

Supplementary notes on Pauropoda (Myriapoda) from SW Europe with description of two new species from France

by Ulf SCHELLER

Abstract. — A collection of 704 specimens of Pauropoda from South of France and Spain has been studied. It contains 28 species two of which are new to science and are described, *Brachypauropus gallicus* and *Acopauropus deharvengi*. Three more species are new to France and one is new to Spain.

Key-words. — Pauropoda, Pauropodidae, Brachypauropodidae, Eurypauropodidae, France, Spain, new species, distribution.

Compléments sur les Pauropodes (Myriapoda) d'Europe sud-occidentale, et description de deux espèces nouvelles de France

Résumé. — Une collection de 704 Pauropodes de France méridionale et d'Espagne est étudiée. Ces animaux ont été répartis entre 28 espèces différentes. Parmi elles, deux sont nouvelles et décrites ici, *Brachypauropus gallicus* et *Acopauropus deharvengi*. Trois autres espèces sont nouvelles en France et une en Espagne.

Mots-clés. — Pauropoda, Pauropodidae, Brachypauropodidae, Eurypauropodidae, France, Espagne, espèces nouvelles, répartition.

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INTRODUCTION

Most of our present knowledge of southwest European Pauropoda derives from the outstanding work of Pr Paul REMY who during the years 1932-1961 published several genera and species from there. The specimens he brought mainly by manual collecting are here supplemented by material collected by Berlese funnel extractions by Drs Louis DEHARVENG, Anne BEDOS and Charles GERS and by Mrs. Sithan LEK, Laboratoire de Zoologie, université Paul Sabatier, Toulouse. Altogether they have gathered 704 specimens, 683 from France and 22 from Spain, most often from mountainous areas.

Abbreviations used : ad., subad. and juv., an adult, a subadult or a juvenile specimen with the number of pairs of legs indicated. When the number of specimens in different sexes and developmental stages has not been reported, the total number of specimens studied are given in square bracket [...].

Collecting data are given in full only when a species is reported for the first time from a country or a département.

SYSTEMATICS

Family PAUROPODIDAE
Subfamily PAUROPODINAE

Genus **ALLOPAUROPUS** Silvestri, 1902
Subgenus **ALLOPAUROPUS** Remy, 1957

Allopauropus (A.) brevisetus Silvestri, 1902

In: BERLESE, A.: *Acari, Myriopoda et Scorpiones hucusque in Italia reperta*, 10, Fasc. 95, No. 12. Padua.

MATERIAL. — France, Lot, Quercy, hanging roots in a cave, 2 juv. 6, 1988.V.22 (loc. 46-79), leg. Deharveng; Lozère, Causse Méjean, Fraissinet de Fourques, alt. 850 m, litter in oak forest, 1 ad. 9 (♀), 4 juv. 6, 1980.VII.30 (loc. 48-18), leg. Deharveng; Hérault, Causse du Larzac, Mourèze, near Mas Rouet, alt. 415 m, dry litter in holm-oak forest, 10 ad. 9 (1 ♂, 9 ♀), 14 juv. 6, 3 juv. 5, 3 juv. 3, 1981.IX.10 (loc. 34-42), leg. Deharveng; Ariège, Rille, beech forest, alt. 920 m, in soil, 1 ad. 9 (♀), 1 juv. 6, 1991.XI.29 (loc. Rh10S) and 1 ad. 9 (♀), 1992.IV.22 (loc. Rh29S) leg. Deharveng and Bedos, and Campagna de Sault, Usine d'Usson, alt. 800 m, beech forest, 1 ad. 9 (♀), 6 juv. 6, 1973.IX (loc. 09-106 and 09-120), leg. Deharveng; Var, La Garde-Freinet [7] and Méounes-lès-Montrieux [1]. — New to Lot, Lozère, Hérault and Ariège.

DISTRIBUTION

The main range covers Southern Europe from France to Rumania and Bulgaria. REMY (1958) mentions it from the USA (Florida) too and there are records from Great Britain, Switzerland and Austria.

Allopauropus (A.) danicus (Hansen, 1902)

Vidensk. Meddr dansk naturh. Foren. 1901: 376-378, pl. 3, Fig. 4a-f.

MATERIAL. — France, Ariège, Rille, alt. 920 m, beech forest, in soil, 1 ad. 9 (♀), 1992.IV.22 (loc. Rh28S), leg. Deharveng and Bedos, and Bellongue, alt. 1120 m, *Picea* plantation, in litter, 1991.III.13, 1 ad. 9 (♀), (loc. Be1L) and 1 subad. 8 (♀) (loc. Be16L), leg. Deharveng and Bedos. — New to Ariège.

DISTRIBUTION

A. danicus is a wide range species known from most countries in Europe, from North and East Africa, Southern Asia and the Americas.

Allopauropus (A.) gravieri Remy, 1935
(Figs 1-6)

Vogesias 1: 7 (REMY 1935a) and *Bulletin du Muséum national d'Histoire naturelle*, Paris 7: 214-215, Fig. 3 (REMY 1935b).

MATERIAL. — France, Aude, Pays de Sault, Belvis, forêt de Picaussel, alt. 1035 m, in a humid doline, 3 ad. 9 (2 ♂, 1 ♀), 1975.X (loc. 11-022), leg. Deharveng. — New to Aude.

DISTRIBUTION. — The species has been collected in many places in France, especially in the south, but is known also from a few sites in Italy, Greece and Rumania.

TAXONOMIC REMARKS

The characters of the pygidium is in all essentials as described by me in *Revue suisse Zool.* (1977, 369, Fig. 5), but the posterior end of the anal plate has a small median indentation. The following emendations of the original description have to be made.

Trunk

Setae on collum segment subsimilar, furcate, primary branch somewhat clavate with short pubescence arranged in whorls; secondary branch rudimentary and glabrous. Sternite process pubescent, narrow, small median incision anteriorly. Sternite appendages with low caps.

Submedian posterior setae on tergite VI are cylindrical, pointed, very shortly pubescent, 0.3-0.4 of their distance apart and 0.5 of the length of pygidial setae a_1 .

Penes small, conical, with straight sides, 2.3 times as long as the greatest diameter; seta short, not fully 0.2 of the length of penis. Seta on coxa of leg 2 in males furcate in the middle, branches annulate, main branch shortest, cylindrical, secondary branch very thin, tapering.

Legs

Setae on coxa and trochanter of leg 9 subequal, furcate, with blunt cylindrical branches; primary branch thickest and a little shorter than secondary one, both branches with dense pubescence arranged in whorls; more anteriorly these setae have rudimentary glabrous secondary branch and somewhat clavate main branch. Tarsus of leg 9 slender, 4.2-4.4 times as long as its greatest diameter; proximal seta tapering, pointed, with short oblique pubescence, rather erect, almost 0.5 of the length of tarsus and 3 times longer than distal seta which is claviform and with dense short oblique pubescence.

***Allopauropus (A.) puritae* Dominguez & Scheller, 1987**

Redia 70: 377-380.

MATERIAL. — France, Haute-Garonne, Comminges, Arbon, Ruan, alt. 790 m, in moss near brook, 1 ad. 9 (♀), 1994.X (loc. RJ2b), leg. Lek. — New to France.

DISTRIBUTION

The species is known previously only from the type locality in the Avila Province in Spain (DOMINGUEZ & SCHELLER 1987) and from a few samples collected in the vicinity (Dr Maria Teresa DOMINGUEZ, pers. com.).

***Allopauropus (A.) zerlingae* Remy, 1936**

(Figs 7-8)

Bulletin du Muséum national d'Histoire naturelle, Paris (2) 8: 70-73, Figs 1-2.

MATERIAL. — France, Haute-Garonne, Sost [5]; Hautes-Pyrénées, Vallée d'Aure, Lortet, alt. 600 m, under moss on boulder, 3 ad. 9 (♀), 3 subad. 8 (♀), 1975.X.20 (loc. 65-98), leg. Deharveng; Ariège, Fougax et Barrineuf [5], Lercoul [4] and Rille [2]. — New to Hautes-Pyrénées.

DISTRIBUTION

A. zerlingae is reported many times from the southern half of France, but also from Spain and Rumania.

REMARKS

Though the species belongs to one of those very early described by REMY and later also collected in many places, mainly by REMY himself, it is partly taxonomically incompletely known. REMY's description is emended in the following respects (material from Ariège, Rille).

Trunk

Penes conical, 1.2-1.3 times longer than greatest diameter, seta 0.6 of the length of penis. Seta on coxa of leg 2 in male thick clavate annulate.

Legs

On the 9th pair of legs setae of coxa and trochanter are furcate with subsimilar cylindrical branches. More anteriorly these setae are simple with rudimentary secondary branches. Tarsus slender, a little curved, 4.4-4.7 times as long as its greatest diameter. Proximal seta long, tapering, pointed, with short oblique pubescence on distal half, 0.5-0.7 of the length of tarsus and 4.3-4.5 times as long as distal seta which is cylindrical with short oblique pubescence.

Subgenus **DECAPAUROPUS** Remy, 1957

Allopauropus (D.) aristatus Remy, 1936

Archs Zool. exp. gén. 78: 19-22, Figs 6-9.

MATERIAL. — France, Ariège, Campagna de Sault [3].

DISTRIBUTION

Though *A. aristatus* has been collected in France in the southern part only, it seems to be a wide range species as it occurs also in a large part of Africa and in the USA and Jamaica. The European range includes Germany, Switzerland, Bulgaria, Yugoslavia, Spain and Greece.

Allopauropus (D.) barcinonensis Remy, 1933

Memor. Acad. Cienc. Art. 23: 270-274, Figs 1-3.

