1100	XN52	This paper
15b.	Bigüezal	Grass land	1100	XN52	This paper
16.	Carrascal	Kermes oak *(Quercus coccifera)*	670	XN12	This paper
17.	Leurza	Beech forest *(Fagus sylvatica)*	400	XN07	This paper
18.	Izaga	Beech forest *(Fagus sylvatica)*	1000	XN23	This paper
19.	Lizarrusti	Beech forest *(Fagus sylvatica)*	600	WN75	This paper
20.	Aralar	Beech forest *(Fagus sylvatica)*	940	WN85	This paper
21a.	Sansoain	Evergreen oak forest *(Quercus rotundifolia)*	650	XN12	This paper
21b.	Sansoain	Austrian pine grove *(Pinus nigra)*	650	XN12	This paper
22.	Codes Ridge	Beech forest *(Fagus sylvatica)*	1414	WN52	This paper
23.	Velate	Beech forest *(Fagus sylvatica)*	700	XN16	This paper

Pseudachorutes palmiensis BOERNER, 1903

Localities: 1a, 1b, 1d, 1e, 2, 3, 4a, 4b, 4c, 6, 7, 8, 9, 10, 11, 12, 14, 15a, 17, 18, 19, 20, 22, 23.

Distribution and ecology

Palaearctic species, widely represented in the Iberian Peninsula. It can be found in the same habitat as the former species. CASSAGNAU (1972) says that it is a vicariant species of *Protachorutes pyrenaeus* in prairie or in low mountain. In Navarra both species can coexist.

Pseudachorutes guadalajarensis SIMON, 1985 (figs. 1–7)
= *Pseudachorutes* sp.: GERS & DEHARVENG (1985)

Localities: 13 (2 specimens), 15b (2 specimens).

Redescription

Length: 0.50 to 0.65 mm. Colour dark blue. Cuticle with strong granulation. Antennae shorter than cephalic diagonal. Antennal segment I with 7 setae. Antennal segment II with 12 setae. Antennal organ III with two sensory rods in a cuticular groove, two cylindrical "guard sensillae" and a ventro-external small sensilla; this segment also bears 13 normal setae. Antennal segment IV with a trilobulate apical vesicle, a subapical organ, a dorso-external microsensilla in a pit, and five sensillae: *S1–3, S7–8; S2* and *S7* flame shaped (fig. 2). Most of the dorsal setae on this segment are blunt; on the ventral part, besides the normal setae, there are ten relatively short, stout and blunt setae.

8 eyes per side. Postantennal organ with 6–9 vesicles in a ring. Bucal cone truncated. Labium short without setae *L* and *D,* and with two postlabial setae (fig. 7). Labrum with 2/3, 3, 4 setae. Styliform maxillae with two apical teeth on the lamella (fig. 6). Mandible reduced, difficult to see. Dorsal chaetotaxy as in fig. 1. Head without *a0* seta. Tergal chaetotaxy as follows:

