

## New species of *Pseudosinella* (Collembola : Entomobryidae) from karst caves of the Basque bio-speleologic district

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**Abstract** – This paper is part of a broader research in karst caves of the north of the Iberian Peninsula and southwestern France. Seven new species and a subspecies of *Pseudosinella* have been found in the karst caves of the Basque bio-speleologic district : *P. aramendiai* n. sp., *P. arrasatensis* n. sp., *P. duprei* n. sp., *P. luquei* n. sp., *P. jesusi* n. sp., *P. eskualduna* n. sp., *P. jeanpierrei* n. sp. and *P. subterranea baztanensis* n. ssp. Descriptions and geographical distribution are given.

**Résumé – Nouvelles espèces de *Pseudosinella* (Collembola : Entomobryidae) dans les grottes du karst du district biospéléologique basque.** – À l'occasion d'une étude sur les Collemboles du karst du Nord de la Péninsule Ibérique et du Sud-Ouest de la France, sept espèces et une sous-espèce de *Pseudosinella*, nouvelles pour la Science, ont été trouvées dans les grottes du district biospéléologique basque : *P. aramendiai* n. sp., *P. arrasatensis* n. sp., *P. duprei* n. sp., *P. luquei* n. sp., *P. jesusi* n. sp., *P. eskualduna* n. sp., *P. jeanpierrei* n. sp. et *P. subterranea baztanensis* n. ssp. On trouvera dans cet article leur description et leur distribution géographique.

During the study of the Collembola caves from the north part of the Iberian Peninsula and southwestern France, 186 natural caves were studied. The present paper involves the study of the *Pseudosinella* of karst caves of the Basque bio-speleologic district (Beruete 2000). Within the territory where the study was made (tab. 1, fig. 1) seven new species and one new subspecies were found.

The description of these new species follows the traditional system for labial chaetotaxy and dorsal macrosetae. However, in order to include in the macrosetae formula of the thoracic tergite II the macroseta anterior to the pseudopore (Deharveng & Gouze 1986; Deharveng 1988), one additional digit has been intercalated between the second and third thoracic segments. The description of the whole 's' setae in the different species is very similar and only morphological changes on these setae will be mentioned in species descriptions. The descriptions include SEM from some species.

### Material and methods

The studied caves included: one cave from Bizkaia, two from Guipuzkoa, one from Lapurdi, one from Baxenabarre, two from Zuberoa, 17 from Navarra and four from Araba. This karst describes an arc over the north of Navarra and it is limited by the rest of the cited territories of Spain and France. A list of caves and their geographical location is given in table 1 and figure 1. In table 7, as annex, a cave list with associated collembola fauna is provided.

The specimens were captured using a manual aspirator over the ponds, gours and active flowstones. Dates are given using the nomenclature: year, month, day (yymmdd).

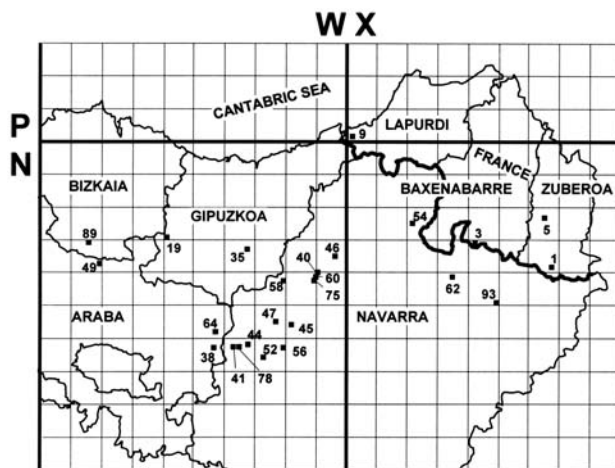
Most of the specimens have been mounted using Hoyer medium to facilitate observation with optical microscopy. When possible, some specimens were dehydrated using an ethanol series increased to 100% and subsequently dried by critical point with CO<sub>2</sub>. The specimens were mounted over an aluminium stub and coated with 16 nm of gold in Argon atmosphere with a sputter coater K550 (Emitech). These specimens have been observed by SEM (Scanning Electron Microscope, DSM 940 A Zeiss). SEM microphotographs were made by R. Jordana and E. Baquero. Type specimens have been deposited in the Museum of Zoology of the University of Navarra.

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**Table 1** – Cave list of the sampled area. The geographic co-ordinates and map localisation is given to the map of fig. 1.

Cave name and locality	Territory	Catalogue number	Geographi-cal Zone	UTM	Altitude	Legit	Map loc.
Akelar (Aralar, Larraun, Alli)	NAVARRA	NA 0473/114	30T	WN 590300 <sup>A7</sup> 60300/	640	Bonet 1929 and 1931; Beruete	40
Akuandi (Urbasa sur, Limitaciones)	NAVARRA	NA 0345/139	30T	WN 563100 <sup>A7</sup> 37700/	980	Beruete	41
Arantzadua II (Urbasa sur, Limitaciones)	NAVARRA	NA .../140	30T	WN 567600 <sup>A7</sup> 38500/	920	Beruete	44
Arbeltz (Andia)	NAVARRA	NA 0487/114	30T	WN 581100 <sup>A7</sup> 44300/	970	Beruete	45
Arkalde (Beruete, Basaburua)	NAVARRA	NA 0329/090	30T	WN 596400 <sup>A7</sup> 66300/	860	Beruete	46
Arleze (Urbasa, Falla de Zunbeltz)	NAVARRA	NA 0230/114	30T	WN 576900 <sup>A7</sup> 45200/	1060	Beruete	47
Artzegi I (Gorbea, Zigoitia)	ARABA	VI 0012/087	30T	WN 519000 <sup>A7</sup> 63000/	900	Beruete	49
Ayssayguer (Holzarte, Larrau)	ZUBEROA	ZU .../117	30T	XN 68700 <sup>A7</sup> 63100/	650	Beruete	1
Basaura (Lokitz)	NAVARRA	NA 0058/140	30T	WN 572100 <sup>A7</sup> 34400/	530	Beruete	52
Bortzerreketa (Baztan, Garzain)	NAVARRA	NA 0088/091	30T	XN 621100 <sup>A7</sup> 75100/	540	Beruete	54
Cerro Viejo (Urbasa, Falla de Zunbeltz)	NAVARRA	NA 0495/140	30T	WN 579200 <sup>A7</sup> 37600/	940	Beruete	56
Cueva fria (Aralar)	NAVARRA	NA 1913/114	30T	WN 578800 <sup>A7</sup> 58900/	1220	Beruete	58
Espinal, Sumidero de (Espinal)	NAVARRA	NA 0255/116	30T	XN 633700 <sup>A7</sup> 59600/	830	Beruete	62
Galarrako kobie (Arrasate)	GIPUZKOA	AR 0211/088	30T	WN 540690 <sup>A7</sup> 70285/	460	Sendra	19
Hornucos, Cueva de los (Suano, Campoo de Suso)	CANTABRIA*	S .../107	30T	VN 301000 <sup>A7</sup> 59000/		González-Luque	nr
Iguaran (Entzia)	ARABA	VI 0047/139	30T	WN 558700 <sup>A7</sup> 42700/	1020	Beruete	64
Istaürdiko ziloa d' (Aussurucq, Basses-Pyrénées)	ZUBEROA		30T	XN 666 <sup>A7</sup> 78		Beruete	5
Lezegaldeko leizea (Aralar)	NAVARRA	NA 0316/114	30T	WN 589300 <sup>A7</sup> 59700/	611	Galán, Jordana & Beruete 1983, Beruete	60
Mairuelegorreta I (Gorbea, Zigoitia)	ARABA	VI 0005/087	30T	WN 519000 <sup>A7</sup> 63000/	1000	Beruete, Gisín & Gama, 1972, Gama, 1976, Cantero	49
Mentrokiloko koba (Aralar)	NAVARRA	NA 0041/114	30T	WN 589990 <sup>A7</sup> 58714/	791	Galán, Beruete	75
Noriturri (Urbasa sur, Limitaciones)	NAVARRA	NA 0233/139	30T	WN 564300 <sup>A7</sup> 37900/	993	Beruete	78
Ormazarreta I (Aralar)	NAVARRA	NA 0470/114	30T	WN 578500 <sup>A7</sup> 58900/	1200	Beruete	58
Oyanbeltzako ziloa OY-101 (Urkulu)	BAXENABARRE	BN .../091	30T	XN 643500 <sup>A7</sup> 69100/	1180	Beruete	3
Pala Vella, Cueva (Biobra)	OURENSE*	OR .../...				Salgado	nl
Redoute Louis XIV, Gfre. (Biriatiou)	LAPURDI	LA .../042	30T	XP 601300 <sup>A8</sup> 00000/		Dupré	9
Respiño, Cueva. del (Celleruelo)	ASTURIAS*	O .../...	30T			Salgado	nl
Supelegor (Gorbea)	BIZKAIA	BI 0023/087	30T	WN 515200 <sup>A7</sup> 69500/	1020	Galán	89
Tío Marcelino, Cueva de (Santotis, Tudanca)	CANTABRIA*	S .../082	30T	UN 388000 <sup>A7</sup> 79000/		González-Luque	nr
Troskaeto leizea (Aralar, Ataun)	GIPUZKOA	AZ 0020/089	30T	WN 568885 <sup>A7</sup> 62330/	580	Galán, Beruete	35
Zarpia (Entzia)	ARABA	VI .../139	30T	WN 564000 <sup>A7</sup> 37800/	920	Beruete	38
Zatoya I - Sorgin zubi (Abaurregaina)	NAVARRA	NA 0189/117	30T	XN 649100 <sup>A7</sup> 51800/	1000	Beruete	93
Zatoya III (Abaurregaina)	NAVARRA	NA 0431/117	30T	XN 649200 <sup>A7</sup> 51800/	960	Beruete, Dupré	93

nr = not represented. nl = not localized. \* Caves from other territories with specimens of the new species.

**Figure 1**

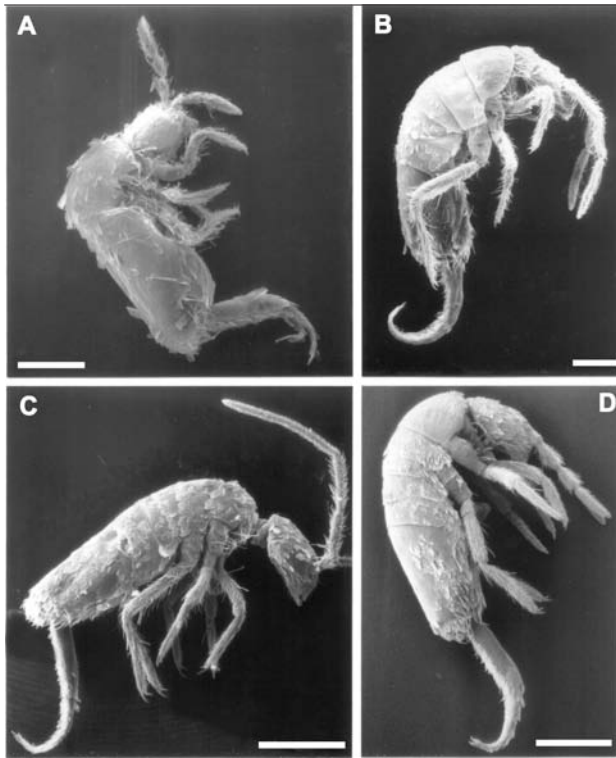
Map with the sampled caves localisation. The numbers are from tab. 1. UTM co-ordinates (10 km) are represented.