MATERIAL. — France, Haute-Garonne, Montesquieu Volvestre, [1]; Hautes-Pyrénées, Lortet, alt. 600 m, under moss on boulder, 2 subad. 8 (♀), 1975.X.20 (loc. 65-98), leg. Deharveng; Aude, Pays de Sault, Belvis, forêt de Picaussel, alt. 1035 m, beech forest, 8 ad. 9 (2 ♂, 6 ♀), 1975.X (loc. 11-22), leg. Deharveng, and Magrie, alt. 225 m, garrigue, in soil, 2 juv. 6, 1 juv. 5, 1990.IV.25 (loc. 11-165), leg. Deharveng and Bedos; Ariège, Bellongue [1] and Arbon [2]; Pyrénées-Orientales, Escaro [1]. — New to Hautes-Pyrénées and Aude.

DISTRIBUTION

It is not known outside Europe where it is widely distributed in Southern France and found rarely in Germany, Slovakia and Spain.

Allopauropus (D.) fagei Remy, 1941

Bull. Soc. zool. Fr. 66: 358-360, Fig. 3a-c.

MATERIAL. — France, Tarn, Sainte-Cécile-du-Cayrou, forêt de la Grésigne, alt. 250 m, sparse oak, in soil, 8 ad. 9 (3 ♂, 5 ♀), 1 subad. 8 (♀), 1 juv. 6, 1 juv. 5, 1993.VI.20 (loc. 81-80), leg. Deharveng and Bedos. — New to Tarn.

DISTRIBUTION

The species is very rare and its European range includes only three sites in France, two in Gard and one in Hérault (REMY 1941), and two sites in Spain, Mallorca (REMY 1954) and Madrid (DOMINGUEZ 1990). Outside it is known from Morocco and Algeria.

Allopauropus (D.) furcula Silvestri, 1902

In: BERLESE, A. (Ed.), *Acari, Myriopoda et Scorpiones hucusque in Italia reperta*, Fasc. 95, No. 7, Pl. 8. Padua.

MATERIAL. — France, Ariège, Arize [2] and Campagna de Sault [2].

DISTRIBUTION

It seems to be widely distributed in Southern Europe but in France it has not been collected outside Ariège and Corsica. The range includes Bulgaria, Rumania, Yugoslavia, Italy, Albania and Greece, also the Canary Islands and Madeira.

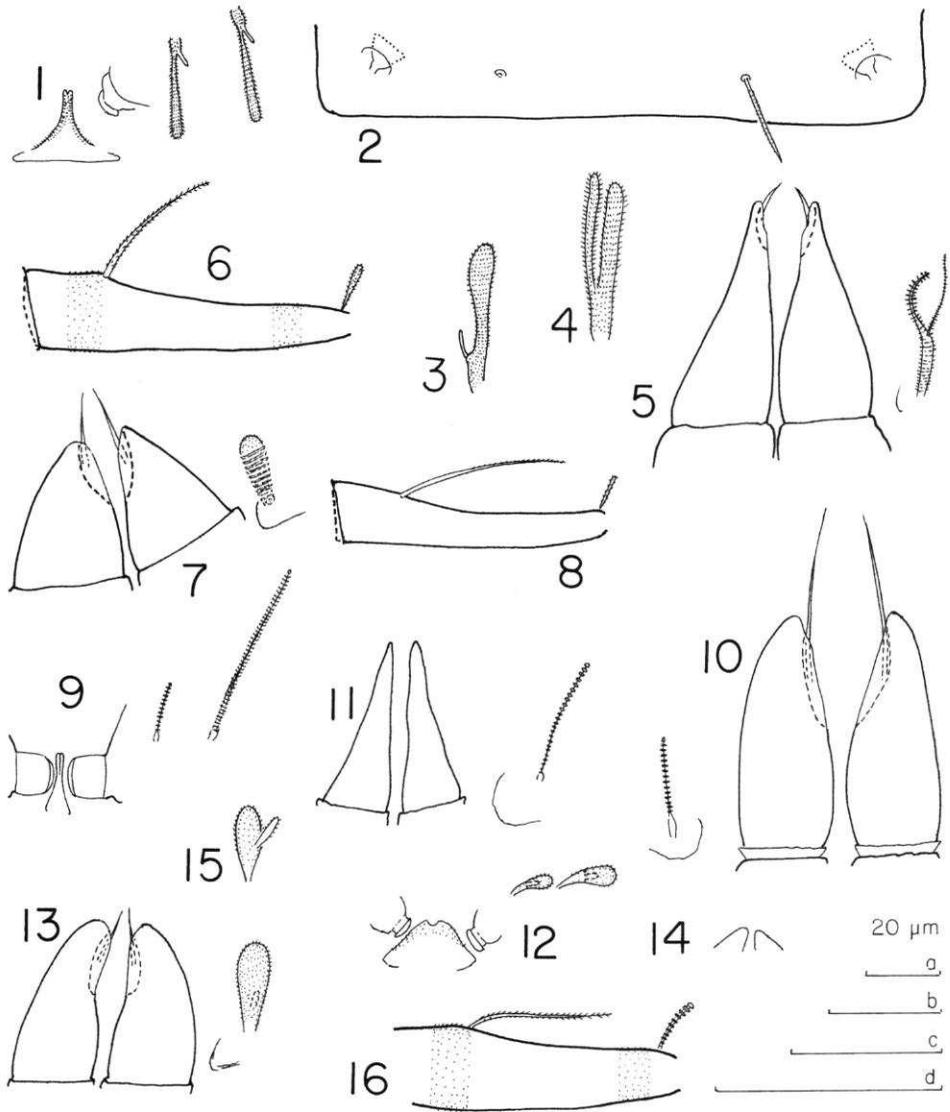
Allopauropus (D.) gracilis (Hansen, 1902)

Vidensk. Meddr dansk naturh. Foren. 1901: 395-397, pl. 5, Fig. 3a-f.

MATERIAL. — France, Lot, Quercy, gouffre du Réveillon, in litter, 3 ad. 9 (♀), 1 subad. 8 (♀), 2 juv. 6, 1 juv. 5, 1973.V.6 (loc. 46-4) and Quercy, Caberets, grotte de Pech Merle, alt. 300 m, in the cave, 1 ad. 9 (♂), 1984.IX.1 (loc. 46-34), leg. Deharveng; Tarn, Sorèze, near the cave Trou du Calel, alt. 500 m, *Buxus* and bushes, in humus, 1 ad. 9 (♀), 1974.V.26 (loc. 81-39), leg. Deharveng; Haute-Garonne, massif d'Arbas, Portet d'Aspet, bois d'Espugalan, alt. 1200 m, beech forest, in soil, 1 ad. 9 (♀), 1984.II.19 (loc. 31-44), leg. Deharveng, and Sost, beech forest, in litter and soil, 11 ad. 9 (♀), 3 subad. 8 (2 ♂, 1 ♀), 3 juv. 6, 2 juv. 3, 1991.X and 1992.IV (10 localities), leg. Deharveng and Bedos; Aude, Campagna de Sault, Usine d'Usson, oak-beech forest, alt. 800 m, 1 juv. 5, 1973.VI.23 (loc. 11-029), leg. Deharveng; Ariège, Bellongue [7], Aston [1], Mijanès [1], Plantaurel [1], Arbon [2], Rille [16], Arize [15], Lercoul [2], Campagna de Sault [3], Lasset [1] and Izard [1]; Pyrénées-Orientales, Vernet-les-Bains [6]; Var, Maures, La Garde-Freinet, 250 m, in litter and humus under chestnut tree, 1 ad. 9 (♀), 1977, (loc. 83-10), leg. Deharveng. — New to Lot, Tarn, Haute-Garonne, Aude and Var.

DISTRIBUTION

The species seems to have a (sub)cosmopolitan range. It is one of the species most often met with in Europe but has been reported also from Africa, South Asia and the Americas.



FIGS 1-16. — 1-6, *Allopauropus (A.) gravieri* Remy: 1, collum segment, right side, sternal view; 2, tergite VI, posterior part; 3, seta of coxa of 9th pair of legs; 4, seta of trochanter of 9th pair of legs; 5, penes and seta of coxa of 2nd pair of legs; 6, tarsus of 9th pair of legs. 7-8, *Allopauropus (A.) zerlingae* Remy: 7, penes and seta of coxa of 2nd pair of legs; 8, tarsus of 9th pair of legs. 9-11, *Allopauropus (D.) productus* Silvestri: 9, collum segment, right side, sternal view; 10, adult, penes and seta of coxa of 2nd pair of legs; 11, subadult, penes and seta of coxa of 2nd pair of legs. 12-16, *Stylopauropus (S.) beauchampi* Remy: 12, collum segment, right side, sternal view; 13, adult, penes and seta of coxa of 2nd pair of legs; 14, subadult, penes; 15, seta of trochanter of 9th pair of legs; 16, tarsus of 9th pair of legs. Pubescence only partly drawn in 6 and 16. Scale a: 2, 6, 8; b: 1, 3-5, 7, 10, 12-16; c: 9; d: 11.

Allopaupopus (D.) helveticus (Hansen, 1902)

Vidensk. Meddr dansk naturh. Foren. 1901: 390-392, pl. 4, Fig. 5a-e.

MATERIAL. — France, Tarn, Sorèze, near the cave Trou du Calel, alt. 500 m, *Buxus* and bushes, in humus, 1 juv. 6, 1974.V.26 (loc. 81-39), leg. Deharveng. — New to Tarn.

DISTRIBUTION

The species is Holarctic and has been collected in most European countries and in North Africa, on the Azores and in North America.

Allopaupopus (D.) multiplex Remy, 1936

Zool. Anz. 116: 315-316, Fig. 3.