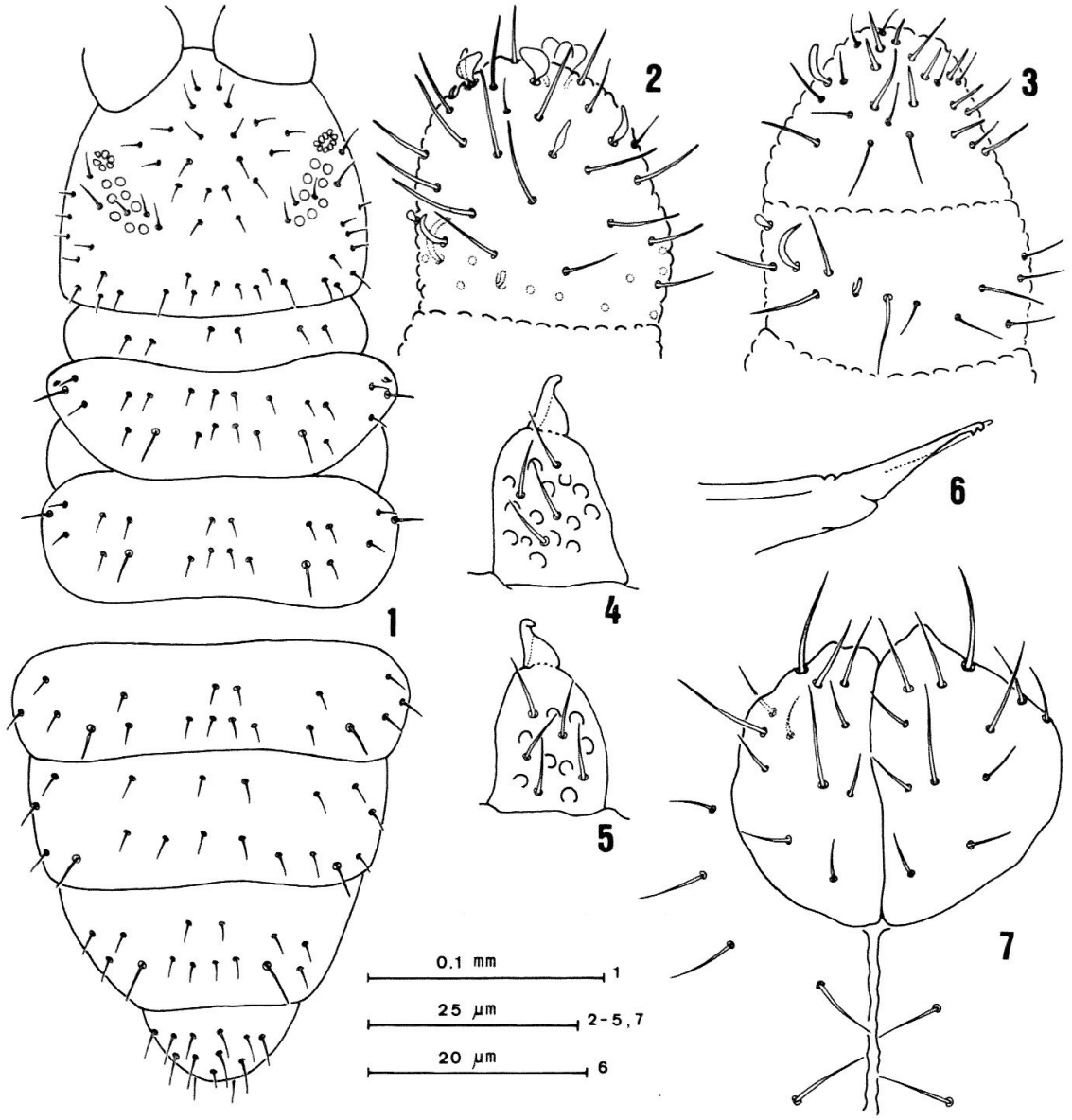
	Thorax			Abdomen	
Row	I	II	III	I–III	IV–V
a	–	10	8	6	8
m	6	2	2	–	–
p	–	10	10	10	10
Absent setae	–	–	*a2*	*a2, a4*	*a2*

Tergal sensorial setae on Th. II–Abd. V in position 3,3/4,4,4,4,3. Mesonotum with a lateral microsensilla in a pit. Lateral sensilla on mesonotum and metanotum in position *m6.*

Tibiotarsal tenent hairs absent. Claw without teeth. Empodial appendage absent. Ventral tube with 4 + 4 setae. Tenaculum with 3 +3 teeth (one specimen shows 4 + 4 teeth). Furca short but well developed. Mucro-dens with 5 setae (some specimens showing asymmetric chaetotaxy 4 + 5) (figs. 4 and 5). Mucro reduced, with a hook-like end. Manubrium with 13 + 13 setae.

Discussion

GERS and DEHARVENG in 1985 reported a *Pseudachorutes* sp. from Morocco with globular sensillae on the antenna and reduced mandible. This specimen has



Figs. 1–7. *Pseudachorutes guadalajarensis* SIMON, 1985: (1) dorsal chaetotaxy of body; (2) dorsal side of antennal segments III and IV; (3) ventral side of antennal segments III and IV; (4 and 5) mucrodens; (6) maxilla; (7) labial chaetotaxy.

been studied by us, and we therefore can conclude that it belongs to the species that is found in Navarra.

When comparing our material with the types of *P. guadalajarensis,* and with the specimen from Morocco, we can notice the following points:

–The antennal and labial chaetotaxy is identical and constant for all the specimens.