## DESCRIPTIONS

### *Pseudosinella aramendiai* Beruete & Jordana n. sp.

**Type material** – Types: Basaura (Lokitz, NA), SP1140, 851018 (leg. *Beruete E.*). **Holotype**: slide SP1140-03. – **Paratypes**: 1 in slide SP1140-01 and 1 in slide SP1140-02.

*Other studied specimens*: Akelar (Aralar, NA), 1 in slide SP1114, 820403. Arbeltz (Andia, NA), 1 in slide SP1192, 861102. Arkalde (Beruete, Basaburua, NA), 1 in slide SP1241, 871002; 1 in slide SP1242, 871002; 4 in slide SP1243, 871002. Arleze (Urbasa, NA), 5 in sample SP1146, 851020. Basaura (Lokitz, NA), (1 in slide SP1025AE, 791006; 1 in slide SP1027AE, 791202; 3 in sample SP1001TS, 801101, erroneous identification as *P. picta* by Jordana & Beruete 1983; 5 in slide SP1150, 851025; 3 in slide SP1158, 851103. Cueva Fría (Aralar, NA), 7 in slide SP1135, 851003. Espinal, Sumidero (Espinal, NA), 2 in slide SP1178, 860615. Lezegaldeko leizea (Aralar, NA), 2 in slide SP1115,



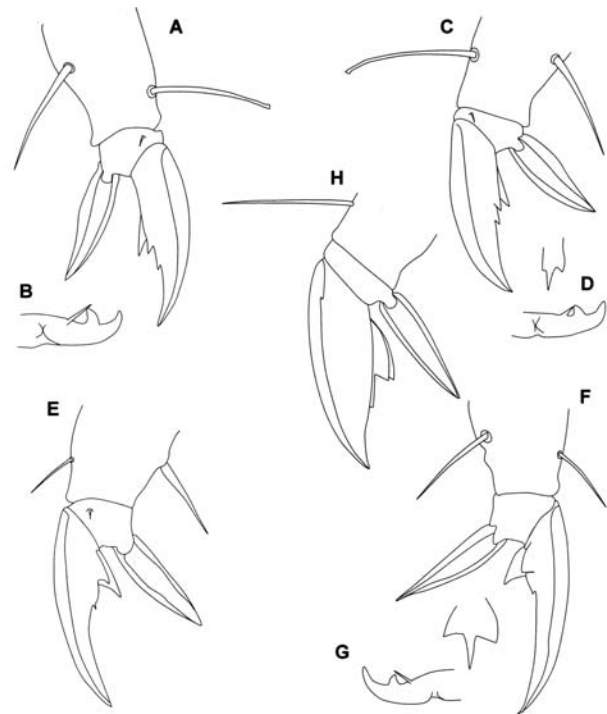
**Figure 2**  
Habitus in Scanning Electron Micrograph. – A, *Pseudosinella aramendiai* n. sp. – B, *Pseudosinella jesusi* n. sp. – C, *Pseudosinella subterranea baztanensis* n. ssp. – D, *Pseudosinella luquei* n. sp. (Bar: 0,2 mm in A, B; 0,5 mm in C, D)

820407; 2 in slide SP1116-2BIS, 820919. Mentrokiloko koba (Aralar, NA), 2 in slide SP1226, 870822. Noriturri (Urbasa, NA), 1 in slide SP1090, 810418. Ormazarreta I (Aralar, NA), 4 in slide SP1133, 851003. Zatoya I - Sorgin zubi (Abaurregaina, NA), 2 in slide SP1250, 871107. Zatoya III (Abaurregaina, NA), 1 in slide SP1182-A. (leg. *Beruete E.*).

**Description** – Size 1.3-1.7 mm. Habitus as the photograph of the figure 2, A. Body pigment scattered over the ocular spots and dorsal head; in several specimens the pigment is restricted to the ocular spots. 4+4 eyes. Size of the corneoles: A and B, 5  $\mu$ m diameter, C and D, 7  $\mu$ m. All corneoles in regression and almost do not project out from the surface cuticle; the four corneoles have the same cuticular reticulation pattern as the body surface, slightly thinner, and are probably not totally functional (SEM observations); corneole E are reduced by optical microscopic observations of crystalline and pigment. Antennae small: relationship antenna/cephalic diagonal between 1.3 and 1.45. Antennal segments I/II/III/IV ratio is roughly 0.07/0.12/0.11/0.19, third segment slightly smaller than the second one. Antennal setae similar to those described for Beruete & Jordana (2001).

1) 1.1: standard macro, meso or microsetae, ciliated and alveolous with a chitinous rim (fig. 6E, a); 1.2: microsetae spine-like shaped and sharp-pointed, with similar alveolous as ciliated setae (fig. 7E).

2) Setae with granular alveolar rim; they are sensory setae “s”. 2.1: setae ciliated only on one side, straight or slightly curved, and especially abundant in antennal segment IV (fig. 6D); 2.2: shorter setae with thicker spines on the surface and sharp-pointed (fig. 8C); 2.3: “s” setae, shorter than the former ones, thin and straight (less than a micrometer in diameter), they look smooth when observed with optical microscopy but may have longitudinal grooves as in *P. riojana* Beruete & Jordana, 2001; they are very abundant on the dorsal surface of antennal segment IV (fig. 6E, b); 2.4: sub-cylindrical “s” setae, slightly thicker, less numerous and present in the dorso-apical surface of the antennal segment IV; they are as long as the standard “s” setae and homologous to the guard sensilla of the sensory organ of the antennal segment III (fig. 7B, a); 2.5: smooth setae, shorter than the former one, with a double ring on their base, and present in the internal part of the antennal segment IV (Beruete & Jordana 2001); 2.6: long or shorter bent setae set in dorsal surface of antennal segment I (fig. 7B, a, b); 2.7: “s” setae, short, slightly thicker, wider at the base, striated, in antennal segments II, III and IV (fig. 1, B of Beruete & Jordana 2001).



**Figure 3**  
A, *Pseudosinella aramendiai* n. sp., claw of leg III. – B, *idem*, micro. – C, *Pseudosinella arrasatensis* n. sp., claw of leg III. – D, *idem*, micro. – E, *Pseudosinella subinflata*, claw of leg III. – F, *Pseudosinella duprei* n. sp., claw of leg III. – G, *idem*, micro. – H., *Pseudosinella inflata*, claw of legs II.

**Table 2** – Comparison of non adaptive characters of the species close to *P. aramendiai* n. sp.

Species	E	Tenant hair	Macrosetae /s	Abd. Seg. II	Labial formula
<i>Pseudosinella aramendiai</i> n. sp.	4	spatulated	R001/0/00/0101+2/0	-aBqq	MMRELL
<i>P. insubrica</i> Gisin & Gama, 1969	0	pointed	R001/0/00/0101+2/0	-aBqq	MmReLL
<i>P. huetheri</i> Stomp, 1971	5	spatulated	R001/0/00/0101+2/0	-aBqq	MmReLL
<i>P. whalgreni</i> (Börner, 1907), sensu Stomp	5	-	R001/0/00/0101+2/0	-aBqq	MmReLL
<i>P. metallica</i> Jacquemart, 1980	4	pointed	R001/0/00/0101+2/-	paBqq	-
<i>P. sandelorum</i> Gruia, 1977	5	spatulated	R001/0/00/0101+2/0	paBqq	-MRELL

underlined= differential character; E= eyes.

3) Sensorial setae “s”, short, more or less striated and leaf-shaped (fig. 6A, B, a): one in the apical dorso-external region of the antennal segment II and the two internal “s” setae of the sensory organ of antennal segment III.

In the apical region of the antennal segments II and III in a interno-ventral position, far from the setae line, there is a pseudopore (fig. 8F), and in an external-ventral position, behind the setae line, there is a special organ inside a pit such as in figure 8B.

Antennal segment IV spindle-like organ, wide in the apex and close to microseta “s”. Apical vesicle absent.

Formula of the labial base:  $M_1M_2REL_1L_2$ . All seta ciliated. Formula of the dorsal macrosetae:  $R001/0/00/0101+2$ . Abdominal tergite II chaetotaxy: -aBq<sub>1</sub>q<sub>2</sub>. Accessory seta “s” in the anterior trichobotrial complex of abdominal tergite IV absent.

Claw (fig. 3A) with dental plate occupying 60-70% of the basal internal edge, although in some specimens it only reaches 55%. Basal teeth of different size, posterior almost two times larger than the anterior and neither of them reaching the level of the distal tooth. Medial tooth barely developed approximately half of the anterior. Empodial appendage spear-like with lateral expansions reaching the tip. Dorsal tibiotarsal tenent hair thin and spatulated. Legs without scales. Retinaculum with 4+4 teeth and one ciliated seta. Two internal and three or four external setae related to two distal pseudopores of each manubrium dorsal shield. Mucro short with sub-equal teeth (fig. 3B).

**Biology** – This species is always found in organic matter accumulations. In Basaura, it has been found in old, mouldy bat manure; in Arbeltz, Cueva Fría and Mentrokilo in old manure from sheep and cattle and in the rest of the caves in vegetal residues. Although this species reaches the dark area of the cave, it has never been found in deep zones where the environmental humidity is near the saturation point.

**Discussion** – According to the macrosetae dorsal chaetotaxy,  $R001/0/00/0101+2$ , and absence of seta “s” in the anterior trichobotrial complex of the abdominal tergite IV, this species belongs to the group *P. insubrica* Gisin & Gama, 1969, from which this species differs by the tibiotarsal tenent hair, labial formula and number of eyes. Together with this species are *P. metallica* Jacquemart, 1980, *P. huetheri* Stomp, 1971, *P. sandelorum* Gruia, 1977, and *P. whalgreni* (Börner 1907). It is distinct from all of them, except from *P. metallica*, in

addition to other characteristics, because of the presence of 4+4 eyes. From *P. metallica*, it is distinguished by the absence in this new species of seta ‘p’ on abdominal tergite II and because the tibiotarsal tenent hair is sharp pointed in *P. metallica* and spatulated in *P. aramendiai* n. sp. In the original description of *P. metallica*, labial chaetotaxy is not given. See tab. 2.

**Derivatio nominis** – This species is dedicated to Felix Aramendía, who died in August 1983 while cave-diving in the Itxako spring, where the subterranean river of the Basaura Cave originates.

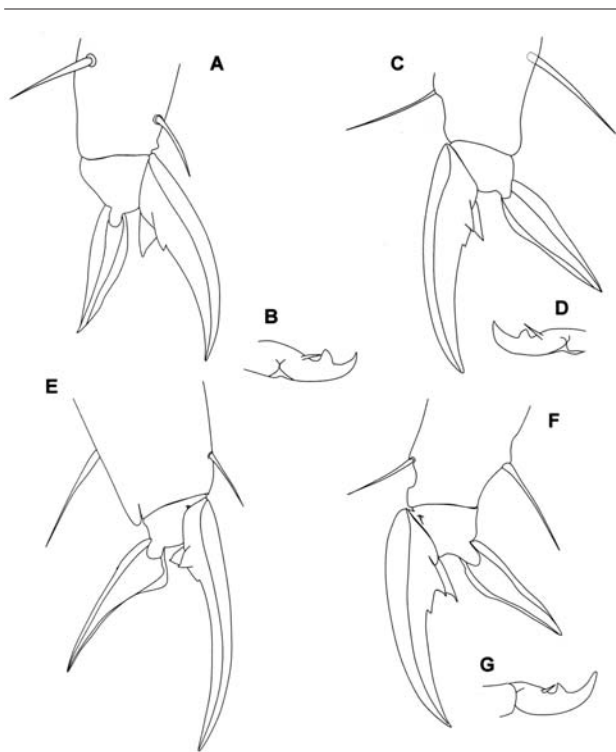
*Pseudosinella arrasatensis* Beruete & Jordana  
n. sp.