MATERIAL. — France, Haute-Garonne, Sost, oak forest, 1 ad. 9 (♂), 1991.X.4 (loc. B19S), leg. Deharveng and Bedos. — New to Haute-Garonne.

DISTRIBUTION

It is known from the western Palearctic Region only but occurs there from Sweden in the north to Morocco in the south, from Great Britain in the west to Greece in the east.

Allopaupopus (D.) productus Silvestri, 1902

(Figs 9-11)

In: BERLESE, A. (Ed.), Acari, Myriopoda et Scorpiones hucusque in Italia reperta 10, Fasc. 95, No. 9, Pl. 12. Padua.

MATERIAL. — France, Hérault, Vic-la-Gardiole [6] and Mourèze [6]; Var, Maures, Estérel, Fréjus, near Saint-Cassien, alt. 120 m, 1 ad. 9 (♀), 2 subad. 8 (♀), 3 juv. 6, 1 juv. 5, 1973.X.5 (loc. 83-02), leg. Deharveng. — New to Var. Spain, Andalusia, Cadiz, Sierra de Algibe, *Quercus suber*, in moss, humus and litter, 1 ad. 10 (♀), 17 ad. 9 (1 ♂, 16 ♀), 2 juv. 6, 1975.X (loc. ELA 10), leg. Deharveng. — New to Andalusia.

DISTRIBUTION

The main area is around the Mediterranean but its occurrence in Irak and various parts of the USA may indicate a Holarctic range. In France it is not known north of Auvergne.

REMARKS

SILVESTRI's description is emended (material from Vic-la-Gardiole and Mourèze) as to the collum segment and the penes.

Trunk

Setae of collum segment simple with very small rudiments of the secondary branches; they are cylindrical, annulate, blunt; lateral setae 3.2-3.3 times as long as submedian ones; sternite

process very narrow, with small anterior apical incision; sternite appendages short, with wide cap, glabrous.

Penes with short collar at base, longish, 2.5 times as long as their greatest diameter, proximal part subcylindrical, apex rounded, distal seta long, 0.7 the length of penis. Coxal seta of leg 2 simple, thin, cylindrical, annulate. In subad. 8 penes have no basal collar, they are longish, 2.7 times as long as greatest diameter, distal half extended, no distal seta; length of penes in subad. 8 is 1/3 of the length in ad. 9.

Allopauropus (D.) vulgaris (Hansen, 1902)

Vidensk. Meddr dansk naturh. Foren. 1901: 392-395, pl. 5, Fig. 2a-g.

MATERIAL. — France, Lot, Quercy, gouffre du Réveillon, in humus, 1 ad. 9 (♂), 1973.V.6 (loc. 46-4), leg. Deharveng; Hautes-Pyrénées, Gavarnie [4]; Haute-Garonne, Sost [11]; Aude, forêt de Lapazeuil, Counozouls, oak and spruce forest, in litter, alt 1530 m, 2 ad. 9 (♂, ♀), 1 juv. 5, 1990.II.21 (loc. 11-160), leg. Deharveng and Bedos; Ariège, Bellongue [5], Arbon [4], Rille [16], Arize [10], Lercoul [2], Campagna de Sault [9], Izard [5], Quérigut [1], Lasset [1]. — New to Lot and Aude.

DISTRIBUTION

The species is widely distributed in France and common in Europe as a whole but possibly more frequent in the west and north than in the east and south. Outside Europe it is present in Africa, Sri Lanka and North America.

Genus **PAUROPUS** Lubbock, 1867

Pauropus furcifer Silvestri, 1902

In: BERLESE, A. (Ed.). *Acari, Myriopoda et Scorpiones hucusque in Italia reperta* 10, Fasc. 95, No. 3, Pl. 4. Padua.

MATERIAL. — France, Hautes-Pyrénées, Lortet [1]; Haute-Garonne, Sost [10]; Ariège, Lercoul [2], Quérigut [2], Campagna de Sault [2]; Pyrénées-Orientales, Vernet-les-Bains [25].

DISTRIBUTION

P. furcifer is widely distributed in Central and Southern Europe and reported also from Algeria and New Zealand.

Pauropus huxleyi Lubbock, 1867

Trans. Linn. Soc. Lond. 26: 182-185, pl. 10, Figs 1-19.

MATERIAL. — France, Hérault, Mourèze, near Mas Rouet, 1 ad. 9 (♀), 1981.IX.10 (loc. 34-42), leg. Deharveng. — New to Hérault.

DISTRIBUTION

It has been mentioned from many European countries, from North America and New Zealand and may have a wide range. However, it often has been confused with *P. lanceolatus* and at present it is impossible to delimit its true range.

***Pauropus lanceolatus* Remy, 1956**

Description (infrasubspecific rank): *Ann. Ent. fenn.* 3 (1937): 141-144.

Elevation: *Mém. Inst. scient. Madagascar* (A) 10: 109.

MATERIAL. — France, Hérault, Mourèze, near Mas Rouet, 18 ad. 9 (6 ♂, 12 ♀), 2 subad. 8 (♀), 6 juv. 6, 1 juv. 5, 1981.IX.10 (loc. 34-42), leg. Deharveng; Ariège, Campagna de Sault, Usine d'Usson, 2 ad. 9 (♀), 1 subad. 8 (♀), 2 juv. 5, 1973.IX (loc. 09-122), leg. Deharveng. — New to Hérault and Ariège.

DISTRIBUTION

The present range includes several European countries but because the species has earlier often been confused with its near relative *P. huxleyi*, its range may be considerably larger than it appears now.

Genus **STYLOPAUROPUS** Cook, 1896

Subgenus **STYLOPAUROPUS** s. str.

***Stylopauropus* (S.) *beauchampi* Remy, 1946**

(Figs 12-16)

Coll. Mus. Zool. Nancy 1: 10.

MATERIAL. — France, Drôme, forêt de Saou, alt. 350-500 m, beech forest, in litter, 94 ad. 9 (22 ♂, 72 ♀), 17 subad. 8 (5 ♂, 12 ♀), 7 juv. 6, 2 juv. 5, 1979.IX.5 (loc. 26-8) leg. Deharveng. — New to Drôme.

DISTRIBUTION

S. beauchampi is a very rare species. It is previously known from the type locality in France, Ain, Bettant (REMY 1946, 1947), one locality in Austria (REMY 1963), two localities in the Czech Republic (CHALUPSKY 1967) and one in the Slovak Republic (KOSEL 1975).

REMARKS

REMY's description is emended as to the collum segment, the penes and the last pair of legs.

Trunk

Setae of collum segment furcate with main branches spatulate with short dense erect pubescence; secondary branch rudimentary; lateral setae about 1.2 times as long as submedian ones; sternite process broadly triangular with a distinct apical incision in the shape of a shallow V or

U; sternite processes with distinct narrowing beneath cap. Penes conical with strongly convex outer surfaces, apex rounded; they are 1.7-1.9 times as long as greatest diameter; seta \approx 0.4 of the length of penis. Coxal seta of leg 2 in male similar to corresponding seta on leg 9 but the secondary branch is rudimentary. In subad. 8 penes are very short, converging, subconical, with rounded tips.

Legs

Setae on coxa and trochanter of leg 9 furcate, main branch spatulate, 3.0-3.1 times as long as broad, secondary branch cylindrical, 0.5 of the length of main branch; both branches with short dense a little oblique pubescence. Tarsus of leg 9 3.7-3.9 times as long as its greatest diameter. Proximal seta tapering, pointed, with oblique pubescence; its length \approx 0.7 of the length of tarsus and 2.5-2.8 times as long as distal seta, which is subcylindrical, blunt, annulate.

Stylopauropus (S.) brito Remy, 1949

Description (infrasubspecific rank): *Bull. Soc. Hist. nat. Moselle* 35 (1938): 156-157, Fig. 1. Elevation: *Mém. natn. Mus. Vict.* 16: 53.

MATERIAL. — France, Drôme, Crest, Vaunaveys-la-Rochette, oak, alt. 250 m, litter, 1 juv. 3, 1993.VII.30 (loc. 26-35), leg. Deharveng and Bedos. — New to Drôme.

DISTRIBUTION

The range of the species is unknown but it has a very scattered and discontinuous distribution in Europe, Morocco, the Azores, North America and Australia. Four localities were previously known in France: one in Bretagne, one in Paris (in a hot-house), one in Basses-Pyrénées and one in Pyrénées-Orientales.

Stylopauropus (S.) pedunculatus (Lubbock, 1867)

Trans. Linn. Soc. Lond. 26: 185, pl. 10, Fig. 20.

MATERIAL. — France, Drôme, Saou [5]; Tarn, Sorèze [1]; Haute-Garonne, Montesquieu, Volvestre [2], Herran [1], Saleich [4], Sost [5], Arbon [1]; Aude, forêt de Lapazeuil, Counozouls, beech and spruce forest, in litter, 1 juv. 6, 1990.II.21 (loc. 11-160), leg. Deharveng and Bedos, and Campagna de Sault, Usine d'Usson, alt. 800 m, oak-beech forest, 1 ad. 9 (♂), 2 subad. 8 (♀), 1 juv. stad.?, 1973.VI.21 (loc. 11-26), leg. Deharveng, and Belvis, forêt de Picaussel, alt. 1035 m, beech forest, humus in doline, 15 ad. 9 (1 ♂, 14 ♀), 7 subad. 8 (2 ♂, 5 ♀), 1975.X (loc. 11-022), leg. Deharveng; Ariège, Arize [1], Bellongue [1], Fougax et Barrineuf [3], Bethmale [2], Campagna de Sault [2], Bélesta [1], Sabart [2], Lherm [3], Quérigut [1], Lasset [2]. Pyrénées-Orientales, Escaro [1]. — New to Aude.