–Th. I bears 3 + 3 setae instead of 4 + 4 setae reported by SIMON (1985) in the original description of *P. guadalajarensis.* The most lateral seta is inserted in the paratergite.

–On Abd. V the sensorial seta is in position *p3* instead of *p2.*

–The only difference between *P. guadalajarensis* and the Morocco-Navarra specimens is that the seta *p2* on Abd. V is absent in *P. guadalajarensis.* Neverthe-

less, SIMON (1985) indicates that it is present in one specimen. Therefore, we are not concerned about this character, at least till more specimens might be examined, and we come to a best knowledge on their variability.

P. guadalajarensis is a close species to *Pseudachorutes minutus* SELGA, 1966. The type of this species has been examined. The antennal segment IV is similar in both species. The maxillary shape is similar, too. Sensillae *S2* and *S7* are flamed-like (as in *P. guadalajarensis*), which does not agree with the original description (fig. 5 in SELGA, 1966).

P. guadalajarensis and *P. minutus* differ in the presence of *p2* seta on Abd. V in the former one, and the number of setae on the dens (6 in *P. minutus* and 5 in *P. guadalajarensis*).

In summary, these species are closely related, to each other and they stand alone among the genus *Pseudachorutes* by the presence of flame-like sensillae on antennal segment IV; bucal cone short; and a possible regression of the mandibles (they must be confirmed in *P. minutus*).

Distribution and ecology

This species seems to be a mediterranean one. It has been found in Spain (Guadalajara – SIMON, 1985 – and Navarra) and Morocco (Oukaimeden, GERS & DEHARVENG, 1985). It lives in Sabine groves *(Juniperus thurifera)* and neighbouring prairies (Guadalajara and Morocco); and in Mediterranean bush land *(Rosmarino-Ericion)* and Grassland in Navarra.

Pseudachorutes laricis n. sp. (figs. 8–20)
= *Pseudachorutes parvulus* p. p.: ARBEA & JORDANA (1985)
(misidentification)

Material

Holotype male and 14 *paratypes* (8 females and 6 males) from Erice, Atez Valley (Navarra, Spain) (Loc. 3). Larch tree forest *(Larix kaempferi)* litter, 1-II-1984.