**Type material** – Types: Galarrako kobie (Arrasate, GI), 840720, (leg. *Sendra*). **Holotype**: slide n° 1. – **Paratype**: slide n° 2.

**Description** – Size: 1.9-2.2 mm. Eyes and pigment absent. Antennae relatively long, relationship antenna/cephalic diagonal oscillates between 2.0 and 2.3. The relationship between antennal segments I/II/III/IV is approximately 0.12/0.25/0.29/0.47. Antennal setae belong to the same principal types described for the precedent species. Details about setae micro-sculpture were not seen as the material available for SEM was insufficient. Macrosetae, mesosetae and microsetae are ciliated and sharp pointed, and are present in all antennal segments; in the base of the antennal segment I there are three smooth, spine-like microsetae such as in figure 7, E. Setae “s” of different ciliated types. Denticulate setae “s” have not been identified, however they are probably present. Setae “s” short and leaf-shaped, one in the apex of antennal segment II and other in the sensory organ of the antennal segment III. The pseudopore (fig. 8F) and the pit organ (fig. 8B) are present in the apex of the antennal segment III and IV. Small organ of the antennal segment IV present, spindle-like and enclose by one sensory seta “s”; apical vesicle absent. Formula clypeo-labral 4/5,5,4. The four clypeal setae are sub-equal, long, thin and smooth. Labral ventrodorsal large comb with 7 to 9 stout teeth, small comb with a higher number, about 12, but developed. Labial formula:  $m_1m_2rel_1l_2$ . Seta “r” vestigial.

Formula of the dorsal macrosetae:  $R111/0/32/0201+2$ . Abdominal tergite II chaetotaxy: pABq<sub>1</sub>q<sub>2</sub>. Accessory seta “s” present in the trichobotrial anterior complex in abdominal tergite IV.

Claw with dental plate occupying approximately 50% of the basal internal border (fig. 3C). Medial tooth well developed; basal teeth unequal, the posterior is slightly more than two times larger than the anterior, not reaching the level of the medial tooth. Empodium spear-like and lateral expansions reaching the apex. Dorsal tibiotarsal tenent hair long and spatulated. Ventrodorsal smooth setae of tibiotarsus III slightly longer than ciliated setae located near. Legs without scales. Ventral tube with 9+9 lateral setae, 7+7 smooth and 2+2 ciliated, 9+9 anterior ciliated setae.



**Figure 4**  
A, *Pseudosinella eskualduna* n. sp., claw. – B, *idem*, mucro. – C, *Pseudosinella pieltaini*, claw. – D, *idem*, mucro. – E, *Pseudosinella jeanpierrei* n. sp., claw. – F, *Pseudosinella pyrenaea*, claw. – G, *idem*, mucro. [All of leg III]

Retinaculum with 4+4 teeth and one ciliated seta. Two internal and three external setae related to the two distal pseudopores in each of the two dorsal shields of manubrium. Mucro relatively short, distal tooth slightly shorter than basal (fig. 3D).

**Discussion** – Based on the non adaptive characters, this species may be included in the group of *P. subterranea* Bonet, 1929, *P. subinflata* Gisin & Gama, 1969, *P. pieltaini* Bonet, 1929, etc. (tab. 3), with a wide representation in the studied area. Regarding the claw structure and the empodial appendix, this species may be close to *P. subinflata* (fig. 3E), clearly diverging from the rest of the species, such as *P. subterranea*, *P. pieltaini*, etc., as the latter have a more stylized claw. The only characteristic which clearly separates this species from the others, is the tibiotarsal tenent hair, while sharp pointed in all known species until now, it is spatulated in the new (fig. 3C). This character, at least in this species group, is very stable.

**Derivatio nominis** – The name of this species derives from the name of the locality of the cave in which the species was found, Arrasate (Mondragón in Castillian language).

**Table 3** – Comparison of non adaptive characters of the species close to *P. arrasatensis* n. sp. and *P. duprei* n. sp.

Species	E	Tenent hair	Macrosetae /s	Abd. Seg. II	Labial formula
<i>Pseudosinella arrasatensis</i> n. sp.	0	spatulated	R111/0/32/0201+2/s	pABqq	mmrell
<i>P. dohali</i> Gisin, 1965	0	pointed	R111/7/32/0201+2/s	pABqq	mmrell
<i>P. longicornis</i> Bonet, 1929	0	pointed	R111/7/32/0201+2/s	pABqq	mmrell
<i>P. tarraconensis</i> Bonet, 1929	0	pointed	R111/7/32/0201+2/s	pABqq	mmrell
<i>P. unguiculata</i> Bonet, 1929	0	pointed	R111/7/32/0201+2/s	pABqq	mmrell
<i>Pseudosinella duprei</i> n. sp.	0	pointed	R111/0/32/0201+2/s	pABqq	Mmrell
<i>P. inflata</i> Bonet, 1931	0	pointed	R111/7/32/0201+2/s	pABqq	Mmrell
<i>P. pieltaini</i> Bonet, 1929	0	pointed	R111/0/32/0201+2/s	pABqq	m(M)mrell
<i>P. subinflata</i> Gisin & Gama, 1969	0	pointed	R111/0/32/0201+2/s	pABqq	m(M)mrell
<i>P. subterranea</i> Bonet, 1929	0	pointed	R111/0/32/0201+2/s	pABqq	m(M)mrell

underlined= differential character; E= eyes.

### *Pseudosinella duprei* Beruete & Jordana n. sp.

**Type material** – Types: Gouffre Redoute Louis XIV (Biriadou, LA). 860228, (leg. *Dupré*). **Holotype**: slide 02. – **Paratypes**: 1 in each slide 01, 03 and 04.

**Description** – Size: 2 mm. Pigment and eyes absent. Relation antenna/cephalic diagonal between 2.3 and 2.7. Relationship between antennal segments I/II/III/IV approximately 0.15/0.25/0.32/0.50. Antennal setae similar to the former species. Setae “s”, short, more or less striated and leaf-shaped present (fig. 6A), one in antennal segment III (exceptionally two setae in one specimen) and the two internal setae “s” of the sensory organ in antennal segment III. Pseudopore and pit organ (fig. 8B) on the apical region of antennal segments II and III.

Small organ of antennal segment IV standard, near to the microseta “s”. Apical vesicle absent.

Formula clypeo-labral 4/5,5,4. The four clypeal setae sub-equals, long, thin and smooth. Ventrodistal large comb of the labrum with 7 to 9 teeth, small comb with a higher number of teeth, about 12, but less developed.

Formula of the labial base:  $M_1m_2rel_1l_2$ , seta “r” vestigial.

Formula of dorsal macrosetae: **R111/0/32/0201+2**. Abdominal tergite II chaetotaxy: **pABq<sub>1</sub>q<sub>2</sub>**. Seta “s” near to the anterior trichobotrium of abdominal tergite IV present. Claw (fig. 3F) with dental plate occupying 30% of the basal internal border. Medial tooth small; basal teeth do not reach the level of medial tooth, the posterior between 1.5 and 2 times larger than anterior and both are wide. Empodial apex spear-like and lateral expansions reaching the apex. Dorsal tibiotarsal tenent hair thin and sharp pointed, not very long. Smooth ventrodistal seta in tibiotarsus II slightly longer than ciliated setae located nearby.

Legs without scales. Ventral tube with 12(11)+12(11) lateral setae, 4+4 smooth and 8(7)+8(7) ciliated.

Retinaculum with 4+4 teeth and one ciliated seta. Two internal setae and three or four external related with the two distal pseudopores in each dorsal shield of the manubrium. Mucro long, distal tooth longer than basal, basal setae thin (fig. 3G).

**Discussion** – This species is very close to *P. subterranea* Bonet, 1929 group. All non adaptive characters, such as the dorsal chaetotaxy of abdominal tergites II and IV are identical in the group species (tab. 3). The only difference of chaetotaxy is the constant presence in this new

species of seta  $M_1$  ciliated (smooth or ciliate in *P. subterranea*, *P. subterranea baztanensis* n. sp. and *P. pieltaini*) although this difference should be prudently considered since the specimens number is reduced. It has the same chaetotaxy as *P. inflata*, a species which has not been found after its description by Bonet, 1931 and with a wider claw (fig. 3H) and narrower in *P. duprei* n. sp.

The relative antennal length is shorter in this species than in *P. subterranea* and *P. subterranea baztanensis* n. sp. Claw morphology is similar to *P. subterranea baztanensis* n. sp. and dental plate occupying a higher percentage of the internal edge of the claw in *P. subterranea*. Empodial apex in this species (fig. 3F) is the least derivative of the comparison species: *P. subterranea*, *P. subterranea baztanensis* n. sp., and the internal edge is slightly concave as in *P. pieltaini* (fig. 4C); in the new species it is spear-like, although it looks to be more adapted to caves when compared with *P. subinflata* (fig. 3E).

**Derivatio nominis** – This species is named after Eric Dupré, a biospeleologist and specialist in Trechini and Catopidae cave beetles from occidental Pyrenees.

*Pseudosinella eskualduna* Beruete & Jordana  
n. sp.

**Type material** – Types: Istaürdiko ziloa (Aussurucq, ZU). SP1328, 881001, (leg. *Beruete E.*). **Holotype**: slide SP1328-01. – **Paratypes**: 1 in each slide SP1328-02, SP1328-03 and SP1328-04.

**Description** – Size: 1.4–1.6 mm. Pigment and eyes absent. The relationship antenna/cephalic diagonal oscillates between 1.7 and 1.9. Relation between antennal segments I/II/III/IV approximately 0.08/0.14/0.14/0.23. Antennal setae and sensory organs are very similar to other species.

Leaf like “s” setae are barely abundant: two to four, normally two, in antennal segment II and the two internal setae “s” of the sensory organ in antennal segment III.

Formula clypeo-labral: 4/5,5,4. Four clypeal setae subequal, long and smooth. Labral ventrodiscal large comb with seven thick teeth and small comb with a higher number of less developed teeth, more than 10. Formula of labial base:  $M_1m_2rel_1L_2$  (in one specimen seta  $l_2$  smooth on one side). Seta “r” vestigial.

Formula of dorsal macrosetae:  $R001/0/22/0201+2$ . Abdominal tergite II chaetotaxy:  $pABq1q2$ . Seta “s” present near the anterior trichobotrium of abdominal tergite IV. Claw (fig. 4A) with dental plate occupying between 30 and 35% of the basal internal edge with a similar structure as in *P. virei* Absolon, 1901 and *P. subvirei* Bonet, 1931. Medial tooth barely developed, basal teeth very different, posterior well developed reaching the level of the medial tooth; anterior tooth approximately the same size as medial tooth. Empodial apex spear-like, wings reaching the apex.

**Table 4** – Comparison of non adaptive characters of the species close to *P. eskualduna* n. sp.

Species	E	Tenent hair	Macrosetae /s	Abd. Seg. II	Labial formula
<i>Pseudosinella eskualduna</i> n. sp.	0	pointed	$R001/0/22/0201+2/s$	pABqq	MmrelL
<i>P. subvirei</i> Bonet, 1931	0	pointed	$R001/0/32/0201+2/s$	pABqq	mmrell
<i>P. virei</i> Absolon, 1901	0	pointed	$R001/0/32/0201+2/s$	pABqq	mmrell

underlined = differential character; E = eyes.

