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The present knowledge of the Symphyla and Pauropoda (Myriapoda) in Germany – an annotated checklist

Karin Voigtländer[1)], Peter Decker[1)], Ulrich Burkhardt[1)] & Jörg Spelda[2)]

[1)] Senckenberg Museum of Natural History Görlitz, Am Museum 1, D–02826 Görlitz, Germany;
e-mail: karin.voigtlaender@senckenberg.de
[2)] Bavarian State Collection of Zoology, Münchhausenstraße 21, D–81247 Munich, Germany

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Abstract. Symphyla and Pauropoda are seriously neglected classes of Myriapoda worldwide, with sparse information on ecology and distribution on species level available. The few records of these taxa are scattered in literature, and many new species remain to be discovered even in Europe. For the first time a comprehensive checklist is provided for the Symphyla and Pauropoda of Germany based on a literature review and database and collection queries. Information on distribution and ecology for both taxa so far available is given. Currently 18 taxa of Symphyla and 36 taxa of Pauropoda are known for Germany. New species records from museum collections and new investigations are given, most of these are from Baden-Württemberg, Bavaria, Hesse, North Rhine-Westphalia, Rhineland-Palatinate, sampled during the last decades. *Decapauropus broelemanni* (Remy, 1935) and *Acopauropus ornatus* (Latzel, 1884) are recorded for Germany for the first time. *Trachypauropus cordatus* (Scheller, 1974) is confirmed for Germany from nine localities.

Key words. Distribution, ecology, species list, catalogue, Arthropoda, Myriapoda, Germany, Europe.

INTRODUCTION

The four classes of Myriapoda are very different in their status of taxonomical and ecological investigation. Compared to vast numbers of studies dealing with Chilopoda and Diplopoda, Pauropoda and Symphyla are mostly neglected in ecofaunistical studies, as they contain generally very small species and are difficult to identify. Apart from a few exceptions (Foddai et al. 1995, Gisin 1947, 1949, Rusek 2001a, b, Scheller 1954, 1990), complete checklists for these two groups are lacking for most countries. For Germany the last overview dates back 50 years (Schubart 1964). Together with Diplopoda and Chilopoda, earlier knowledge of Pauropoda (six species) and Symphyla (four species) known so far for Germany was summarised by Verhoeff (1934). The first note on symphylans from Germany was given by Latzel (1895), who reported *Scolopendrella immaculata* (Newport, 1845) and *S. notacantha* Gervais, 1844 from the surroundings of Hamburg. Haase (1884, 1885) recorded the first pauropod species *Stylopauropus pedunculatus* (Lubbock, 1867) from Silesia, which at that time belonged to Germany. Later authors (such as Hansen 1902, Büttner 1926, Griepenburg 1932, 1936) also provided records of pauropods and symphylans. Remy (1936a) in the first extensive survey of Germany added several new records for Pauropoda, so the number of taxa increased to 15.

Since the beginning of the 1960s a somewhat more thorough sampling was initiated mainly by Scheller, Hüther, Dunger and later also by Spelda. A comparatively high number of records of Symphyla and Pauropoda exists from Southwestern Germany (Baden-Württemberg) due to the sampling done by Remy, Scheller and Spelda. While Hüther focused especially on North Rhine-Westphalia and Rhineland-Palatinate, the material brought together by Dunger and others mostly came from Saxony. A number of other authors provided some single records.

Here for the first time a comprehensive checklist for the Symphyla and Pauropoda of Germany is provided, based on a literature review and database and collection queries. Information on habitats and ecology is given for each species including also information from other European countries.

We hope this review will be the basis for more extensive studies on these neglected myriapods in the future.

MATERIALS AND METHODS

The present investigation is based on a comprehensive review of the literature available for Germany. These data are available online in the Global Biodiversity Information Facility (GBIF, http://www.gbif.org, Edwards et al. 2000) and in the Edaphobase data warehouse on soil zoology (http://www.edaphobase.org, Burkhardt et al. 2014).

Additionally material from recent investigations, as well as material from the collections of the Senckenberg Museum of Natural History Görlitz (SMNG), Senckenberg Museum Frankfurt (SMF) collected by A. Allspach, Zoologische Staatssammlung München (ZSM) and the private collection of Jörg Spelda (JSC) (partly listed in Spelda 2005) was studied. Also additional information on the published records from Dunger, deposited in the SMNG, is provided.

The classification of pauropods follows Scheller (1977a, 2008). In addition to the original descriptions we used the following literature for species identification: Edwards (1959a, b), Hasenhütl (1986), and Scheller (1974a, 1976, 1978a).