Description

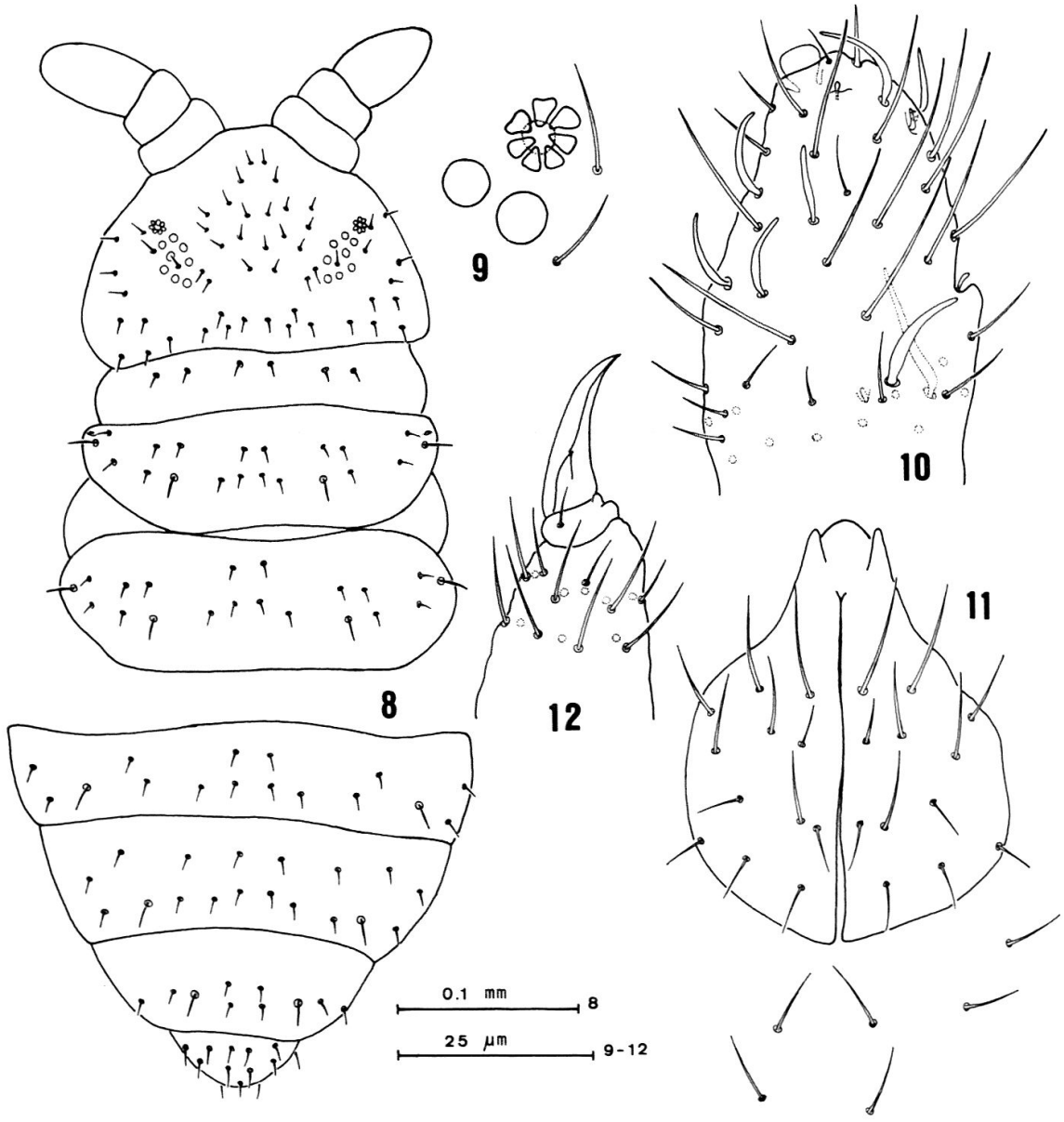
Length: 0.50 to 0.75 mm. Colour dark blue. Ocular area pigmented black. Antennae shorter than cephalic diagonal. Antennal segment IV with a simple apical vesicle; a subapical organ; a dorso-external microsensilla in a pit; and 6 subcylindrical sensillae (fig. 10). Antennal organ III with two curved sensory rods in a cuticular poorly developed groove; two long subcylindrical "guard sensillae"; and a ventro-external sensilla. Antennal segments I, II, and III with 7; 12; and 17 normal setae.

8 eyes per side. Postantennal organ with (7)–8–(9) vesicles (fig. 9), being about 1.5 times as long as the diameter of nearest ocellus. Mouth parts as in the genus. Labium as in fig. 11.

Dorsal chaetotaxy is shown in fig. 8. Head with a unpaired seta *d0, a0* absent. Tergal sensorial setae on Th. II – Abd. V in position 3,3/4,4,4,4,3. Mesonotum with a lateral microsensilla in a pit. Lateral sensilla on mesonotum and metanotum in position *m6*. Tergal chaetotaxy as follows:

	Thorax		Abdomen		
Row	I	II–III	I–III	IV	V
a	–	8	6	8	2
m	6	2	–	–	–
p	–	10	10	10	8(10)
Absent setae	–	*a2*	*a2,a4*	*a2*	*a2–5(p2)*

The chaetotaxy in Abd. V between *p3* sensillae is very variable: typical chaetotaxy is shown in fig. 13 (*a1* and *p1* present, *p2* absent in 50% of specimens); *a1* and/or *p1* can be present or absent, and *p2* can be present too (figs. 14–18).