Dorsal tibiotarsal tenent hair small, thin and pointed. Ventrodiscal tibiotarsal smooth seta slightly longer than ciliated setae nearby. Legs without scales.

Retinaculum with 4+4 teeth and one ciliated seta. Two internal setae and four external setae related with the two distal pseudopores of each dorsal shield of manubrium. Mucro short with distal tooth slightly longer than basal (fig. 4B).

**Biology** – This species was found in rotten vegetal residues with a high humidity at the bottom of a doline, which traversed the cavity, and, as such, was not found in a truly cavernicolous habitat.

**Discussion** – The chaetotaxy of this species is unique. The proximity with *P. virei* Absolon, 1901 (lives with *P. eskualduna* in Istaürdiko ziloa) and with *P. subvirei* Bonet, 1931 may be high. In accordance with the study of non-adaptive characters, the differences between these two species are: two dorsal macrosetae in thoracic segment II in this species compared to three macrosetae in *P. virei* and *P. subvirei*; setae  $M_1$  and  $L_2$  ciliated in this species and smooth in the other two (tab. 4).

Considering adaptive characters, claw structure is similar to *P. virei* and *P. subvirei*, the only difference is the relative length of the mucro in these two species.

**Derivatio nominis** – The species name is taken from the word “eskualduna”, dialectal form of Iparralde, with certain Basque bio-speleology tradition (e. g. *Escualdoniscus coiffaiti* Vandel, *Aphaenops eskualduna*, etc.).

*Pseudosinella jeanpierrei* Beruete & Jordana  
n. sp.

**Type material** – Types: Oyanbeltzako ziloa (Urkulu, BN), 950527, (leg. *Beruete E.*). **Holotype**: slide n° 01. – **Paratypes**: 12 in ethyl alcohol and 2 in SEM stub.

*Other studied specimens*: Oyanbeltzako ziloa (Urkulu, BN), 1 in slide SP1301, 880612, (leg. *Beruete E.*).

**Description** – Size: 2 mm. Pigment and eyes absent. The relationship antenna/cephalic diagonal is 2.33. Relationship between antennal segments I/II/III/IV: 0.13/0.28/0.23/0.43. Antennae longer than the other studied species. Normal setae and sensory setae similar to the others. There are no significant differences in the setae types when observed by SEM. It must be noted

**Table 5** – Comparison of non adaptive characters of the species close to *P. jeanpierrei* n. sp.

Species	E	Tenent hair	Macrosetae /s	Abd. Seg. II	Labial formula
<i>Pseudosinella jeanpierrei</i> n. sp.	0	pointed	R221/1/32/0201+2/s	pABq	Mmrell
<i>P. pyrenaea</i> Bonet, 1931	0	pointed	R221/1/32/0201+2/s	pABq	mmrell
<i>P. oxybarensis</i> Gisin & Gama, 1969	0	pointed	R221/1/32/0201+2/s	pABq	mmrell
<i>P. bessoni</i> Deharveng, 1988	0	pointed	R221/1/32/0201+3/s	pABq	Mmrell

underlined= differential character; E= eyes.

that the leaf-shaped setae are numerous in comparison with other species: one to three in antennal segment II, two in the sensory organ of antennal segment III, more than three in the dorso-apical region of the same segment and three or four in the dorso-basal region of the antennal segment IV.

Formula clypeo-labral: 4/5,5,4. The four clypeal setae subequal, long, thin and smooth. Large ventrodiscal comb with eight thick teeth, small comb with approximately 14 less developed teeth. Basal labial chaetotaxy (fig. 9B) follows the formula: **M<sub>1</sub>m<sub>2</sub>rel<sub>1</sub>l<sub>2</sub>**. Seta 'r' vestigial.

Formula of dorsal macrosetae: **R221/1/32/0201+2**. Abdominal tergite II chaetotaxy: **pABq<sub>1</sub>q<sub>2</sub>**. Seta "s" present near the anterior trichobotrium of abdominal tergite IV.

Claw (figs. 4E; 10A) with dental plate occupying the 20 to 25% of the basal internal edge. The medial tooth substituted by a rounded expansion, observed by SEM, is seen as a pointed fold such as in *P. oxybarensis* Gisin & Gama, 1969 and *P. pyrenaea* Bonet, 1931; basal teeth subequal and small. Internal edge of empodial appendix concave, basal width such as in the previously described species. Tibiotarsal tenent hair thin and pointed. Ventrodiscal smooth seta of tibiotarsus III slightly longer than nearby ciliated setae.

Retinaculum with 4+4 teeth and one ciliated seta. Two internal setae and three or four external setae related to the two distal pseudopores in each dorsal shield of the manubrium. Mucro long, distal tooth longer than basal, and basal seta small.

**Discussion** – Thibaud & Massoud (1983) cited the presence of *P. oxybarensis* in Oyanbeltza cave. Only one specimen was found on the initial sampling date (SP13019) from the mentioned cave and its cephalic chaetotaxy was asymmetric (**R221 - R211**), as such this specimen may belong to this species. On the thoracic tergite II, there is a macroseta anterior to the pseudopore in the same position as indicated by Deharveng & Gouze (1986) in *P. cabidochei* and Deharveng (1988) in *P. bessoni*. The absence of this macroseta in *P. oxybarensis* suggests that it might belong to another species. Also, the specimen differs from *P. oxybarensis* in other characteristics such as by having a larger claw, empodial narrowing and presence of leaf-shaped setae "s" in antennal segment IV. The scarce material (only one specimen) led us to ask for additional specimens from the original authors but, unfortunately, we were unable to contact them. Eventually, we obtained 15 specimens from the cave and concluded that they belong to a different species of *P. oxybarensis* since they differ in the dorsal

cephalic macrosetae: **R211** in *P. oxybarensis* and **R221** in this species (tab. 5).

This species has a similar chaetotaxy to that of *P. pyrenaea*, **R221/1/32/0201+2**, with an accessory "s" seta near to the anterior trichobotrium of abdominal tergite IV, and abdominal tergite II chaetotaxy with formula **pABq<sub>1</sub>q<sub>2</sub>**. This new species differs from *P. pyrenaea* (fig. 4F, G) in the larger claw and empodial narrowing, a more basal dental plate in *P. jeanpierrei* (20 to 25% in this species, 35 to 40% in *P. pyrenaea*) and the presence of type 3 setae in antennal segments III and IV: two in the sensory organ of antennal segment III, and sometimes, one extra seta in *P. pyrenaea*; two setae in this sensory organ and three extra setae in *P. jeanpierrei* n. sp. in antennal segment III, four leaf-like setae in *P. jeanpierrei* n. sp. and none in *P. pyrenaea* in antennal segment IV.

All differences found are related to adaptive characteristics, so it seems that *P. pyrenaea* and this new species are closely related phylogenetically, and *P. pyrenaea* is a less derivative stage (smaller degree of troglomorphy). In effect, this new species looks to be more adapted to cave habitats (claw and empodial appendix narrower and higher number of antennal sensory setae).

Differentiation of these related species in two neighboring karstic areas may be understandable considering that both areas are separated by land in which flysch deposition predominated, with areas of sand and schist without karstification. They are areas lithologically well separated. On the other hand, it is possible that the Oyanbeltza cave was populated from the south, after the glacial ices disappeared and also from populations of *P. pyrenaea* coming from the nearby Abodi range. Altitudinal differences (lower temperature) and water regimen (older and drier caves in the south, younger and with higher humidity in the north) may explain the higher degree of troglomorphy in the new species.

At the moment, it may be an endemism of the Oyanbeltza cave since the samples from other nearby caves, such as Elursaso, Astaete and Amuladoy, have not provided similar results. More extensive sampling on both sides of the border may provide clarification of this state in caves from Navarra (karstic zones of Idopil, Saiarre, etc.) that have not yet been sampled.

**Derivatio nominis** – This species was named after Jean Pierre Besson, a famous speleologist with a thorough knowledge of the Pyrenean karstic region. Since Louis Deharveng dedicated a new species to him (*P. bessoni*), we have adapted the first name of our good friend to name this new species.

**Table 6** – Comparison of non adaptive characters of the species close to *P. jesusi* n. sp. and *P. luquei* n. sp.

Species	E	Tenant hair	Macrosetae /s	Abd. Seg. II	Labial formula
<i>Pseudosinella jesusi</i> sp. n.	0	pointed	R101/0/32/0201+2/s	pABqq	mmrell
<i>P. immaculata</i> (Lie-Petersen, 1896)	0	pointed	R101/0/32/0201+2/s	pABqq	M(m)mrrell
<i>Pseudosinella luquei</i> sp. n.	6	broaden	R000/0/00/0101+2/s	-aBqq	MMRELL
<i>P. suboculata</i> Bonet, 1931	6	broaden	R000/0/00/0101+2/s	-aBqq	MmRell
<i>P. superoculata</i> Gisin & Gama, 1969	6	pointed	R000/0/00/0101+2/s	-aBqq	MmRell
<i>P. goughi</i> Gisin & Gama, 1972	6	pointed	R000/0/00/0101+2/s	-aBqq	mmRell
<i>P. duodecimoculata</i> Bonet, 1931	6	spatulated	R011/0/00/0101+2/s	-aBqq	MMRELL

underlined= differential character; E= eyes.

### *Pseudosinella jesusi* Beruete & Jordana n. sp.

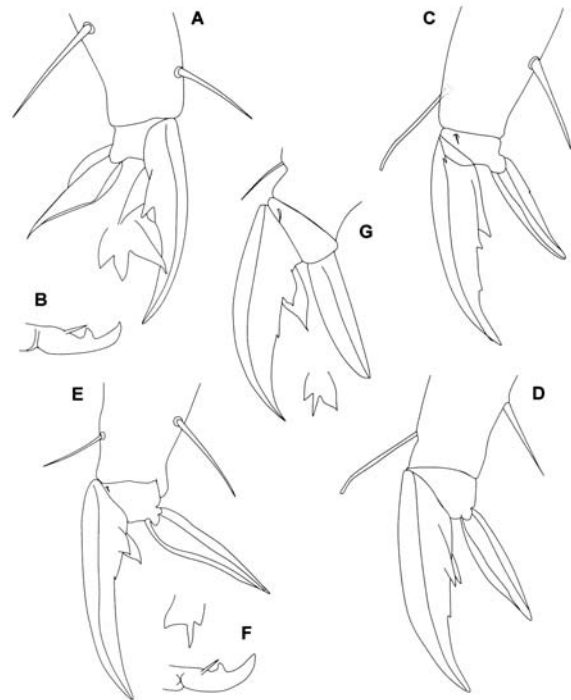
**Type material** – Types: Akuandi (Urbasa south, NA), SP1276, 880116, (leg. *Beruete E.*). **Holotype**: slide SP1276-02. – **Paratypes**: 1 in slide SP1276-01 and 1 in slide SP1276-03, 30 paratypes in ethyl alcohol and 1 specimen in SEM stub.