DISTRIBUTION

This is certainly the pauropod species most often collected in France and so it is in many other European countries. It seems to have a wide extra-European range too, which is similar to those in *Allopauropus vulgaris* and *Stylopauropus brito*.

Subgenus **DONZELOTAUROPUS** Remy, 1957

Stylopauropus (D.) cruciatus Scheller, 1973

(Figs 17-22)

Rev. écol. Biol. Sol 10: 138-141, Fig. 3.

MATERIAL. — France, Ariège, Bellongue, alt. 1080 m, *Picea* plantation, litter, 4 ad. ♀ (2 ♀, 2 ♂), 1991.III.13 (loc. Be4L, Be12L), leg. Deharveng and Bedos; Izard, alt. 1520 m, *Picea* plantation, litter, 1 ad. ♀ (♂), 1991.III.22 (loc. Ie10L), leg. Deharveng and Bedos; Rille, alt. 920 m, beech forest, litter, 1 ad. ♀ (♀), 1991.XI.29 (loc. Rh10L), leg. Deharveng and Bedos. — New to France.

DISTRIBUTION

The species is here reported for the first time outside the type locality NW Pic de l'Ortell in Andorra, alt. 2200 m.

REMARKS

The French material agrees in general very well with the type specimen. However, the latter is a subadult female and could not be described in all details and therefore my original description is emended in the following respects.

Head

Tergal setae of medium length, cylindrical, blunt, annulate; relative lengths of them, 1st row: $a_1 = 10$, $a_2 = 12-13$; 2nd row: $a_1 = 9-10$, $a_2 = 15-16$, $a_3 = 16-18$; 3rd row: $a_1 = 15-16$, $a_2 = 18-20$; 4th row: $a_1 = 19-21$, $a_2 = 19-22$, $a_3 = 26-28$, $a_4 = 23-25$; lateral group: $l_1 = 24-27$, $l_2 = 22-23$, $l_3 = 25$. The ratio a_1/a_1-a_1 is: 1st and 3rd rows 0.7-0.8, 2nd row 0.4-0.5 and 4th row 1.8-1.9. Temporal organs 0.5-0.6 of their shortest distance apart; no ptil. Head cuticle somewhat granular.

Antennae

There is a rudimentary p''' on the sternal side of 4th segment.

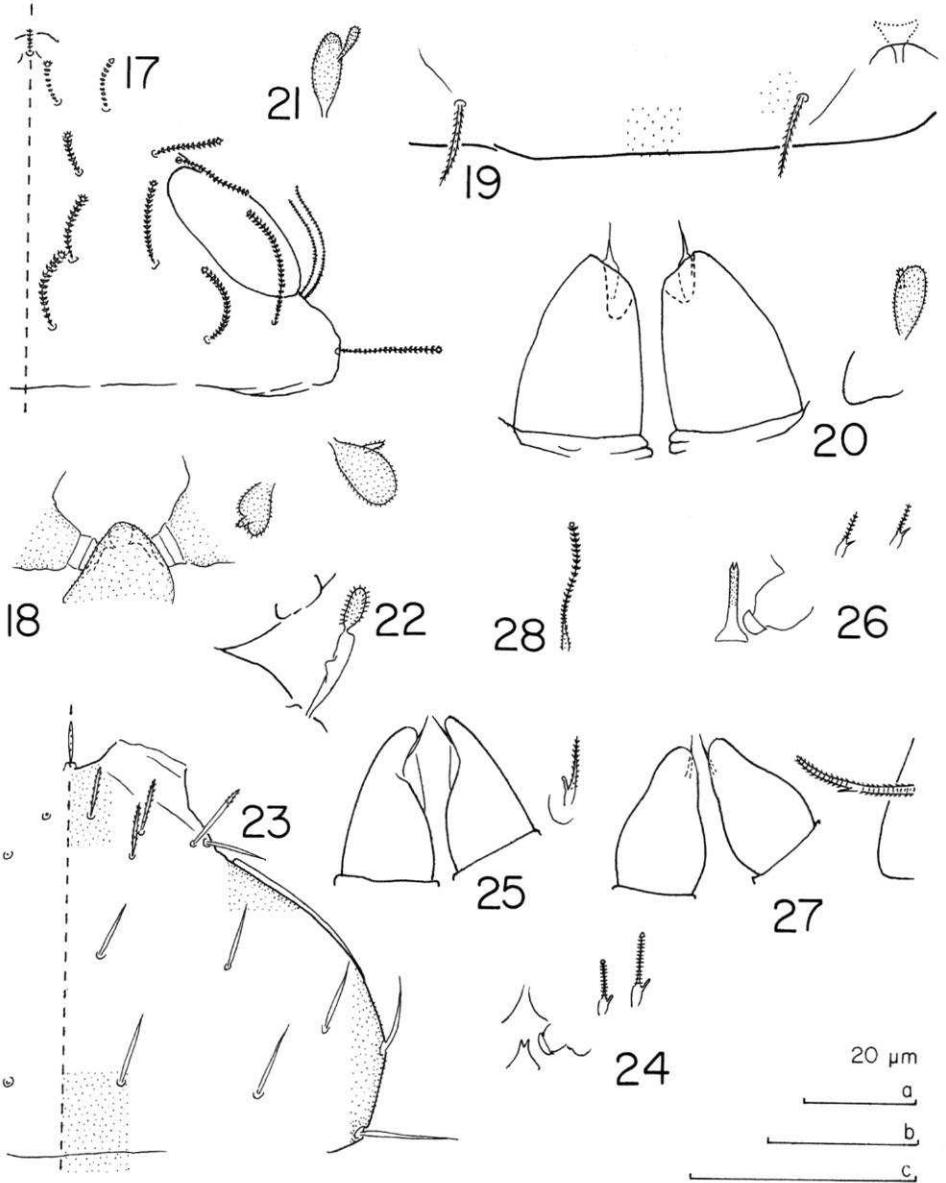
Trunk

Setae of collum segment broadly leaf-shaped with very short cylindrical secondary branches; both branches shortly pubescent. Lateral setae 1.5-1.6 times as long as submedian ones. Sternite process triangular and with blunt anterior part and shortly pubescent.

Penes proportionately short, 1.3 times as long as their greatest diameter; seta 0.3 of the length of penis. Seta on coxa of leg 2 in male as seta on coxa of leg 9.

Legs

Setae on coxa and trochanter of legs 1-9 furcate and of the same shape; they are proportionately shorter than in the type specimen. The posterior part of tergite VI and the anal plate in lateral view are drawn in Figs 19 and 22.



FIGS 17-28. — 17-22, *Stylopauropus (D.) cruciatus* Scheller: 17, head, right half, tergal view; 18, collum segment, right side, sternal view; 19, tergite VI, posterior part; 20, penes and seta on coxa of 2nd pair of legs; 21, seta on trochanter of 9th pair of legs; 22, anal plate, lateral view. 23-25, *Scleropauropus (S.) grassei* Remy: 23, head, right half, sternal view; 24, collum segment, right side, sternal view; 25, penes and seta of coxa of 2nd pair of legs. 26-28, *Brachypauropus hamiger* Latzel: 26, collum segment, right side, sternal view; 27, penes and seta of coxa of 2nd pair of legs; 28, seta of coxa of 9th pair of legs. Pubescence only partly drawn in 23. Scale a: 17, 19-21, 25; b: 18, 22-24, 27, 28; c: 26.

Subfamily SCLEROPAUROPODINAE

Genus **SCLEROPAUROPUS** Silvestri, 1902

Subgenus **SCLEROPAUROPUS** Remy, 1941

Scleropauropus (S.) grassei Remy, 1936

(Figs 23-25)

Bulletin du Muséum national d'Histoire naturelle, Paris (2) 8: 73-76, Figs 3-4.

MATERIAL. — France, Hérault, Mourèze, Bois Noir, *Quercus ilex*, alt. 415 m, 22 ad. 9 (5 ♂, 17 ♀), 11 subad. 8. (2 ♂, 9 ♀), 6 juv. 6. 2 juv. 5, 41 specimens, 1981.IX.10 (loc. 34-42), leg. Deharveng. — New to Hérault.

DISTRIBUTION

S. grassei has not been collected outside the southern half of France where it is known previously from Auvergne, Gard, Landes and Dordogne in 17 specimens from 5 sites.

REMARKS

REMY's description is here emended as to the following characters.

Head

Tergal and sublateral sides with 25 setae arranged as in Fig. 23; tergal ones somewhat lanceolate, sublateral ones tapering and pointed; anterior setae with short oblique distal pubescence. Anterior setae a little shorter than posterior and sublateral ones. In 1st row a_1 are 1.1-1.2 times as long as distance a_1-a_1 , in the following rows this ratio is 2.0-2.3, ≈ 1 and 0.7-0.8 respectively. Anterior part of temporal organs a little lifted up, posterior part not separated from head surface. Cuticle of tergal side distinctly granular.

Trunk

Collum segment. Setae furcate, primary branch cylindrical annulate, secondary branch very short cylindrical glabrous; lateral seta 1.3-1.4 times as long as submedian ones. Sternite process small glabrous and with anterior V-shaped incision. Appendages subcylindrical with low cap.

Penes 1.6 times as long as their greatest diameter, distal 1/3 narrow subcylindrical converging; distal seta 0.5-0.6 of the length of penis.

Family BRACHYPAUROPODIDAE

Genus **BRACHYPAUROPUS** Latzel, 1884

Brachypauropus hamiger Latzel, 1884

(Figs 26-28)

Die Myriapoden der österreichisch-ungarischen Monarchie. Wien. 2: 30-31.

MATERIAL. — France, Drôme, Donzère [10].