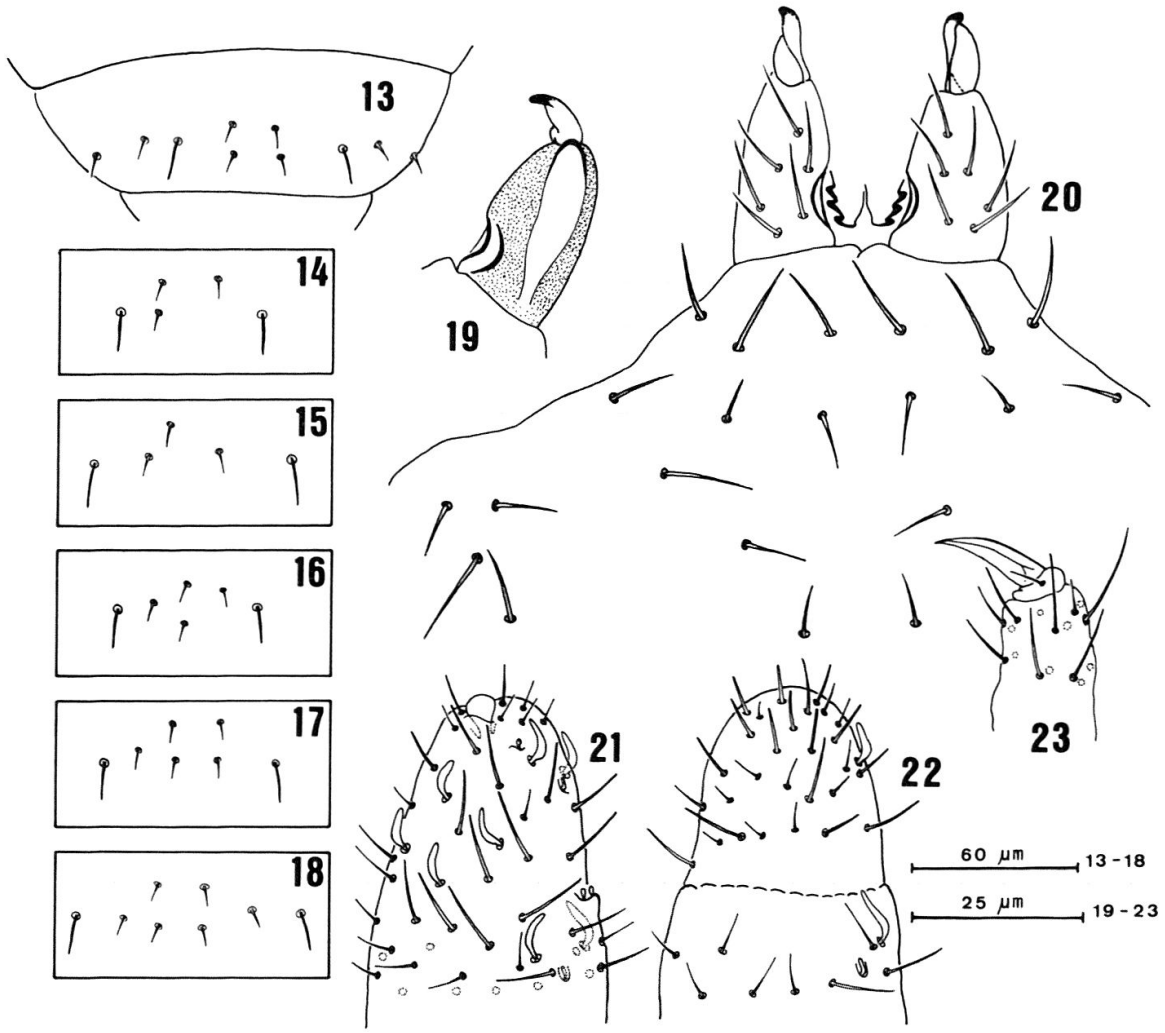


Figs. 8–12. *Pseudachorutes laricis* n. sp.: (8) dorsal chaetotaxy of body; (9) postantennal organ and anterior ocelli; (10) dorsal side of antennal segments III and IV; (11) labial chaetotaxy; (12) tibiotarsus III and claw.

Without acuminate tibiotarsal tenent hair. Claw without inner tooth, but with a pair of lateral teeth. Empodial appendage absent (fig. 12). Ventral tube with 4 + 4 setae. Tenaculum with 3 + 3 teeth and corpus without setae. Manubrium with 13 + 13 setae. Dens with 6 setae. Mucro spoon-like shaped, curved with a hook-like apex (fig. 20). The dens presents a ventral elongate area with smooth cuticle (fig. 19).

Affinities

Pseudachorutes laricis n. sp. is closely related to *Pseudachorutes parvulus* BOERNER, 1901, and to *Pseudachorutes crassus* GAMA, 1964. All of them have unpaired *d0* seta, simple apical vesicle in antennal segment IV and the same type of postantennal organ and furca. The differences with these two species lie in the absence of *a2* seta on Th. II and in the chaetotaxy of Abd. V.