**Other studied specimens**: Akuandi (Urbasa south, NA), (1 in slide SP1109, 820207; SP1113, erroneous identification as *P. subterranea* by Jordana & Beruete 1983), 1 in slide and 6 in ethyl alcohol, 820307; 1 in slide SP1131, 850929; 2 in slide SP1162, 851117; SP1298, 2 in slide and 14 in ethyl alcohol, 880609, (leg. *Beruete E.*). Arantzadua II (Urbasa south, NA), (1 in slide SP1111, 820214, erroneous identification as *P. subterranea* by Jordana & Beruete 1983); 2 in slide SP1089, 801214; 3 in slide SP1153, 851025; 1 in slide SP1340, 881023; 2 in slide SP1341, 881023; 3 SP1342, 881023, (leg. *Beruete E.*). Noriturri (Urbasa south, NA), (1 in slide SP1090, 810418, erroneous identification as *P. subterranea* by Jordana & Beruete 1983); SP1110, 21 in slides and 8 in ethyl alcohol, 820214; SP1130, 31 in slides and 6 in ethyl alcohol, 850921; SP1280, 41 in slides and 25 in ethyl alcohol, 880416; SP1281, 11 in slides and 2 in ethyl alcohol, 880416; SP1339, 31 in slides and 31 in ethyl alcohol, 881023, (leg. *Beruete E.*). Zarpia (Entzia, AR), 17 in sample SP1266, 871121; 1 in slide SP1267, 871121, (leg. *Beruete E.*).

**Description** – Size: 2 mm (male 1.55 mm.) Habitus as figure 2 B. Pigment and eyes absent. Ratio antenna/cephalic diagonal between 1.82 and 2.33. Relationship between antennal segments I/II/III/IV is approximately 0.079/0.213/0.261/0.363. Setae and sensory organs of antennal segments are as described for other species in this paper. Leaf-like setae are scarce: one or two in antennal segment II and two internal setae “s” of the sensory organ in antennal segment III.

Cliepo-labral formula 4/5,5,4 (fig. 9A). Four subequal clypeal setae, long, thin and smooth. Large ventrodistal comb of the labrum with 8 or 9 thick teeth, small comb with 12 to 14 less developed teeth. Formula of labial base: **m<sub>1</sub>m<sub>2</sub>rel<sub>1</sub>l<sub>2</sub>**. Seta “r” vestigial.

Formula of dorsal macrosetae: **R101/0/32/0201+2**. Abdominal tergite II chaetotaxy: **pABq<sub>1</sub>q<sub>2</sub>**. Seta “s” close to ante-

**Figure 5**

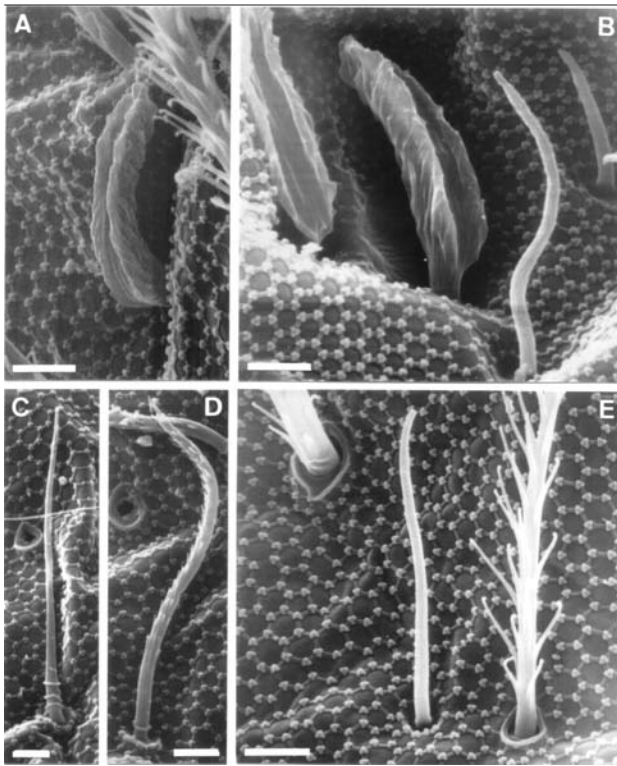
A, *Pseudosinella jesusi* n. sp., claw. – B, *idem*, mucro. – C, *Pseudosinella luquei* n. sp., claw. – D, *Pseudosinella suboculata*, claw. – E, *Pseudosinella subterranea baztanensis* n. ssp., claw. – F, *idem*, mucro. – G, *Pseudosinella immaculata*, claw. [All of leg III]

rior trichobotrium of abdominal tergite IV present. Claw (Figs. 5 A; 10 B) with dental plate extending over approximately 45% of basal internal edge. Medial tooth well developed, basal teeth unequal, posterior more than two times the anterior, pointed, almost reaching the medial tooth level. Empodial appendix with a wide base, some specimens with a light notch in the distal half of the internal edge, and sometimes with a small tooth in the external edge when is observed by optical microscope. SEM observations show a external lamina which may produce a fold with tooth shape. Dorsal tibiotarsal tenent hair thin and pointed. Ventrodistal smooth seta in tibiotarsus II slightly longer than nearby ciliated setae. Trocanteral organ with 10 to 13 straight, thin, smooth and pointed setae. Legs without scales. Ventral tube with 16+16 lateral setae, 8+8 smooth and 8+8 ciliated; 8(9)+8(9) anterior ciliated setae; minimum of 8+8 posterior setae, 6+6 ciliated and 2+2 smooth.

Retinaculum with 4+4 teeth and one ciliated seta. Two internal setae and three or four external related to the two distal pseudopores of each dorsal shield of the manubrium. Mucro long, with distal tooth longer than basal. Basal seta small (fig. 5B).

**Biology** – This species was found in the remains of rotten wood residues with a high humidity, always in





**Figure 6**  
*Pseudosinella jesusi* n. sp. – A, leaf-like sensilla of antennal segment II. – B, sensory organ of antennal segment III. – C, pointed sensilla of the antennal segment IV. – D, non symmetrical spiny sensilla on the antennal segment IV. – E, normal seta ciliated (a) and sensilla striated (b) from antennal segment II (Bar: 2  $\mu$ m).

dark areas where this species may be found living together with *P. pieltaini*. In spite of this *P. unguilonginea* also lives in some caves where this species is found, although they inhabit different substrates.

**Discussion** – The non-adaptive chaetotaxy of this species is substantially shared with *P. immaculata* (Lie-Pettersen 1896) in Gisin & Gama (1972) (tab. 6). The only difference is that seta  $m_1$  is always smooth in the new species and it may be ciliated in *P. immaculata*. The shape of empodial appendix is spear-like in *P. immaculata* (fig. 5G), with a wider base in the new species. Relative antennal length is larger in the new species, 1.8 to 2.3 times the cephalic diagonal, and about 1.5 times in *P. immaculata*. Claw narrower in the new species and dental plate occupying a more basal position.

**Derivatio nominis** – This species, found in caves in Urbasa and in Entzia, is dedicated to Jesús Beruete, father of the senior author, who enjoyed the mountains.

### *Pseudosinella luquei* Beruete & Jordana n. sp.

**Type material.** – Types: Arleze (Urbasa, NA), SP1146, 851020, (leg. *Beruete E.*). **Holotype:** slide SP1146-12. – **Paratypes:** slides SP1146-05, SP1146-06, SP1146-07, SP1146-08, SP1146-09, SP1146-10, SP1146-11 and SP1146-13. 1 specimen in SEM stub and 77 in ethyl alcohol.

**Other studied specimens:** Supelegor (Gorbea, BI), 2 in slide, 670324, (leg. *C. Galán*). Mairuelegorreta I (Gorbea, AR), 3 specimens (leg. *Esparta E.T.*). – Arleze (Urbasa, NA), 2 in slide SP1315, 880918; SP1316, 3 in slides and 2 in ethyl alcohol, 880918. Artzegi I (Gorbea, AR), SP1253, 3 in slides and 4 in ethyl alcohol, 871108. Ayssayger (Holtzarte, Larrau, ZU), 1 in slide SP1361, 881217; Cerro Viejo (Urbasa, NA), SP1171, 4 in slides and 8 in ethyl alcohol, 851229; Iguaran (Entzia, AR), SP1273, 3 in slides and 13 in ethyl alcohol, 871212. (Gorbea, AR), SP1252, 5 in slides and 50 in ethyl alcohol, 871108. Ormazarreta I (Aralar, NA), 3 in slide SP1133, 851003; Troskaeto leizea (Aralar, GI), SP1164, 3 in slides and 1 in ethyl alcohol, 851203. Zarpia (Entzia, AR), SP1267, 4 in slides and 49 in ethyl alcohol, 871121 (leg. *Beruete E.*) – Respiño, Cueva del (Celleruelo, O), 40 in sample 880625. Pala Vella, Cueva (Biobra, OR), 3 in sample 880701, (leg. *Salgado*). – Tío Marcelino, Cueva de (Santotís, Tudanca, S), 5 in sample A-109, 920808. Hornucos, Cueva de los (Suano, S), 20 in sample A-116, 921128 (leg. *González Luque C.*).

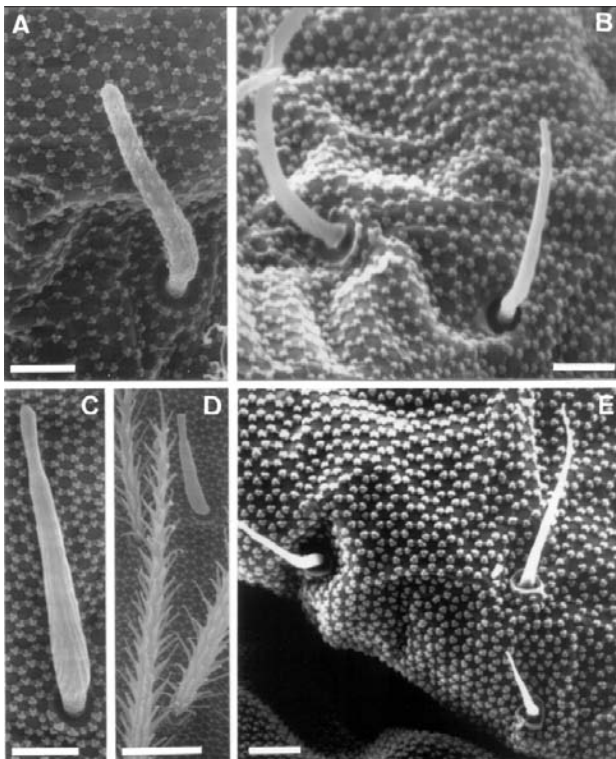
**Description** – Habitus like figure 2D. Size: 2-2.5 mm. Blue pigment very dispersed in dorsal body surface, antennae and legs (except on tibiotarsus which only shows isolated grains of pigment), more concentrated in the ventral body region and especially over ocular spots and forehead. 6+6 eyes. Ratio antenna/cephalic diagonal in our specimens between 1.4 and 1.9. Ratio between antennal segments I/II/III/IV is about 0.14/0.34/0.41/0.92. Antenna without scales. Antennal setae similar to those described for former species but with the particularity that the pointed apex of the majority of sensillae “s”, of different types have a narrowing end such as in figures 7A, C and D. Leaf-like “s” setae are few, one in antennal segment II and two internal setae “s” of the sensory organ in antennal segment III. Formula clypeo-labral: 4/5,5,4.

Four clypeal setae subequal, long, thin and ciliated. Formula of labial base:  $M_1M_2REL_1L_2$ , but in Mairuelegorreta (Gorbea) and Iguaran (Entzia) in Araba, Arleze (Urbasa) in Navarra, “Cueva de Tío Marcelino” (Tudanca) and “Cueva de los Hornucos” (Hermandad de Campoo de Suso) in Cantabria, their populations have some specimens with variations in several setae  $M_2$ , E and/or  $L_1$ ; however  $L_2$  is always ciliated and the formula  $M_1m_2Rel_1l_2$  of *P. suboculata* (Gisin & Gama, 1972) never appears. Seta  $M_1$  equal or slightly shorter than  $M_2$ ; seta R between 1/2 and 2/3 seta  $M_2$ .