DISTRIBUTION

B. hamiger is everywhere rare and is not known outside the Southern half of Europe. The French range is restricted to the east part from Côte-d'Or and Jura to Gard and Vaucluse.

REMARKS

REMY's description is emended in the following respects.

Trunk

Setae on collum segment similar furcate, primary branch cylindrical pointed annulate, secondary branch very short pointed glabrous. Sternite process longish, very narrow, with anterior V-shaped incision, anterior half pubescent. Appendages glabrous subglobular with small hemispherical cap.

Pênes with convex sides, apex rounded; they are 1.5 times as long as greatest diameter; seta 0.3 of the length of penis. Setae on coxa and trochanter of leg 9 simple, blunt, annulate. Coxal seta of leg 2 in male thickest at base, tapering, on proximal half with oblique pubescence, annulate distally; short pointed rudiment of secondary branch in the middle of the seta.

Brachypauropus superbis Hansen, 1902

Meddr dansk naturh. Foren. 1901: 410-412, pl. 6, Fig. 3a-h.

MATERIAL. — France, Hérault, La Gardiole [1]; Var, Maures, Méounes-les-Montrieux, at the Gapeau, alt. 200 m, holm-oak forest, 1 subad. 8 (♀), 1981.IV.7 (loc. 83-19), leg. Deharveng. — New to Var. Spain, Andalusia, Cadiz, Sierra Grazalena, *Quercus ilex*, in moss and soil, 1 ad. 9 (♂), 1975.XII (loc. ECA 5), leg. Deharveng; same place, Sierra de Algibe, *Quercus suber*, from sample with moss, humus and litter, 1 stad.?, 1975.XII (loc. ECA 10), leg. Deharveng. — New to Spain.

However, Dr Maria Teresa DOMINGUEZ, in her unpublished studies of the Spanish Pauropoda, mentions it from Avila and Segovia, Barcelona and Santander (pers. comm.).

GENERAL DISTRIBUTION

It is known previously from one locality in Poland (RAFALSKY 1977), many in France (some papers by REMY), one locality in Rumania (REMY 1939) and one in Italy (HANSEN 1902; SILVESTRI 1902).

Brachypauropus gallicus n. sp.

(Figs 29-40)

TYPE LOCALITY. — France, Aude, haute vallée de l'Aude, Campagna de Sault, Usine d'Usson, alt. 800 m, oak-beech clearing.

TYPE MATERIAL. — Holotype: ad. 9 (♂), locality as above 1973.VI.22 (loc. 11-026), leg. Deharveng. — Paratype: Ariège, Bellongue, alt. 1080 m, *Picea* plantation, in litter, 1 subad. 8 (♀), 1991.III.13 (loc. Be 16L), leg. Deharveng and Bedos.

OTHER MATERIAL. — Same data as holotype, 1 juv. 6. Holotype and paratype in MNHN, Laboratoire de Zoologie (Arthropodes), Paris.

ETYMOLOGY. — From Latin *gallicus* = Gallic (French).

DESCRIPTION

Length: 0.52 mm.

Head

Tergal and lateral sides with 23 setae arranged as in Fig. 29. Anterior setae cylindrical, striate, blunt; setae on the central part and posterolateral one sublanceolate, pointed, somewhat curved; lateral group very thin, tapering, pointed, curved inwards. In 1st row a_1 are twice longer than distance a_1-a_1 , in the following two rows this ratio is 0.8 and 0.6 respectively. Temporal organs small with anterior tubiform and tapering appendage which is a little longer than the organ. Tergal side of head granular.

Antennae

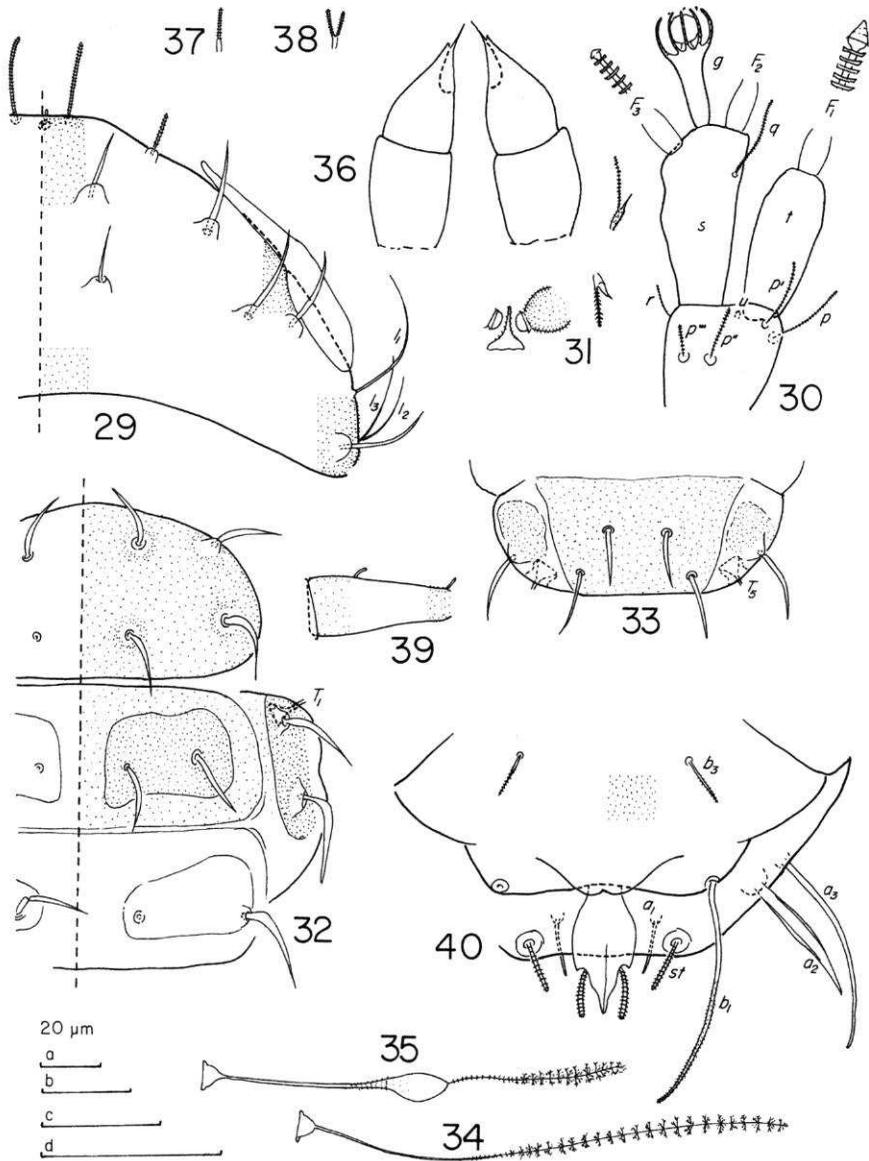
Segment 3 with 3 cylindrical, annulate, blunt setae and on tergal side a rudimentary g' . Segment 4 with 6 such setae, their relative lengths: $p = 100$, $p' = 84$, $p'' = 53$, $p''' = 47$, $r = 44$, $u = 10$. Tergal seta p 0.5 of the length of tergal branch t . The latter fusiform, 2.4 times as long as the greatest diameter, a little shorter than sternal branch s . The latter a little clavate, 2.1 times as long as its greatest diameter with a distinct posterodistal truncation; its seta q inserted 1/4 from distal end, cylindrical, tapering, annulate; its length is 0.7 of the length of s . Relative lengths of flagella (base segments included) and base segments: $F_1 = 100$, $bs_1 = 10$; $F_2 = 83$, $bs_2 = 10$, $F_3 = 98$, $bs_3 = 11$. The F_1 2.7 times as long as t , F_2 and F_3 2.1 and 2.5 times as long as s respectively. Distal calyces glabrous, those of F_1 and F_2 conical, those of F_3 rounded. Globulus g has slender cylindrical stalk, it is 2.1 times as long as its greatest diameter and almost 0.7 of the length of s , greatest diameter 0.9 of greatest diameter of t ; 8 bracts. Globulus of 3rd segment rudimentary. Antenna glabrous.

Trunk

Collum segment with only one pair of setae, furcate with main branch cylindrical blunt annulate, secondary branch rudimentary conical glabrous; length of setae as long as length of appendages. Sternite process very narrow, pointed, with oblique pubescence. Sternite appendages subglobular with dense erect pubescence, caps small hemispherical glabrous. Tergites II-V divided transversely, I and VI not so. Tergites with weakly chitinized plates: one undivided on I, 1 lateral and 2 submedian pairs on II-V, one median undivided plate and 2 lateral plates on VI. Tergite I with 4+4 setae; II-V with 6+6 setae, 2 setae on each subtergite; VI with 4+2 setae, 2+2 on the median subtergite and one each on the lateral subtergites. These setae curved, pointed, glabrous; most anterior and lateral ones sometimes somewhat hook-like.

Trichobothria except T_3 with very thin simple axes; proximal 1/3 glabrous, distal half with thin erect branched pubescence hairs which are arranged in whorls. The T_3 with thin axis except for a large swelling in the middle; distal part of swelling almost glabrous, proximal part with very short pubescence in whorls; distal part of T_3 as that of other trichobothria. Relative lengths of trichobothria: $T_1 = T_2 = 100$, $T_3 = 82$, $T_4 = 75$, $T_5 \approx 95$.

Penes 2-parted: beneath a conical pointed end-segment a subcylindrical base of the same length; seta short, 0.3 of the length of the conical part. Coxal seta of leg 2 in male furcate, main branch cylindrical annulate, secondary branch short pointed glabrous.