Abbreviations in the text: A. Allspach (AA), U. Burkhardt (UB), P. Decker (PD), W. Dunger (WD), J. Spelda (JS) K. Voigtländer (KV), Landesamt für Umwelt (LFU), for specimens means leg pairs (L[number]), adult (ad.), individual (ind.) and juvenile (juv.).

Focus-stacked montage images were taken with a Leica® DMS5500B microscope and DFC295 camera (SMNG) and a Leica® SM-LUX microscope with incident illumination at ZSM. HeliconFocus or Leica® Application Suite 3.8 was used for focus-stacking of up to 85 images. Maps were created using ArcMap version 10.0 (ESRI Kranzberg, Germany).

RESULTS

Currently the checklist includes 18 taxa of Symphyla and 36 taxa of Pauropoda for Germany. In Pauropoda 32 valid species from ten genera and five families and in Symphyla 18 species from six genera and two families are known (Table 1). Four species of Pauropoda, *Fagepauropus breviseta*, *Decapauropus cursor*, *D. trichosphaera*, and *D. unicus*, all listed by Hüther (1982) are currently regarded as nomina nuda due to lack of species description and type material.

Table 1. Symphyla and Pauropoda from German Federal States. Abbreviations: L – record from literature, X – new record, F – first record, G – only in greenhouses, ? – imprecise record. BB – Brandenburg, BE – Berlin, BW – Baden-Württemberg, BY – Bavaria, HB – Bremen, HE – Hesse, HH – Hamburg, MP – Mecklenburg-Western Pommerania, NI – Lower Saxony, NW – North Rhine-Westphalia, RP – Rhineland Palatinate, SH – Schleswig-Holstein, SL – Saarland, SN – Saxony, ST – Saxony-Anhalt, TH – Thuringia

	BW	BY	BE	BB	HB	HH	HE	NI	MP	NW	RP	SL	SN	ST	SH	TH
Class Pauropoda																
Family Pauropodidae																
Allopauropus danicus (Hansen, 1902)	LX							L		LX	L	L	L			
Decapauropus aristatus (Remy, 1936)											L					
Decapauropus barcinonensis (Remy, 1933)	L									L	L					
Decapauropus broelemanni (Remy, 1935)	F															
Decapauropus cuenoti Remy, 1931	LX									L	L		LX			
Decapauropus distinctus (Bagnall, 1936)	LX															
Decapauropus doryphorus (Remy, 1936)												L				
Decapauropus gracilis (Hansen, 1902)	LX	X	L	X		L	LX			L	L	L	LX			X
Decapauropus helophorus (Remy, 1936)		L									L					
Decapauropus helveticus (Hansen, 1902)	LX	LX									L					
Decapauropus hessei (Remy, 1935)	L															
Decapauropus kocheri (Remy, 1954)												L				

Table 1. (continued)

	BW	BY	BE	BB	HB	HH	HE	NI	MP	NW	RP	SL	SN	ST	SH	TH
Decapauropus meridianus (Remy, 1941)	L															
Decapauropus multiplex (Remy, 1936)	LX												L			
Decapauropus tenellus (Scheller, 1971)	L						X									
Decapauropus thalassophilus (Remy, 1935)											L	L				
Decapauropus viticolus Hüther, 1975											L					
Decapauropus vulgaris (Hansen, 1902)	LX	LX	L				X		X	LX	L		L			
Pauropus bagnalli Remy, 1935	L															
Pauropus furcifer Silvestri, 1902	L	X					X									X
Pauropus huxleyi Lubbock, 1867	LX	L				L	L			L						
Pauropus lanceolatus Remy, 1937	LX	X				L	L	L			L					
Stylopauropus pedunculatus (Lubbock, 1867)	LX	LX					X			LX	LX	L	LX	L		
Stylopauropus pubescens Hansen, 1902	LX	L					LX				L					
Scleropauropus lyrifer Remy, 1936	L															
Family Polypauropodidae																
Polypauropus duboscqi Remy,1932												L				
Family Amphipauropodidae																
Amphipauropus rhenanus (Hüther, 1971)	(L)										L					
Family Brachypauropodidae																
Brachypauropus hamiger Latzel, 1884	L	L											X			
Brachypauropus strebeli Hüther, 1971											L					
Family Eurypauropodidae																
Trachypauropus cordatus (Scheller, 1974)		F					F			LF						
Acopauropus asper (Scheller, 1974)							L									
Acopauropus ornatus (Latzel 1884)		F														
Decapauropus cursor Hüther, 1982											L					
Decapauropus trichosphaera Hüther, 1982											L					
Decapauropus unicus Hüther 1982											L					
Fagepauropus breviseta Hüther, 1982											L					
Sum of taxa	21	12	2	1	0	3	10	2	1	18	15/19	7	7	1	0	2
Class Symphyla																
Family Scolopendrellidae																
Symphylella elongata Scheller, 1952	LX		L							X						
Symphylella isabellae (Grassi, 1886)	LX	L					X	L		X			LX			
Symphylella major Scheller, 1961	L															
Symphylella vulgaris (Hansen, 1903)	LX	LX	L	L			LX			L	L	L	LX			
Scolopendrellopsis arvernorum (Ribaut, 1931)	L	X									L					
Scolopendrellopsis subnuda (Hansen, 1903)	LX	LX	L				LX		X	LX	L	L	LX			L
Scolopendrella notacantha Gervais, 1839	LX	LX				L				L	L					L
Geophilella pyrenaica Ribaut, 1913	L									L	L					
Family Scutigerellidae																
Hanseniella nivea (Scopoli, 1763)													LX			
Hanseniella oligomacrochaeta Scheller, 2002			G													
Hanseniella orientalis (Hansen, 1903)			G													
Scutigerella causeyae Michelbacher, 1942	LX	LX	L				X			LX	L		X			
Scutigerella immaculata (Newport, 1845)	L	L	L	L		L	L	L	L	L	L		L		L	L
Scutigerella linsleyi Michelbacher, 1942																
Scutigerella nodicercus Michelbacher, 1942	LX	LX									L					
Scutigerella palmonii Michelbacher, 1942	L										L					
Scutigerella remyi Juberthie-Jupeau, 1963		L								L	L					
Scutigerella verhoeffi Michelbacher, 1942	?	?														
Sum of taxa	12	9	7	2	0	2	5	2	2	9	10	2	6	0	1	3