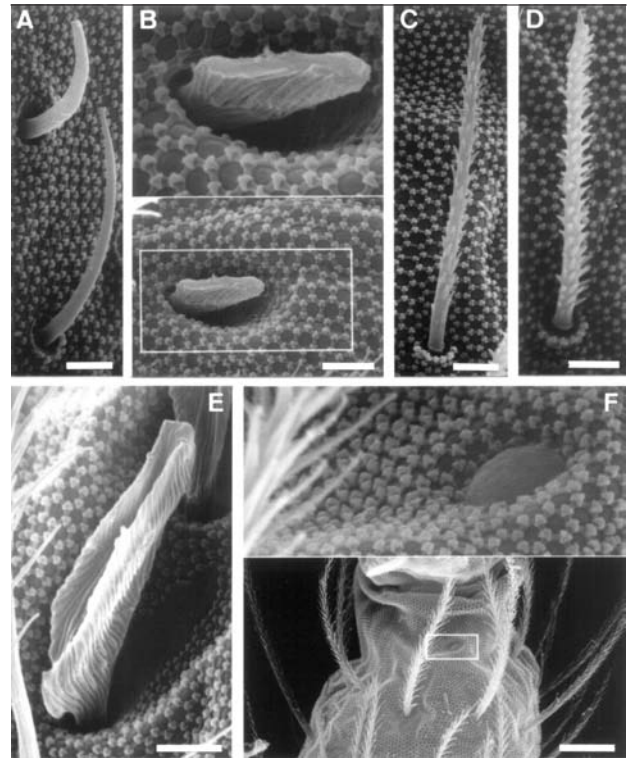
Formula of dorsal macrosetae: **R000/0/00/0101+2**. Abdominal tergite II chaetotaxy: **-aBq<sub>1</sub>q<sub>2</sub>**. Seta "s" close to anterior trichobotrium of abdominal tergite IV present. Claw (figs. 5 C; 10 D) with dental plate extending over 60 to 70% of the basal internal edge. Medial tooth well developed although smaller than basal teeth, which are pointed, and unequal and approximately localized 50% of the claw basal internal edge; posterior tooth two to three times larger than the anterior and situated in a more basal position. Two lateral teeth present. Empodial appendix spear-like and with a small tooth on external edge; fins reach the apex. Dorsal tibiotarsal tenent hair thin and slightly broader in the tip.

Retinaculum with 4+4 teeth and one ciliated seta. Two internal setae and eight or nine external related to two distal pseudopores in each dorsal shield of the manubrium. Mucro short with distal tooth slightly longer than basal.

**Biology** – This species is found in residues (branches, leaves, etc.) of beech trees. Because of its wide distribution, it is probably an epigeal species but not yet found on the surface.



**Figure 7**  
Sensillae and microsetae on antennal segments. – A, *Pseudosinella jesusi* n. sp., scaly sensilla from segment III. – B, *idem*, sensillae. – C, *Pseudosinella luquei* n. sp., sensilla from antennal segment III. – D, *idem*, other sensilla. – E, *Pseudosinella jesusi* n. sp., microsetae from segment I. (Bar: 2 µm except in D: 5 µm).



**Figure 8**  
Sensillae on antennal segments. – A, *Pseudosinella subterranea baztanensis* n. ssp., striated sensillae from segment I. – B, *Pseudosinella luquei* n. sp., microsensilla in a pit on apex of segment II. – C, *idem*, non symmetrical spiny sensilla on segment III. – D, *idem*, spiny sensilla on segment III. – E, *Pseudosinella subterranea baztanensis* n. ssp., leaf-like sensilla of the sensory organ from segment III. – F, *Pseudosinella subinflata* pseudopore on the apex of antennal segment II (detail up x8) (Bar: 2 µm except for F: 10 µm).

**Discussion** – The present species shares with *P. suboculata* Bonet, 1931 the same dorsal macrosetae chaetotaxy following the formula **R000/0/00/0101+2** (tab. 6), with accessory seta "s" near the anterior trichobotrium in abdominal tergite IV present. The differences with *P. suboculata* are labial chaetotaxy with only setae **M<sub>1</sub>** and **R** ciliated in *P. suboculata* and all ciliated in the new species, although in some populations may be some variations (**L<sub>2</sub>** always ciliated).

Basal teeth of dental plate not so pointed and projects forward as in *P. suboculata* (fig. 5D) and an external tooth in the empodium is present in the former species. Antennae shorter (1.4 to 1.9 times the cephalic diagonal) than in *P. suboculata* (2 to 2.3 times). Gisin and Gama (1972), in the redescription of Bonet species, pointed out that their studied specimens were completely colourless, probably because of the conservation conditions. Specimens of *P. suboculata* studied in the present work were not completely colourless but

had somewhat less pigment than *P. luquei* in the frontal head area overall.

With *P. duodecimoculata* Bonet, 1931, shares the labial chaetotaxy following the formula  $M_1M_2REL_1L_2$ , and the relative size of the antennae; the differences are the dorsal cephalic chaetotaxy, **R011** in Bonet's species, **R000** in *P. luquei* n. sp., the claw structure and in the tibiotarsal tenent hair, spatulated in *P. duodecimoculata*, slightly broader in the tip in *P. luquei* n. sp.

Differences with *P. superoculata* Gisin & Gama, 1969 are the labial chaetotaxy, claw structure, the empodial appendix shape, distal half of internal edge concave in the species of Gisin & Gama, and in the tibiotarsal tenent hair, pointed in this species and slightly spatulated in *P. luquei* n. sp.

The differences with *P. goughi* Gisin & Gama, 1972, are the labial chaetotaxy,  $m_1(M_1)m_2Rel_1l_2$  in *P. goughi*, the claw structure, much more derivative in the species of Gisin & Gama, since it does not have the medial tooth and proximal teeth are more basal of *P. luquei* n. sp. In addition, tibiotarsal tenent hair is pointed in *P. goughi*.

**Derivatio nominis** – This species is dedicated to Carlos González Luque, cantabrian speleologist, who kindly donated a large collection of collembola from Cantabria and Asturias for the present work. The name *P. luquei*, published in the May, 1999 (Vol. 4, nº 5) volume of the magazine National Geographic, Spanish edition, passed to be *nomem nudum*, following Art. 13 (a) (i) of International Code of Zoological Nomenclature. Following the Code the publication date of the species corresponds to the publication date of the present paper.

### *Pseudosinella subterranea baztanensis*

Beruete & Jordana n. ssp.

**Type material** – Types: Bortzerreketa (Ezkaldo, Gartzain, Baztán, NA), SP1389, 890525, (leg. *Beruete E.*). **Holotype**: slide SP1389-01. – **Paratypes**: 1 in each slide SP1389-02, SP1389-03, SP1389-04, 8 in ethyl alcohol and 1 in SEM stub.

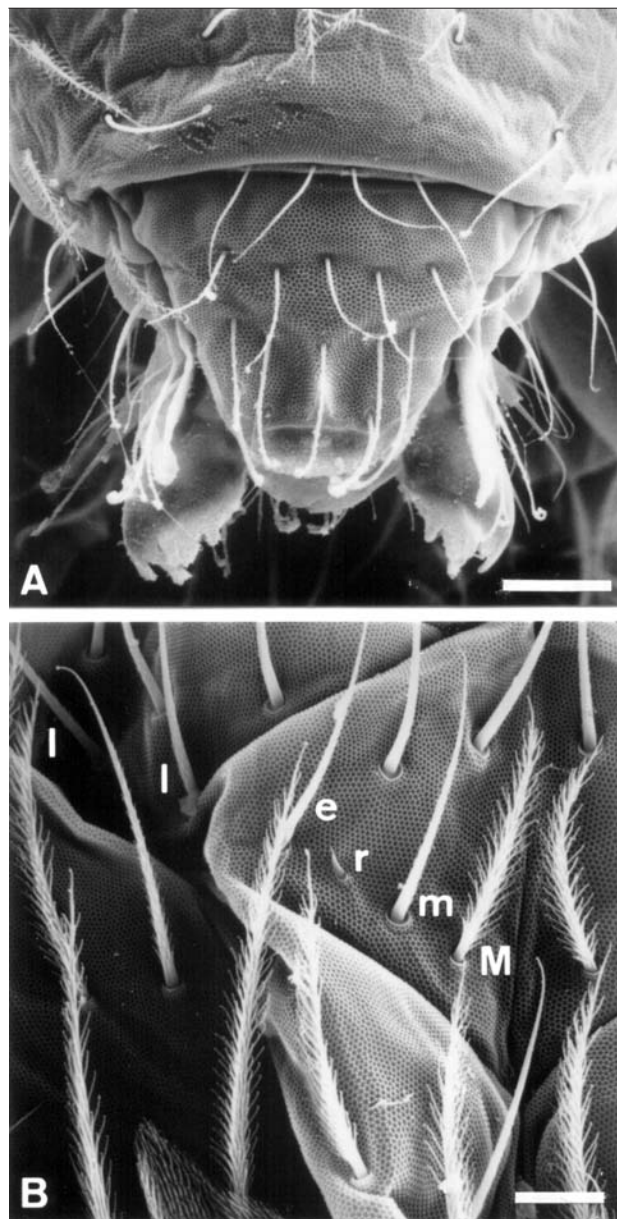
**Other studied specimens**: Bortzerreketa (Ezkaldo, Gartzain, Baztán, NA), 2 in sample SP1230, 870925; 1 in slide SP1379, 890328; 6 in sample SP1381, 890328; 7 in sample SP1390, 890525; 3 in sample SP1391, 890525, (leg. *Beruete E.*).

**Description** – Habitus as figure 2 C. Size: 2-3.5 mm. Pigment and eyes absent. Relationship antenna/cephalic diagonal between 3.5 and 4. Relationship between antennal segments I/II/III/IV approximately 0.21/0.35/0.51/1.14. Setae and sensory organs

of antennal segments similar to those described for other species in this paper.

Seta “s” leaf-shaped, short and more or less striated, numerous: two to four in antennal segment II, two internal setae “s” of sensory organ in antennal segment III and two to five extra setae in the same segment; this type of setae is not found in antennal segment IV.

Formula clypeo-labral: 4/5,5,4. The four clypeal setae are subequal, long, thin and smooth. Large ventrodiscal comb of labrum with approximately 9 thick teeth, small comb with a



**Figure 9**  
A, *Pseudosinella jesusi* n. sp., clypeo - labral setae (Bar: 20  $\mu$ m). – B, *Pseudosinella jeanpierrei* n. sp., labial setae (Bar: 10  $\mu$ m).

number of less developed teeth. Formula of the labial base:  $m_1(M_1)m_2rel_1l_2$ . Seta  $m_1$  sporadically ciliated, seta "r" vestigial.

Dorsal macrosetae formula:  $R111/0/32/0201+2$ . Abdominal tergite II chaetotaxy:  $pABq_1q_2$ . Seta "s" nearby to anterior trichobotrium of abdominal tergite IV present.

Claw (figs. 5E, 10C) with dental plate occupying 30% of the basal internal edge. Medial tooth small but conspicuous, basal teeth unequal, posterior approximately two times larger than the anterior and it does not reach the medial tooth level. Empodial appendix spear-like, lateral expansions reaching the apex, distal half of internal edge slightly concave and without teeth. Dorsal tibiotarsal tenent hair thin and pointed. Smooth

ventrodistal seta of tibiotarsus III slightly longer than nearby ciliated setae. Legs without scales. Trocanteral organ with 22 smooth setae. Ventral tube with 11(12) + 11(12) lateral setae, 3(5) + 3(5) smooth and 7(8) + 7(8) ciliated and 11(7) + 11(7) anterior ciliated setae.