FIGS 29-40. — *Brachypauropus gallicus* n. sp., holotype: 29, head, right side, tergal view; 30, right antenna, sternal view; 31, collum segment, right side, sternal view; 32, tergites I and II; 33, tergite VI; 34, T₁; 35, T₃; 36, penes and seta on coxa of 2nd pair of legs; 37, seta on coxa of 9th pair of legs; 38, seta on trochanter of 9th pair of legs; 39, tarsus of 9th pair of legs; 40, pygidium, median and left side, sternal view. Pubescence only partly drawn in 29, 32 and 40. Scale a: 32, 33; b: 34; c: 35-39; d: 29-31, 40.

Legs

All legs 5-segmented. Setae on coxa of leg 9 simple cylindrical annulate; setae on trochanter furcate with similar branches which are cylindrical annulate. More anteriorly these setae are simple with rudimentary secondary branches.

Tarsus of leg 9 tapering, 2.4 times as long as its greatest diameter. Setae subequal, cylindrical, glabrous, about 0.1 of the length of tarsus. Cuticle of tarsus with short and dense pubescence.

Pygidium

Tergum: Hind margin between st almost straight; cuticle glabrous. Relative lengths of setae: $a_1 = st = 10$, $a_2 = 27$, $a_3 = 32$. The a_1 and st are cylindrical and converging, the former glabrous and curved a little inwards, the latter striate and straight; a_2 and a_3 are glabrous and diverging, the former also almost straight and lanceolate, the latter subcylindrical tapering curved inwards. Distance a_1-a_1 2.2 times as long as a_1 , distance a_1-a_2 3.1 times as long as distance a_2-a_3 ; distance $st-st$ 2.8 times as long as st and 1.3 times as long as distance a_1-a_1 .

Sternum: Margin between b_1 almost straight but with a median lobe which is 2-parted posteriorly; margins glabrous, the rest shortly pubescent. Relative lengths of setae (pygidial $a_1 = 10$): $b_1 = 42$, $b_3 = 9$. No b_2 . These setae subcylindrical, tapering, shortly pubescent, striate distally. The b_1 1.1 times as long as b_1 and b_3 almost 0.3 of distance b_3-b_3 . Anal plate 1.7 times as long as broad, widening from the base and outwards, lateral margins convex, posterior margin with sublateral U-shaped indentions and between them a wedge-shaped lobe protruding backwards; two appendages protrude posteriorly from the sublateral indentions; appendages cylindrical, striate, blunt, curved inwards.

Subad. 8: Relative lengths of d_1 and d_2 (pygidial $a_1 = 10$) 50 and 62 respectively. Distance d_1-d_1 2.3 times as long as d_1 and a little shorter than distance d_1-d_2 .

TAXONOMIC REMARKS

The new species is closely related to *B. superbus* Hansen from which it is separated by having the tubiform appendage of the temporal organs distinctly longer than the organ (not distinctly shorter), by some antennal characters e.g. $t < s$ (not $t > s$), flagella not thickened distally (thickened in *superbus*), the bases of the flagella glabrous (not shortly pubescent), moreover by the swelling of the T_3 which is glabrous (not with distinct pubescence), the $T_3 < T_5$ (not $T_3 > T_5$), tergite I not divided into subtergites (divided in *superbus*), the seta on trochanter of the last pair of legs furcate (not simple), the penes pointed and with long base segment (blunt distally and with short base segment) and the anal plate is different (with long triangular posteriomedian process and distinct indentations at the bases of the appendages (not short blunt process and no posterolateral indentations).

Family EURYPAUPODIDAE

Genus **ACOPAUROPUS** Cook, 1896

Acopauropus consobrinus (Remy, 1937)

Bulletin du Muséum national d'Histoire naturelle, Paris (2) 9: 253-256, Figs 1-5.

MATERIAL. — France, Tarn, Sorèze, near the cave Trou du Calel, alt. 500 m, humus near the entrance, 1 ad. ♀, 1973.V.31 (loc. 81-36), leg. Deharveng; Hérault, La Gardiole, Bois Noir, alt. 50 m, in humus under

Quercus ilex, 1 juv. 6, 1974.I.6, leg. Deharveng; Haute-Garonne, Herran [1] and Sost [2]; Hautes-Pyrénées, vallée d'Aure, Lortet, alt. 600 m, under moss on boulder, 1 subad. 8 (♀), 1975.X.20 (loc. 65-98), leg. Deharveng; Ariège, Arize [9] and Quérigut [4]; Pyrénées-Orientales, Sorèze [3] and Vernet-les-Bains [35]. — New to Tarn, Hérault and Hautes-Pyrénées.

DISTRIBUTION

Obviously *A. consobrinus* is the most frequent species in Eurypauropodidae in Southern France. It was known previously from 12 localities in 5 southern départements. Outside it is a very rare species known from one locality in Austria (SCHUSTER 1960; REMY 1961) and one in Spain (REMY 1961).

REMARKS

REMY's description does not include the chaetotaxy of the head nor the description of the penes.

Head

Setae annulate-striate. Vertex: no setae. Tempus: 0+2; setae pointed; $te_1 \approx 30$, $te_2 = 20$, $sio-te_1 = 5$, $te_1-te_2 = 9 \mu\text{m}$. Frons: Frontal pore near lp_2 ; close to middle part of temporal organ a short blunt granular frontal protuberance. Index of frontal setae: median row, $mp = 22$, $mm = 37$, $ma = 12$, $mp-mm = 27$, $mm-ma = 40$; lateral row, $lp_1 = 20$, $lp_2 = 46$, $lp_3 = 24$, $lp_1-lp_2 = 18$, $lp_2-lp_3 = 25$, $lp_1-lp_1 = 28$, $lp_3-lp_3 = 124$; anterior row, 3 setae, $la_1 = 20$, $la_2 = la_3 = 30$, $la_1-la_2 = 19$, $la_2-la_3 = 8$, $la_1-la_1 = 41$, $la_1-la_3 = 25$, $la_3-lp_3 = 23 \mu\text{m}$. Distance $la_1-la_1/la_1-la_2 = 2.1$. Peristomal row, 5 setae, $pe_1 = pe_2 = 20$, $pe_3 = 19$, $pe_4 = 21$, $pe_5 = 29$, $pe_1-pe_2 = 10$, $pe_2-pe_3 = 8$, $pe_3-pe_4 = 11$, $pe_4-pe_5 = 24 \mu\text{m}$.

Trunk

Penes short, rounded, glabrous, 1.3 times as long as their greatest diameter; seta short, 1/4 of the length of penis.

Acopauropus ornatus Latzel, 1884

Verh. k.-k. zool.-bot. Ges. Wien 33: 127.

MATERIAL. — France, Ariège, Rille, alt. 920, beech forest, in soil, 1 juv. 3, 1991.XI.29 (loc. Rh21S), leg. Deharveng and Bedos. — New to Ariège.

DISTRIBUTION

Like the preceding species the French range of *A. ornatus* is restricted to the southernmost part of the country. Four localities only are known previously: two in Gard (REMY 1947, 1953) and two in Basses-Pyrénées (REMY 1953, 1961). Outside Southern France it is known only from some localities in Austria.

Acopauropus deharvengi n. sp.

(Figs 41-54)

TYPE LOCALITY. — France, Drôme, Montélimar, Donzère, alt. 120 m, under rotten oak-wood, alt. 120 m.

TYPE MATERIAL. — Holotype: subad. 8 (♀), locality as above, 1984.X.23 (loc. 26-34), leg. Deharveng.

ETYMOLOGY. — Dedicated to the collector, Dr. Louis DEHARVENG, Laboratoire de Zoologie, université Paul Sabatier, Toulouse, who has facilitated my work in so many ways.

DESCRIPTION

New abbreviations: *tso*, temporal sense-organ of the head; *fpo*, frontal pore; *fpr*, frontal protuberance.

Length: 1.25 mm.

Head

Setae *ve*, *mp* and *te* with short pubescence, *ve* and *mp* cylindrical and blunt, *te* tapering; other setae annulate. Vertex: 3 setae, $ve_1 = 9$, $ve_2 = 7-8$, $ve_2-ve_2 = 13$. Tempus: 0+3 setae, $te_1 = 10$, $te_2 = te_3 = 20$, $te_1-te_2 = 5$, $te_2-te_3 = 6$, *tso-te*₁ 3 μm. Frons: The *fpo* not identified; close to middle part of temporal organ a short blunt granular *fpr*. Index of frontal setae: median row, $mp = 22$, $mm = 24$, $ma = 13$, $mp-mm = 22$, $mm-ma = 41$; lateral row, $lp_1 = 20$, $lp_2 = 34$, $lp_3 = 25$, $lp_1-lp_2 = lp_2-lp_3 = 22$, $lp_1-lp_1 = 27$, $lp_3-lp_3 = 113$; anterior row, 3 setae, $la_1 = 13$, $la_2 = 15$, $la_3 = 25$, $la_1-la_2 = 18$, $la_2-la_3 = 25$, $la_1-la_1 = 20$, $la_1-la_3 = 46$, $la_3-lp_3 = 12$ μm. Distance $la_1-la_1/la_1-la_2 = 1.1$. Peristomal row, 5 setae, $pe_1 = 17$, $pe_2 = 20$, $pe_3 = 21$, $pe_4 = 19$, $pe_5 = 23$, $pe_1-pe_2 = 8$, $pe_2-pe_3 = 6$, $pe_3-pe_4 = 9$, $pe_4-pe_5 = 35$ μm.