Figs. 13–20. *Pseudachorutes laricis* n. sp.: (13) characteristic chaetotaxy of abdominal tergite V; (14 to 18) variations in chaetotaxy of abdominal tergite V; (19) ventral side of dens; (20) furca. Figs. 21–23. *Pseudachorutes romeroi agrensis* n. ssp.: (21) dorsal side of antennal segments III and IV; (22) ventral side of antennal segments III and IV; (23) tibiotarsus III and claw.

The species differs from *Pseudachorutes pratensis* RUSEK, 1973 by the presence of an unpaired seta *d0* on the head. The similarity with this species comes from the chaetotaxy in both Th. II and Abd. V.

Derivatio nominis

The specific name, *laricis,* indicates the presence of the species in a larch tree forest *(Larix kaempferi).*

Pseudachorutes romeroi agrensis n. ssp. (figs. 21–27)

Material

Holotype male and 2 *paratypes* (female and male) from Bardenas, near Caparroso village (Navarra, Spain) (Loc. 13). Mediterranean bush *(Rosmarino-Ericion),* humus and soil, 1-III-1982.

Other material: Sansoain (Loc. 21a). Evergreen oak forest *(Quercus rotundifolia)* litter, 27-VII-1982, 1 male.

Description

Length: 0.50–0.60 mm. Colour dark blue. Antennae shorter than cephalic diagonal. Antennal segment IV with a simple apical vesicle; a subapical organ; a dorso-external microsensilla in a pit; and 6 cylindrical sensillae (two dorso-external and four dorso-internal) (figs. 21 and 22). Antennal organ III with two straight small sensory rods in a cuticular groove; two "guard sensillae" similar to those of antennal segment IV; and a ventro-external sensilla. This segment bears 17 normal setae.

8 eyes per side. Postantennal organ with 7 vesicles shaping an ellipse. Bucal cone acuminate and very long. Styliform long maxillae. Labial chaetotaxy as in fig. 26.

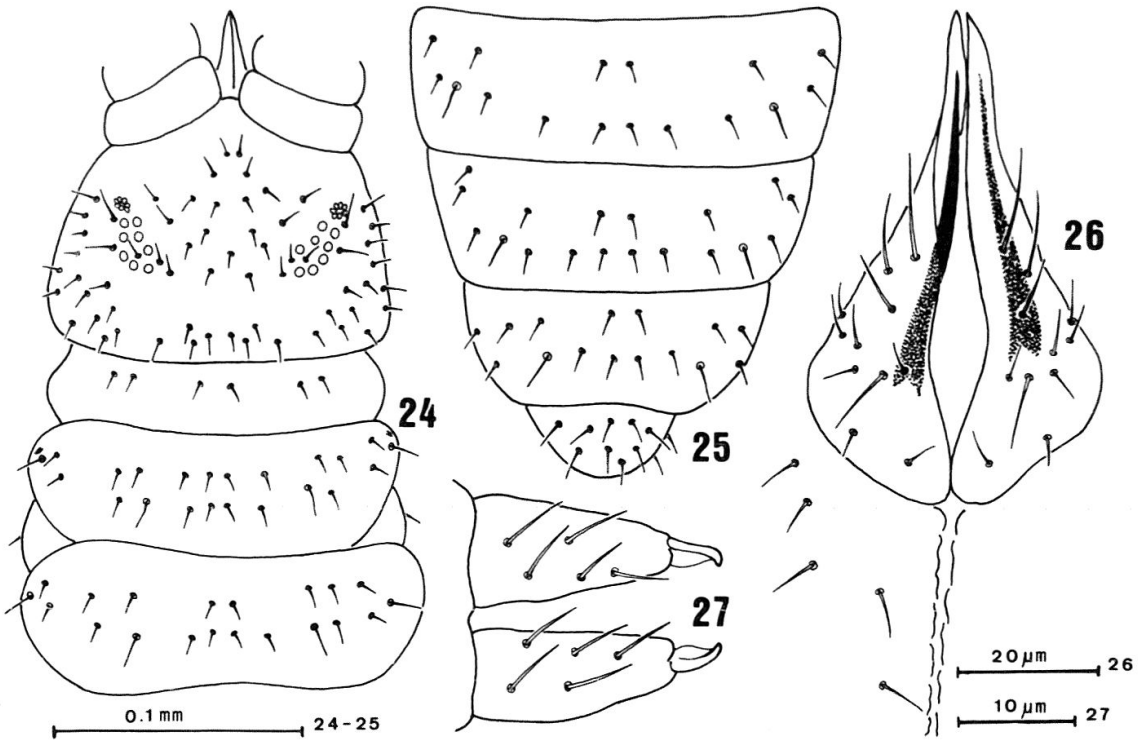
With acuminate tibiotarsal tenent hair. Claw without teeth. Empodial appendage absent (fig. 23).