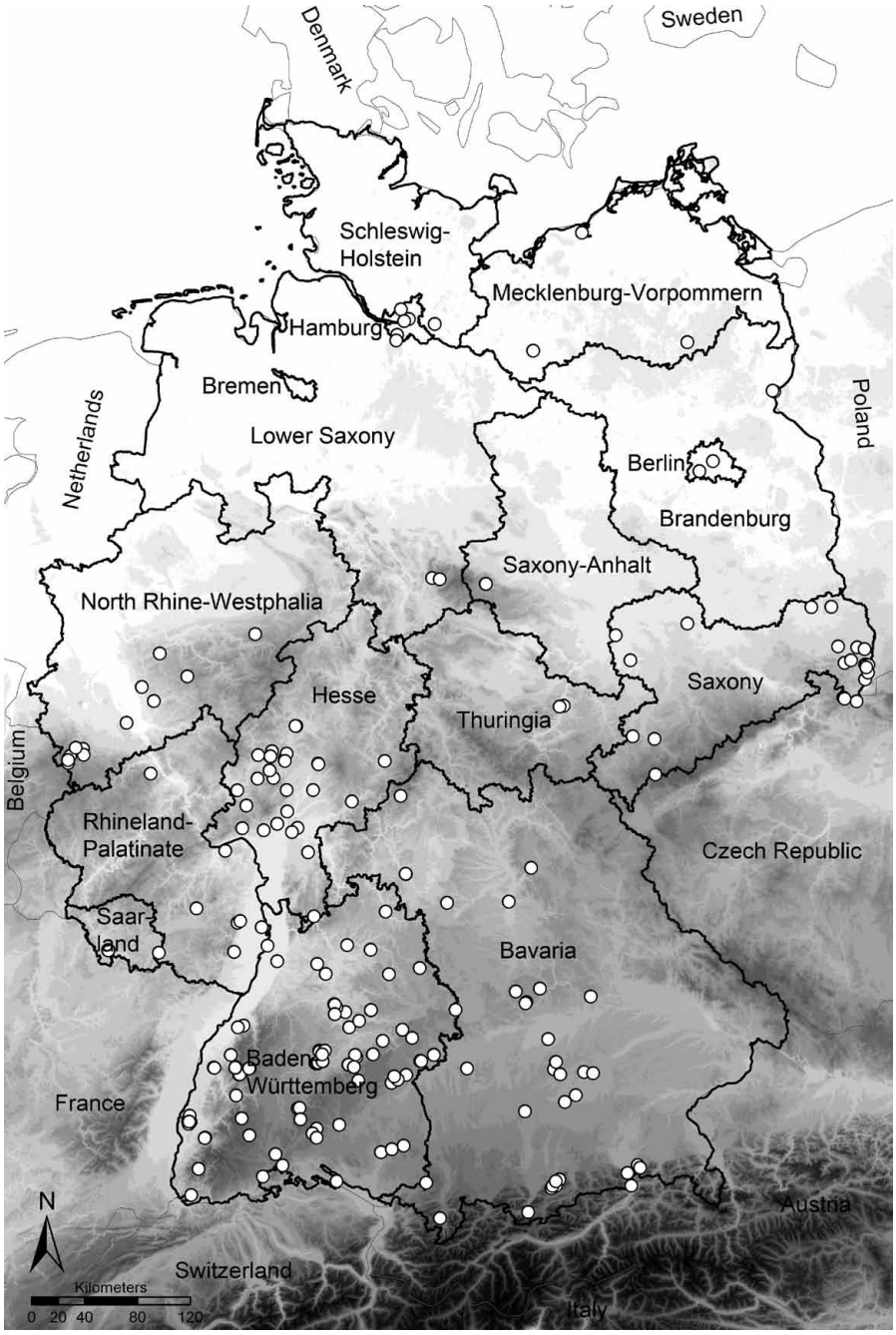

Fig. 1. Record sites of Symphyla and Pauropoda in Germany.

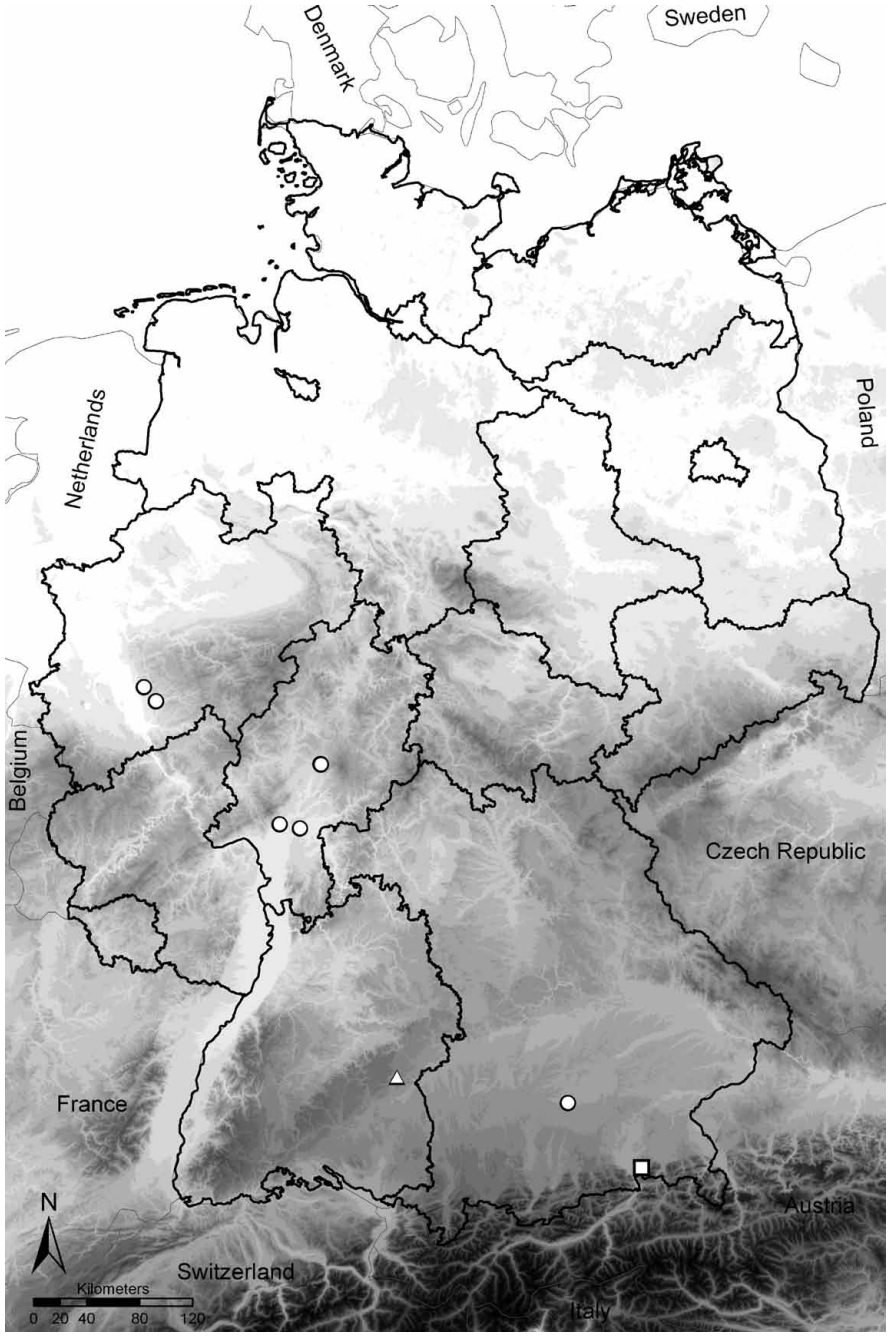

Fig. 2. Records of *Decapauropus broelemanni* (Remy, 1935) (triangle), *Trachypauropus cordatus* (Scheller 1974) (circle) and *Acopauropus ornatus* (Latzel, 1884) (square) in Germany.