Antennae

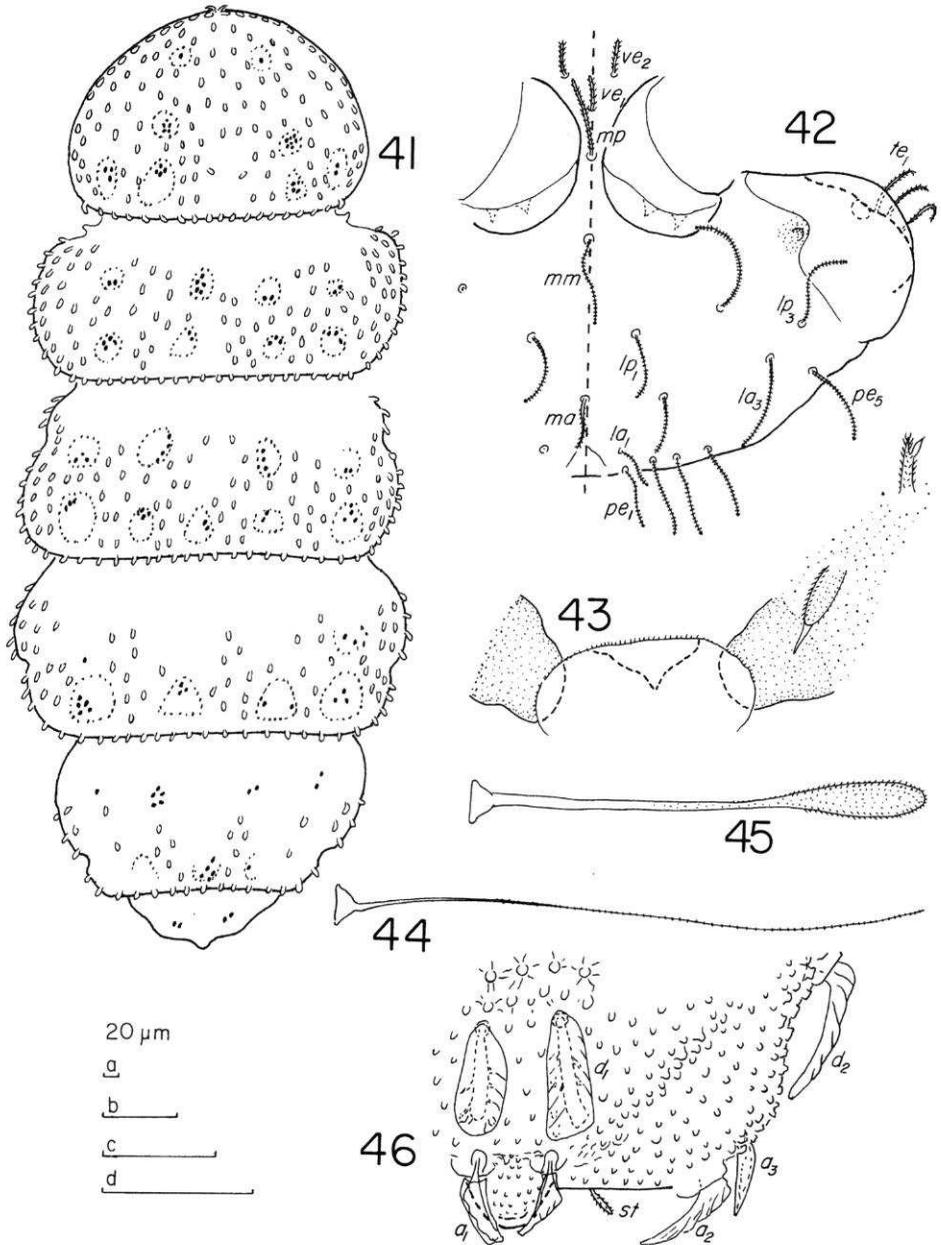
Segments 1-4 coarsely granular, *s* and *t* less and basal segments of flagellae and *g* only weakly; chaetotaxy of segments 1-4:1/2/4+g'/5. Segment 1, $p = 18$; segment 2, $p = p' = 20$; segment 3, $p = 21$, $p' = p''' = 20$, $p''' = 15$; segment 4, $p = 30$, $p' = 19$, $p'' = 20$, $p''' = 12$, $r = 13$ μm. Sternal branch *s*, anterior margin = 54, posterior margin = 42, Ø of base = 11, maximum Ø = 17, $q = 45$ μm. Anterior margin of *s*/length of *g* = 0.5, anterior margin/posterior margin = 1.3, anterior margin/maximum Ø = 3.2, maximum Ø/Ø of base = 1.5. Tergal branch *t* subcylindrical, length = 41, Ø of base = 8, maximum Ø = 12 μm, length of *t*/maximum Ø = 3.4; pore not identified.

Globulus *g*, length = 27, Ø = 5.5, Ø of base = 3 μm, number of bracts = 9, two of them furcate, their length = 4, capsule length = 2.5, Ø = 3.5 μm. Length of flagellae, $F_1 = 120$, $bs_1 = 16$, $F_2 = 115$, $bs_2 = 14$, $F_3 = 79$, $bs_3 = 11.5$ μm. Calyces subconical, granular, largest on F_1 , smallest on F_3 .

Trunk

Setae on collum segment short with short oblique pubescence; submedian ones subcylindrical, probably simple with pointed glabrous apex; lateral ones tapering, pointed, furcate distally, secondary branch short and glabrous. Sternite process broad, triangular anteriorly, with short erect pubescence; sternite appendages wide, granular, somewhat turned inwards. Tergites with two main types of protuberances: large folioform or ceratoid ones and numerous small subconical raisings in and below the cuticle. Large protuberances in general curved and/or winged. Wings more or less transparent, often unsymmetrical, axes evenly curved or hook-like. Number of latero-marginal setae: II 0/11-12, III 3/9, IV 4-5/4-5, VI 3/2. Length/width ratio of tergites:

I 110/160 = 0.7, II 85/195 = 0.4, III 95/200 = 0.5, IV 80/165 = 0.5, VI 35/80 = 0.4.



FIGS 41-46. — *Acopaupopus deharvengi* n. sp., 41-45, holotype; 46, subadult paratype: 41, body with tergites I-VI; 42, head, right half, anterior view; 43, collum segment, median and right part, sternal view; 44, T_1 ; 45, T_3 ; 46, pygidium in subadult specimen with setae d_1 and d_2 , tergal view. In 41 outlines only of chaetotaxy, marginal setae not drawn in tergite I; tergal warts marked with black dots. Scale a: 41; b: 42, 44, 46; c: 45; d: 43.

The d_1 of pygidial tergum large, folioform, length = 30 and 34 μm , broadest in distal part, 1.5-1.7 times as long as their distance apart; $d_2 = 39 \mu\text{m}$, 0.5 of distance d_1-d_2 .

Trichobothria with thin axes, especially T_1 and T_2 , pubescence of sparse short simple hairs, in distinct whorls distally. The T_3 with thick axis and a distal clavate swelling the length of which is 1/3 of the length of T_3 ; proximal 1/3 glabrous, the rest with dense short oblique pubescence. Length of trichobothria: $T_1 = 165$, $T_2 = 143$ and 145 , $T_3 = 80$, $T_5 = 84 \mu\text{m}$. Ratio $T_3/T_2 = 0.6$.

Legs

Setae on coxa of leg 7-8 as submedian setae of collum segment; seta on trochanter furcate with shorter tapering branch 1/3 of the length of longer, cylindrical, annulate one; shorter branch and basal part with oblique pubescence. On legs 1-6 coxal setae are furcate with two subequal strong glabrous pointed diverging branches protruding from a shortly pubescent base. Seta on trochanter of these legs as corresponding seta on legs 7-8 but the shorter branch is glabrous. Tarsi of legs 1 and 8 not divided, intervening ones divided. Tarsus of leg 8 strongly tapering, 2.1 times as long as its greatest diameter, two tergal and one sternal seta, all pointed and glabrous. Proximal tergal seta longest, 0.5 of the length of tarsus, 2.8 times as long as distal tergal seta and 2.5 times as long as sternal seta.