Dorsal chaetotaxy as in fig. 25. Head without *a0,* and with unpaired seta *d0.* Tergal chaetotaxy as follows:

	Thorax			Abdomen		
Row	I	II	III	I–III	IV	V
a	–	10	8	6	8	8
m	6	2	2	–	–	–
p	–	10	10	10	10	8
Absent setae	–	–	*a2*	*a2–3*	*a2*	*a2, p5*

Tergal sensorial setae on Th. II – Abd. V in position 3,3/4,4,4,4,3. Mesonotum with a lateral microsensilla in a pit. Lateral sensilla on mesonotum and metanotum in position *m6.*

Ventral tube with 4 + 4 setae. Tenaculum with 3 + 3 teeth. Furca well developed. Manubrium with 13 + 13 setae. Dens with 5 setae on each branch. Mucro slightly curved (fig. 27). Genital plate in the male with 13 setae (8 genital and 5 circumgenital setae).



Figs. 24–27. *Pseudachorutes romeroi agrensis* n. ssp.: (24) dorsal chaetotaxy of head and thoracic tergites I–III; (25) chaetotaxy of abdominal tergites III–VI; (26) labial chaetotaxy and maxillae; (27) dens and mucro.

Affinities

Our specimens are different from *Pseudachorutes romeroi* SIMON, 1985 by the sensillae number in antennal segment IV (5 in *P. romeroi* and 6 in the new subspecies) and by setal number on the dens (6 in *P. romeroi* and 5 in the new subspecies).

As the specimen numbers of *P. romeroi* and the new subspecies are very limited, we prefer not to overstate the weight of the differences to stablish a new species.

Derivatio nominis

The subspecific name, *agrensis,* is derived from "Vasconum ager", which means "Southern Navarra".

ACKNOWLEDGEMENTS

We wish we could express our gratitude to the following persons: Dr. Louis Deharveng who kindly sent us a specimen of *P. guadalajarensis* from Morocco to be examined; Dr. Dolores Selga and Dr. Juan Carlos Simon, who kindly granted us all their cooperation to examine several specimens which are cited in this paper; and Dr. Judith Najt for her commentaries about *P. guadalajarensis.*

Part of the specimens used in this work came from the samples taken in the project no. 0220/81, granted by CAICYT to the Zoology Department, University of Navarra.

RÉSUMÉ

Dans ce travail on étude les espèces du genre *Pseudachorutes* présents dans la Navarre (Nord de la Péninsule Ibérique). On parle à propos de quatre espèces dont deux sont nouvelles pour la science: *Pseudachorutes laricis* sp. n., très proche à *Pseudachorutes parvulus* BOERNER, 1901, mais avec des caractères propres, surtout la chétotaxie dorsale (absence de la soie *a2* sur le tergite thoracique II et présence de les soies *a1* et *p1* et absence de la soie *p2* sur le tergite abdominal V). *Pseudachorutes romeroi agrensis* ssp. n. est différent de la espèce principale à cause du nombre des sensilles sur l'article antennaire IV (*agrensis* ssp. n. porte 6 sensilles, alors que la espèce principale n'en possède que 5) et du nombre des soies de la dens (qui sont 6 chez la espèce principale, alors qu'il n'y en a que 5 chez la nouvelle sous-espèce). Par ailleurs, on fait une nouvelle description de *Pseudachorutes guadalajarensis* SIMON, 1985, pour lequel de nouvelles localités sont ajoutées.

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