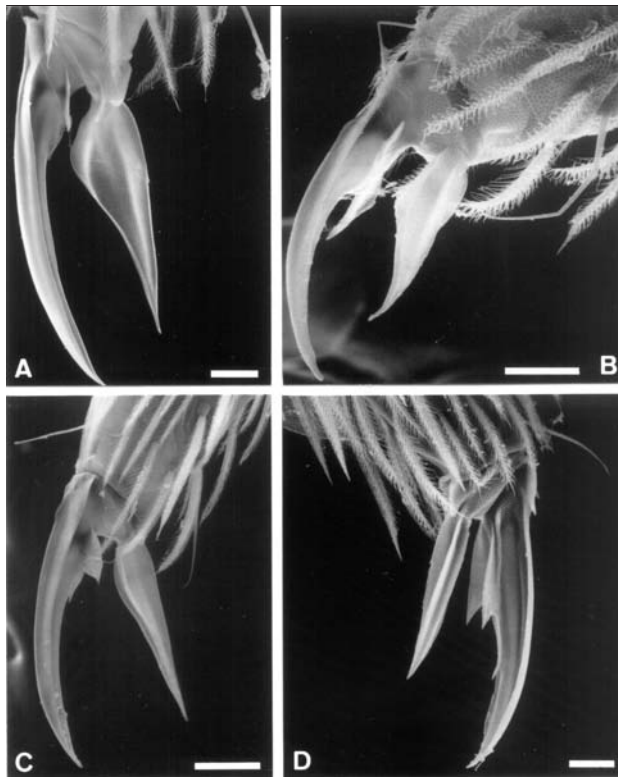
Retinaculum with 4 + 4 teeth and one ciliated seta. Two internal setae and three to five external setae related to the two distal pseudopores in each dorsal shield of the manubrium. Mucro long, distal tooth longer than the basal (fig. 5F).

**Biology** – This subspecies was found in Bortzerreketa Cave, near the town of Gartzain, in the Baztán valley. It is an active sewer, into which the Gartzain spring drains. Also found in this cave is *P. subinflata* in drier areas where flooding is infrequent, fundamentally in rotten vegetable residues. This new subspecies is usually found in deeper zones which periodically flood; it lives over clay and humid slime rich in vegetal residues.

**Discussion** – The differences with the type species are a large size, longer antennae, two to four leaf-like setae "s" in antennal segment II and two to five extra setae in antennal segment III (*P. subterranea* Bonet, 1929 shows one seta in antennal segment II, and the extra seta in antennal segment III is absent). Claw straighter and narrowing; dental plate more reduced in the new subspecies, empodial appendix is not as wide in the basal half and because of that its shape is also narrow. In the new subspecies, dorsal shield of the manubrium has two internal setae and three to five external setae related to the two distal pseudopores, otherwise two and three in *P. subterranea*.

**Derivatio nominis** – The subspecies is named after the valley where the cave in which this species found is located.

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**Figure 10**  
Scanning Electron Micrograph of the claw. – A, *Pseudosinella jeanpierrei* n. sp., leg III. – B, *Pseudosinella jesusi* n. sp., leg III. – C, *Pseudosinella subterranea baztanensis* n. ssp., leg III. – D, *Pseudosinella luquei* n. sp., leg I (Bar: 10  $\mu$ m except in D: 20  $\mu$ m).

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**Table 7** – Annex list, by provinces, of the cited caves and associated collembolan fauna.

ARABA caves	Species
Artzegi I (Gorbea, Zigoitia)	<i>Pseudosinella luquei</i> Beruete & Jordana n. sp. <i>Pseudosinella unguiculata</i> Bonet, 1929. New record. <i>Tomocerus minor</i> (Lubbock), 1862. New record. <i>Onychiurus argus</i> Denis, 1924. New record. <i>Protaphorura prolata</i> (Gisin), 1956. New record. <i>Pseudosinella luquei</i> Beruete & Jordana n. sp. <i>Tomocerus minor</i> (Lubbock), 1862. New record.
Iguaran (Entzia)	
Mairuelegorreta I (Gorbea, Zigoitia)	<i>Arrhopalites cf. sericus</i> Gisin, 1947. New record <i>Onychiurus bernardoi</i> Beruete et al, 1995. Beruete et al, 1995. <i>Pseudosinella duodecimoculata</i> Bonet, 1931. Bonet, 1929 mo <i>P. duodecimoculata</i> Handschin, 1928. Bonet, 1931. Gisin & ma, 1970. Selga, 1971. Gama, 1976. <i>Pseudosinella luquei</i> Beruete & Jordana n. sp. <i>Pseudosinella unguiculata</i> Bonet, 1929. Bonet, 1931. Selga, 71. Gisin & Gama, 1972. Gama, 1976. New citation. <i>Tomocerus minor</i> (Lubbock), 1862. New record. <i>Arrhopalites pygmaeus</i> (Wankel), 1869. New record. <i>Megalothorax tuberculatus</i> Deharveng & Beruete, 1993. New cord <i>Onychiurus argus</i> Denis, 1924. New record. <i>Pseudosinella jesui</i> Beruete & Jordana n. sp. <i>Pseudosinella luquei</i> Beruete & Jordana n. sp.
Zarpia (Entzia)	
BAXENABARRE caves	Species
Oyanbeltzako ziloa OY-101 (Urku)lu)	<i>Pseudosinella jeanpierrei</i> Beruete & Jordana n. sp.
BIZKAIA caves	Species
Supelegor (Gorbea)	<i>Pseudosinella luquei</i> Beruete & Jordana n. sp. <i>Pseudosinella unguiculata</i> Bonet, 1929. New record.
CANTABRIA caves	Species
Hornucos, Cueva de los (Suano, mpoo de Suso)	<i>Pseudosinella luquei</i> Beruete & Jordana n. sp. <i>Pseudosinella</i> sp.
Tio Marcelino, Cueva de (Santotis, danza)	<i>Pseudosinella luquei</i> Beruete & Jordana n. sp. <i>Tomocerus minor</i> (Lubbock), 1862. New record.
GIPUZKOA caves	Species
Galarrao kobie (Arrasate)	<i>Pseudosinella arrasatensis</i> Beruete & Jordana n. sp.
Troskaeto leizea (Aralar, Ataun)	<i>Arrhopalites boneti</i> Stach, 1945. New record. <i>Neelus murinus</i> Folsom, 1896. New record. <i>Onychiurus aranzadii</i> Beruete et al, 1995. Beruete et al, 1995. <i>Onychiurus aralarensis</i> Beruete, Arbea & Jordana, 2001 <i>Protaphorura subarmata</i> (Gisin), 1957. New record. <i>Pseudosinella antennata</i> (Boneti), 1929. New record. <i>Pseudosinella luquei</i> Beruete & Jordana n. sp. <i>Tomocerus minor</i> (Lubbock), 1862. New record. <i>Typhlogastrura mendizabali</i> (Bonet), 1930. New record. <i>Xenyla caudata</i> Jordana, 1993. New record.
LAPURDI caves	Species
Redoute Louis XIV (Biriatiou)	<i>Pseudosinella duprei</i> Beruete & Jordana n. sp.
NAVARRA caves	Species
Akelar (Aralar, Larraun, Ali)	<i>Arrhopalites boneti</i> Stach, 1945. Stach, 1945. Selga, 1963. Selga, 1971. <i>Arrhopalites coecus</i> (Tullberg), 1871. Selga, 1963. <i>Arrhopalites pygmaeus</i> (Wankel), 1869. Bonet, 1931. Selga, 1963. Selga, 1971. <i>Onychiurus boneti</i> Gisin, 1953. Bonet, 1931, como O. <i>handschini</i> Denis, 1925. Gisin, 1953. Selga, 1971. Jordana & Beruete, 1983, como O. <i>akelaris</i> Jordana & Beruete, 1983. New citation.

NAVARRA caves (continuation)	Species
	<i>Protaphorura prolata</i> (Gisin), 1956. Jordana & Beruete, 1983, como O. <i>cancellatus</i> Gisin, 1956. <i>Pseudosinella antennata</i> (Bonet), 1929. Bonet, 1929a, como <i>P. peltaini antennata</i> Bonet, 1929. Bonet, 1931. Selga, 1971. Gisin & Gama, 1972. Gama, 1976. Jordana & Beruete, 1983. New citation. <i>Pseudosinella arամediai</i> Beruete & Jordana n. sp. <i>Arrhopalites boneti</i> Stach, 1945. New record. <i>Folsomia sexoculata</i> (Tullberg), 1871. New record. <i>Friesea (Polyacanthella) subterranea</i> Cassagnau, 1958. New record. <i>Heteromurus major</i> (Moniez), 1889). New record. <i>Hypogastrura (Mucrella) acuminata</i> Cassagnau, 1952. New record. <i>Onychiurus ameskoanus</i> Beruete, Arbea & Jordana, 2001. <i>Onychiurus silvarius</i> Gisin, 1952. Jordana & Beruete, 1983. <i>Protaphorura prolata</i> (Gisin), 1956. Jordana & Beruete, 1983, como O. <i>cancellatus</i> Gisin, 1956. <i>Pseudosinella cf. alba</i> (Packard), 1873. New record. <i>Pseudosinella jesui</i> Beruete & Jordana n. sp. <i>Pseudosinella navarrensis</i> Ardanaz & Jordana, 1985. New record. <i>Pseudosinella peltaini</i> Bonet, 1929. Jordana & Beruete, 1983. New citation. <i>Pseudosinella unguilonginea</i> Jordana & Beruete, 1983. Jordana & Beruete, 1983. New citation. <i>Tomocerus minor</i> (Lubbock), 1862. New record. <i>Hypogastrura (Ceratophysella) bengtssoni</i> (Agren), 1904. New record. <i>Isotoma (Parisotoma) notabilis</i> Schäffer, 1896. New record. <i>Megalothorax tuberculatus</i> Deharveng & Beruete, 1993. New record. <i>Onychiurus gemae</i> Simon & Luciañez, 1994. New record. <i>Pseudosinella jesui</i> Beruete & Jordana n. sp. <i>Pseudosinella peltaini</i> Bonet, 1929. Jordana & Beruete, 1983. New citation. <i>Tomocerus minor</i> (Lubbock), 1862. New record. <i>Arrhopalites boneti</i> Stach, 1945. New record. <i>Heteromurus major</i> (Moniez), 1889). New record. <i>Pseudosinella arամediai</i> Beruete & Jordana n. sp. <i>Pseudosinella subinflata</i> Gisin & Gama, 1969. New record. <i>Tomocerus minor</i> (Lubbock), 1862. New record. <i>Arrhopalites boneti</i> Stach, 1945. New record. <i>Cryptopygus cf. debilis</i> (Cassagnau), 1959. New record. <i>Folsomia candida</i> Willem, 1902. New record. <i>Folsomia quadrioculata</i> (Tullberg), 1871. New record. <i>Hypogastrura (Ceratophysella) engadinensis</i> Gisin, 1949. New record. <i>Isotoma (Parisotoma) notabilis</i> Schäffer, 1896. New record. <i>Megalothorax tuberculatus</i> Deharveng & Beruete, 1993. Deharveng & Beruete, 1993. <i>Onychiurus argus</i> Denis, 1924. New record. <i>Protaphorura armata</i> (Tullberg), 1869. New record. <i>Pseudosinella arամediai</i> Beruete & Jordana n. sp. <i>Pseudosinella subinflata</i> Gisin & Gama, 1969. New record. <i>Tricantella perfecta</i> Denis, 1926. New record. <i>Folsomia finitaria</i> (Linnaeus), 1758. New record. <i>Mesogastrura ojoviensis</i> (Stach), 1918. New record.
Akuandi (Urbasa sur, Limitaciones)	
Arantzadua II (Urbasa sur, Limitaciones)	
Arbeltz (Andia)	
Arkalde (Beruete, Basaburua)	
Arleze (Urbasa, Falla de Zumbeltz)	