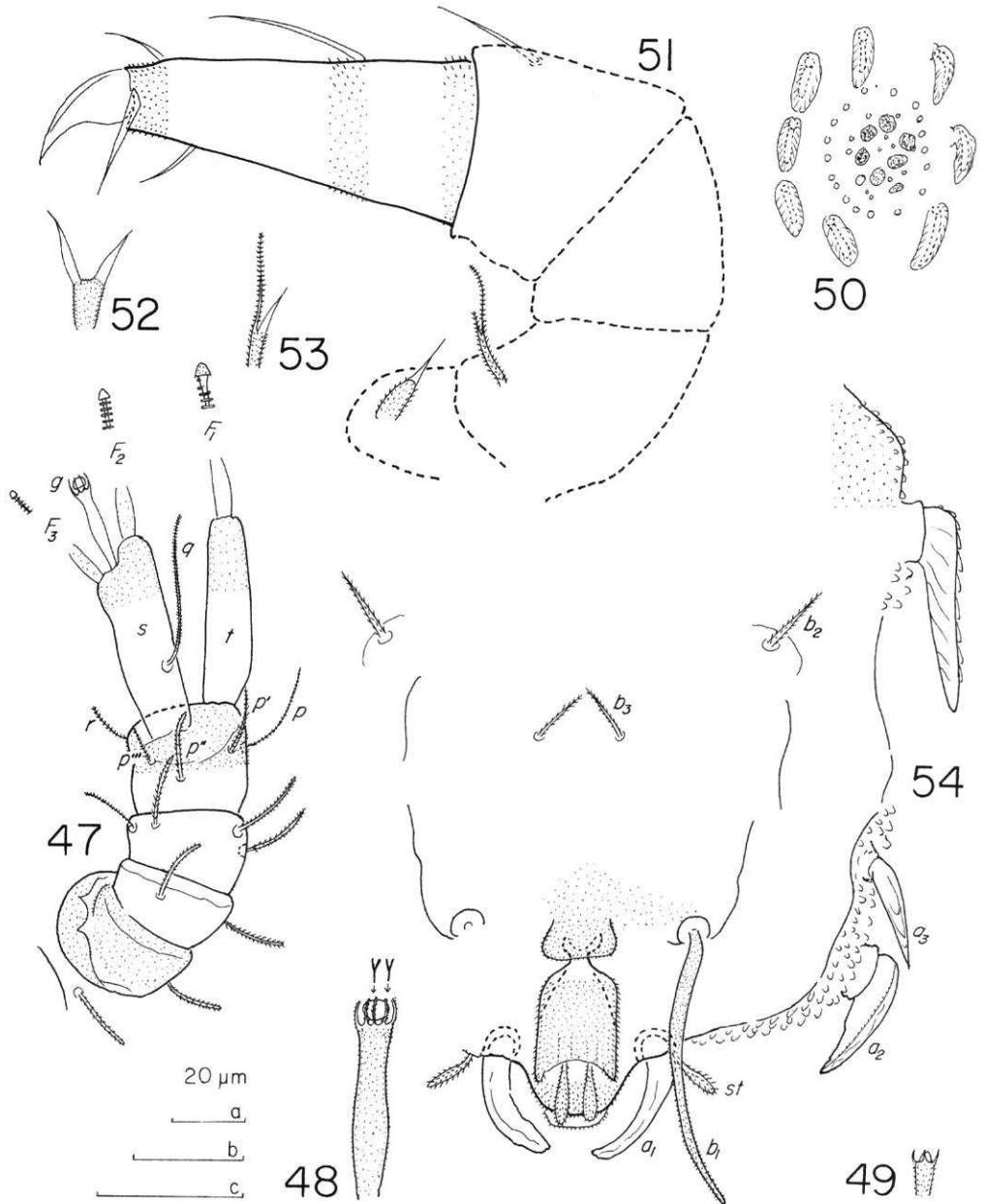
Pygidium

Tergum: Margin between st with rounded posterior lobe. The a_1 , a_2 and a_3 are glabrous, curved inwards, a_1 also large, ceratoid, converging, a_2 large and scale-like, a_3 ceratoid, almost straight, diverging; st clavate, with oblique pubescence, curved outwards, diverging. The $a_1 = 25$, $a_2 = 22$, $a_3 = 20$, $st = 10$, $a_1-a_1 = 27$, $a_2-a_2 = 100$, $a_3-a_3 = 107$, $a_1-a_2 = 38$, $a_2-a_3 = 19$, $st-st = 37 \mu\text{m}$; $st-st/a_1-a_1 = 1.0$, $a_1/a_1-a_1 = 0.9$, $a_1/a_1-a_2 = 0.7$, $a_1-a_1/a_2-a_3 = 1.4$.

Sternum: Margin between b_1 and below the base of the anal plate with a distinct median shortly pubescent lobe which is narrowest at base and has straight posterior margin. Setae tapering, b_1 blunt and with very short pubescence, b_2 and b_3 pointed and with distinct oblique pubescence. The $b_1 = 50$, $b_2 \approx 15$, $b_3 = 11$, $b_1-b_1 = 48$, $b_2-b_2 = 69$, $b_3-b_3 = 15$, $b_1-b_2 = 54$, $b_2-b_3 = 31 \mu\text{m}$; $b_1-b_1/b_1 = 1.0$, $b_1/b_2 = 3.3$. Anal plate 1.5 times as long as broad, with short narrow anterior stalk, lateral margins parallel, posterolateral corners short and blunt; two clavate submedian appendages protrude backwards from the concave posterior margin, length of appendages 0.5 of the length of plate; plate and appendages with dense short pubescence.

TAXONOMIC REMARKS

The species is close to *A. consobrinus* but is distinguished from it by good characters. The vertex setae ve_1 and ve_2 are well developed (very short or even absent in *consobrinus*), the 1st antennal segment has only one seta (not two), the stalk of the antennal globulus g has a wide part in the middle (not evenly tapering), the posteromedian row of warts on the tergites II-IV is missing, the pygidial setae a_1 are proportionally bigger and more stout and blunt, the posteromedian lobe between the setae b_1 is constricted at base (not widest at base) and with straight posterior margin (not with median indentation) and the setae b_1 and b_2 have no apical hair.



FIGS 47-54. — *Acopauropus deharvengi* n. sp., holotype: 47, right antenna, sternal view; 48, antennal globulus *g*, above the shape of two branched bracts; 49, antennal globulus *g'*; 50, tergite I, submedian part, 8 protuberances and group of tergal warts; 51, 9th leg, contours of tibia, femur, trochanter and coxa dashed; 52, seta of coxa of 9th pair of legs; 53, seta of trochanter of 9th pair of legs; 54, pygidium, median and left part, sternal view. Pubescence only partly drawn in 47, 51 and 54. Scale a: 47, 50; b: 51-54; c: 48, 49.

DISTRIBUTION PATTERNS OF THE PAUPODA OF SOUTHERN FRANCE

The Pauropoda are represented in France by three families in Tetramerocerata all with world-wide distribution: Pauropodidae, Brachypauropodidae and Eurypauropodidae. In the collection accounted for above they are represented by 22, 3 and 3 species respectively. Two of them are nova species and 3 species are new to France and one is new to Spain. Among those 26 species previously described, the French distribution has been enlarged with 1-4 new départements in no less than 22 species. Even in France, REMY's native country, where he made extensive collections, the species diversity and the ranges of the species are incompletely known.

The Pauropoda are far less investigated outside France but by scrutinizing and comparing the ranges of the species studied here, some distributional elements may be distinguished.

WIDE RANGE

None of the French species in Brachypauropodidae and Eurypauropodidae are known outside West Palearctic but in Pauropodidae several species have very large ranges, sometimes reaching even into other faunal regions. This wide range group includes *Allopauropus danicus* and *gracilis* which may be subcosmopolitan and *A. aristatus* which is Holarctic-Ethiopian. When better known further species may enter this group. Candidates are among others some species now considered as Holarctic e.g. *A. helveticus* and *vulgaris*, *Stylopauropus pedunculatus* and probably *A. brevisetus* and *productus* too.

WEST PALEARCTIC

Most species in south of France are purely West Palearctic but their ranges differ in shape. *Allopauropus multiplex* but also *Pauropus furcifer* seem to be most widely distributed. The latter is reported to have an even much wider range but is probably West Palearctic because the record from New Zealand by REMY (1952) is doubtful. A range similar to that in *P. furcifer* appears in *A. fagei* but its main area is more southern with wide distribution in North Africa. A somewhat smaller range is seen in *A. barcinonensis* not occurring in North Africa and Northern Europe. Similar ranges occur in the south and middle European *Stylopauropus beauchampi*, *Brachypauropus superbus*, *Acopauropus consobrinus* and *ornatus* while others are restricted to south of Europe as the three *Allopauropus* species *gravieri*, *zerlingae* and *furcula* and *Brachypauropus hamiger*.

SW EUROPEAN

Five rare species are confined to South-west Europe. One of them, *Allopauropus puritae*, here reported from Ariège and previously reported only from central Spain, may have the largest range, provided it is not a case of discontinuity. The areas of the other four species are smaller. As far as known that of *Stylopauropus cruciatus* includes only a mountainous area in west Ariège and a single locality in high altitude in the Andorran Pyrenees. The third species, *Scleropauropus grassei*, has a larger but dispersed range in south of France. The remaining two species of this group are the two new species described above, *Brachypauropus gallicus* and *Acopauropus deharvengi*, the former from Aude and Ariège and the latter from Drôme only.

Recently Dr Maria Teresa DOMINGUEZ, Madrid, has made an extensive study of the distribution of the Spanish Pauropoda (doct. thesis, unpublished). Comparing the collection

accounted for above with her list reveals considerable similarities. Disregarding those 8 species belonging to or being candidates to the wide range group, 10 species or 50% are common to the Spanish fauna.

UNKNOWN RANGES

The three species, *Paupopus huxleyi* and *lanceolatus* and *Stylopauropus brito* have been mentioned from many sites in several countries but they have not been grouped here because there is some doubt as to the identity of many earlier records. The former two have often been confused and the latter has a range difficult to interpret because it is very scattered and discontinuous not only in France but also far outside.

INDICATORS OF ENDEMISM

The pauropods are small and strictly terrestrial, most often soil-living and adapted to a uniform type of environment with high moisture and humidity. Because they have also a very low vagility and their dispersal ability is inconsiderable they seem to be of high biogeographical importance. The combination of slow dispersal and very large ranges in some species indicate a slow speciation rate and the wide ranges of most genera point in the same direction. However, many species probably very many, have restricted ranges but the reason for that is unknown. They may be relicts of formerly widely distributed species or they may be neoendemics which have evolved where they now live. Among the South-west European species studied above *Allopauropus puritae* from Ariège and central Spain belongs to a widespread and probably very old group of species. It has many representatives mainly in the tropics and subtropics and may have evolved by allopatric speciation a long time ago. It may be that *Scleropauropus grassei* which is known only from the southern half of France has a similar evolution history since the genus is very widespread and there are several morphologically similar species. The third southwestern species, *Stylopauropus cruciatus*, belongs to a widespread and morphologically diversified genus with its main range on the northern hemisphere. Contrary to most European species it seems to have a small range, up to now collected only from a few localities between 900 and 2200 m altitude in Andorra and Ariège. It may be old too as it lacks close relatives in the West Palearctic but shows similarities to some Nearctic species. The subgenus to which it belongs has only a few species in Europe but is more diversified in the Nearctic. Even if the true ranges of the genera and species are more or less incompletely known in the Pauropoda there do occur species in SW Europe which may be endemics.

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