NAVARRA caves (continuation)	Species
Basaura (Lokitx)	<i>Onychiurus zabidensis</i> Beruete, Arbea & Jordana, 2001.
	<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.
	<i>Pseudosinella luquei</i> Beruete & Jordana n. sp.
	<i>Pseudosinella subinflata</i> Gisin & Gama, 1969. New record.
	<i>Tomocerus minor</i> (Lubbock), 1862. New record.
	<i>Arrhopalites boneti</i> Stach, 1945. Jordana & Beruete, 1983. New citation.
	<i>Arrhopalites coecus</i> (Tullberg), 1871.
	<i>Arrhopalites elegans</i> Cassagnau & Delamare, 1953. New record.
	<i>Arrhopalites pygmaeus</i> (Wankel), 1869. New record.
	<i>Folsomia candida</i> Willem, 1902. New record.
	<i>Folsomia fimetaria</i> (Linnaeus), 1758. Jordana & Beruete, 1983.
	<i>Heteromurus nitidus</i> (Templeton), 1835. Jordana & Beruete, 1983. New citation.
	<i>Isotoma (Parisotoma) notabilis</i> Schäffer, 1896. Jordana & Beruete, 1983. New citation.
	<i>Isotomiella cf. barivlerai</i> Deharveng, 1989. Jordana & Beruete, 1983. New citation.
	<i>Megalothorax sp. (gr. M. incertus)</i> . New record.
	<i>Megalothorax tuberculatus</i> Deharveng & Beruete, 1993. New record.
	<i>Mesaphorura italica</i> (Rusek), 1971. Jordana & Beruete, 1983.
	<i>Mesogastrura ojcoviensis</i> (Stach), 1918. Jordana & Beruete, 1983, como <i>Mesochorutes levantinus</i> (Bonet), 1930. New citation.
	<i>Neelus murinus</i> Folsom, 1896. Jordana & Beruete, 1983. New citation.
	<i>Onychiurus argus</i> Denis, 1924. New record.
	<i>Onychiurus cf. rectopapillatus</i> Stach, 1933. New record.
	<i>Protaphorura campata</i> (Gisin), 1952. New record.
	<i>Protaphorura prolata</i> (Gisin), 1956. New record.
	<i>Pseudacherontides spelaeus</i> (Ionesco), 1922. Jordana & Beruete, 1983. New citation.
	<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.
	<i>Pseudosinella subinflata</i> Gisin & Gama, 1969. Jordana & Beruete, 1983. New citation.
	<i>Pseudosinella unguilonginea</i> Jordana & Beruete, 1983. New record.
	<i>Schaefferia lindbergi</i> Gama, 1962. Jordana & Beruete, 1983. New citation.
	<i>Smithurinus sp.</i> Jordana & Beruete, 1983, como <i>S. krausbaueri</i> Börner, 1901.
	<i>Sphaeridia pumilis</i> (Krausbauer), 1898. Jordana & Beruete, 1983.
	<i>Xenylla boernerii</i> Axelson, 1905. Jordana & Beruete, 1983.
	<i>Folsomia candida</i> Willem, 1902. New record.
	<i>Pseudosinella subinflata</i> Gisin & Gama, 1969. New record.
	<i>Pseudosinella subterranea baztanensis</i> Beruete & Jordana n. sp.
	<i>Tomocerus minor</i> (Lubbock), 1862. New record.
	<i>Arrhopalites boneti</i> Stach, 1945. Jordana & Beruete, 1983. New record.
	<i>Arrhopalites sericus</i> Gisin, 1947. Jordana & Beruete, 1983.
	<i>Heteromurus nitidus</i> (Templeton), 1835. Jordana & Beruete, 1983.

NAVARRA caves (continuation)	Species
Mentrokiloko koba (Aralar)	<i>Tetracanthella sp.</i> New record.
	<i>Tomocerus minor</i> (Lubbock), 1862. Jordana & Beruete, 1983. New citation.
	<i>Arrhopalites boneti</i> Stach, 1945. New record.
	<i>Isotoma (Parisotoma) notabilis</i> Schäffer, 1896. Jordana & Beruete, 1983.
	<i>Mesaphorura macrochaeta</i> Rusek, 1976. Jordana & Beruete, 1983. New citation.
	<i>Neelus murinus</i> Folsom, 1896. Jordana & Beruete, 1983. New citation.
	<i>Pseudosinella antennata</i> (Bonet), 1929. New record.
	<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.
	<i>Pseudosinella subinflata</i> Gisin & Gama, 1969. New record.
	<i>Arrhopalites boneti</i> Stach, 1945. New record.
	<i>Folsomia sexoculata</i> (Tullberg), 1871. New record.
	<i>Hypogastrura (Ceratoophysella) bentgssoni</i> (Agren), 1904. New record.
	<i>Hypogastrura (Mucrella) acuminata</i> Cassagnau, 1952. New record.
	<i>Isotoma (Parisotoma) notabilis</i> Schäffer, 1896. Jordana & Beruete, 1983.
	<i>Isotomiella minor</i> (Schäffer), 1896. Jordana & Beruete, 1983.
	<i>Mesaphorura hylophila</i> Rusek, 1971. Jordana & Beruete, 1983.
	<i>Neelus murinus</i> Folsom, 1896. New record.
	<i>Onychiurus argus</i> Denis, 1924. New record.
	<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.
	<i>Pseudosinella jesusi</i> Beruete & Jordana n. sp.
<i>Pseudosinella pieltaini</i> Bonet, 1929. Jordana & Beruete, 1983. New citation.	
<i>Pseudosinella unguilonginea</i> Jordana & Beruete, 1983. New record.	
<i>Tomocerus minor</i> (Lubbock), 1862. Jordana & Beruete, 1983.	
<i>Folsomia penicula</i> Bagnall, 1939. New record.	
<i>Heteromurus major</i> (Moniez), 1889. New record.	
<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.	
<i>Pseudosinella luquei</i> Beruete & Jordana n. sp.	
<i>Arrhopalites pygmaeus</i> (Wankel), 1869. New record.	
<i>Megalothorax tuberculatus</i> Deharveng & Beruete, 1993. New record.	
<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.	
<i>Pseudosinella pyrenaica</i> Bonet, 1931. New record.	
<i>Tomocerus minor</i> (Lubbock), 1862. New record.	
<i>Hypogastrura (Ceratoophysella) succinea</i> Gisin, 1949. New record.	
<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.	
<i>Pseudosinella pyrenaica</i> Bonet, 1931. New record.	
OURENSE caves	Species
Pala Vella, Cueva (Biobra)	<i>Pseudosinella luquei</i> Beruete & Jordana n. sp.
ZUBEROA caves	Species
Ayssayguer (Holzarte, Larrau)	<i>Isotomiella minor</i> (Schäffer), 1896. New record.
	<i>Isotomurus palustris</i> (Müller), 1776. New record.
	<i>Pseudosinella luquei</i> Beruete & Jordana n. sp.
	<i>Tomocerus minor</i> (Lubbock), 1862. New record.

NAVARRA caves (continuation)	Species
Cueva fria (Aralar)	<i>Onychiurus argus</i> Denis, 1924. New record.
	<i>Onychiurus silvarius</i> Gisin, 1952. Jordana & Beruete, 1983.
	<i>Protaphorura prolata</i> (Gisin), 1956. Jordana & Beruete, 1983. New citation.
	<i>Pseudosinella luquei</i> Beruete & Jordana n. sp.
	<i>Pseudosinella subinflata</i> Gisin & Gama, 1969. Jordana & Beruete, 1983. New citation.
	<i>Onychiurus argus</i> Denis, 1924. New record.
	<i>Anurida cf. granaria</i> (Nicolet), 1847. New record.
	<i>Folsomia sp.</i> New record.
	<i>Hypogastrura purpurescens</i> (Lubbock), 1868. New record.
	<i>Isotoma (Desoria) tigrina</i> (Nicolet), 1842. New record.
	<i>Onychiurus argus</i> Denis, 1924. New record.
	<i>Heteromurus gemae</i> Simon & Luciañez, 1994. New record.
	<i>Protaphorura prolata</i> (Gisin), 1956. New record.
	<i>Protaphorura subarmata</i> (Gisin), 1957. New record.
	<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.
	<i>Pseudosinella subinflata</i> Gisin & Gama, 1969. New record.
	<i>Pseudosinella subvirei</i> Bonet, 1931. New record.
	<i>Schaefferia cf. quadriculata</i> (Stach), 1939. New record.
	<i>Tomocerus minor</i> (Lubbock), 1862. New record.
	<i>Arrhopalites boneti</i> Stach, 1945. New record.
	<i>Arrhopalites coecus</i> (Tullberg), 1871. New record.
	<i>Arrhopalites pygmaeus</i> (Wankel), 1869. New record.
	<i>Brachystomella parvula</i> (Schäffer), 1896. New record.
	<i>Deutonura deficiens sylvatica</i> Deharveng, 1982. New record.
	<i>Folsomia candida</i> Willem, 1902. Jordana & Beruete, 1983. New citation.
	<i>Folsomia decopsis</i> Steiner, 1958. New record.
	<i>Hypogastrura (Ceratoophysella) denticulata</i> (Bagnall), 1941. New record.
	<i>Hypogastrura (Ceratoophysella) engadinensis</i> Gisin, 1949. New record.
	<i>Isotoma (Desoria) tigrina</i> (Nicolet), 1842. New record.
	<i>Isotomiella minor</i> (Schäffer), 1896. New record.
	<i>Isotomurus cf. balteatus</i> (Reuter), 1876. New record.
	<i>Isotomurus palustris</i> (Müller), 1776. New record.
	<i>Nonobella grassei grassei</i> (Denis), 1923. New record.
	<i>Neanura muscorum</i> (Templeton), 1835. New record.
	<i>Neelus murinus</i> Folsom, 1896. New record.
	<i>Onychiurus argus</i> Denis, 1924. New record.
	<i>Onychiurus aralarensis</i> Beruete, Arbea & Jordana, 2001.
	<i>Proisotoma minuta</i> (Tullberg), 1871. New record.
<i>Protachorutes pyrenaicus</i> Cassagnau, 1955. Jordana & Beruete, 1983. New citation.	
<i>Protaphorura prolata</i> (Gisin), 1956. New record.	
<i>Protaphorura prolata</i> (Gisin), 1956. New record.	
<i>Pseudachorutes palmiensis</i> Börner, 1903. New record.	
<i>Pseudosotoma monochaeta</i> (Kos), 1942. New record.	
<i>Pseudosotoma sensibilis</i> (Tullberg), 1871. New record.	
<i>Pseudosinella antennata</i> (Bonet), 1929. Jordana & Beruete, 1983. New citation.	
<i>Pseudosinella aramendiai</i> Beruete & Jordana n. sp.	
<i>Pseudosinella navarrensis</i> Ardanaz & Jordana, 1985. New record.	
<i>Pseudosinella subinflata</i> Gisin & Gama, 1969. Jordana & Beruete, 1983. New citation.	