Records from about 100 localities could be extracted from literature.

In total about 150 localities for Pauropoda and Symphyla are known for Germany (Fig. 1).

Decapauropus broelemanni (Remy, 1935) and *Acopauropus ornatus* (Latzel, 1844) are recorded here for the first time for Germany, the former from one locality in Baden-Württemberg (Fig. 2), and the latter from the Bavarian Alps (Fig. 2). *Trachypauropus cordatus* (Scheller, 1974), until now known for Germany based merely on a doubtful record (cf.) from Hüther & Kinkler (2013), is newly confirmed for Germany from nine localities in Bavaria, Hesse and North Rhine-Westphalia (Fig. 2).

ANNOTATED CHECKLIST

Class Pauropoda

Family Pauropodidae

Allopauropus danicus (Hansen, 1902)

Previous Records. Between Rhine and Saar, surroundings of Bochum and Braunschweig [general information on collection sites for all species treated in this publication], 1955–1961 (Hüther 1974). **Baden-Württemberg**: Triberg im Schwarzwald, 01/02 June 1936 (Remy 1936a); Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962); Tübingen, Bebenhausen, spruce forest/beech forest, 1996 (Krauß et al. 1998, JSC). **Lower Saxony**: Bad Grund, Grube "Hülfe Gottes", cave, 1936 (Mühlmann 1942). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982). **Saarland**: Wadgassen, mine heap, *Robinia* afforestation, 1975–1976 (Guttmann 1979). **Saxony**: Görlitz, Berzdorf, brown coal open-cast mine dump with deciduous afforestation three year-old, 12 June 1962, leg. W. Dunger, det. J. Chalupský, 1 ind., (Dunger 1967). [cf.] ibid., 1962, 2 L8; Görlitz, Kiesdorf, floodplain forest, 51.0391° N, 14.883° E, soil cores, 0–5 cm soil depth, 5 November 1962, leg. & det. WD (SMNG, Dunger 1967) 2 L8.

New Records. **Baden-Württemberg**: Vöhrenbach, Linach-Stausee, meadow, 48.0151° N, 8.3113° E, 16 April 1993, flotation process, leg. & det. JS (JSC) 1 juv. **North Rhine-Westphalia**: Langerscheid, spruce forest, leaf litter, 50.52131° N, 6.34056° E, 7 May 2014, leg. SMNG, det. UB (SMNG) 2 L9; Dedenborn, spruce forest, leaf litter, 50.55002° N, 6.34147° E, 7 May 2014, leg. SMNG, det. UB (SMNG) 2 L9; Dedenborn, spruce forest, 50.55002° N, 6.34147° E, 7 May 2014, soil core, 0–5 cm, leg. SMNG, det. UB (SMNG) 1 L8, 1 L9; Schlitterley, oak forest, 50.62028° N, 6.49382° E, 7 May 2014, leg. SMNG, det. UB (SMNG) 1 L9.

Allopauropus danicus is recorded from all continents (subcosmopolitan, Scheller 1982) and very different biotopes. According to Hüther & Kinkler (2013) the species prefers coniferous woodland, where it can be found especially in dead wood affected by red ring-rot. Also Krauß et al. (1998), Scheller (1976, Switzerland), Scheller (1977a, Greece) and Dizdarević (1977, Bosnia and Herzegovina), found this species only in spruce forests and in an Abieti-Picetum. Occurrences in oak forest, beech woods and floodplains are also known (Dizdarević 1971, Dinaric Alps; Scheller 1976, Switzerland; Scheller 1977a, Greece). Rarely *A. danicus* occurs on open land with sparse vegetation (Hüther 1982, Guttmann 1979, both Germany). At Banyuls-sur-Mer, France, Remy (1936b) found the species between leaves lying under the sand at places wetted by spindrift. Records from caves (Remy 1939) as well as from hothouses (Scheller 1976, Switzerland) exist. It was found in soil (especially in loam), under stones, in leaf litter and dead wood (Chalupský 1967, Scheller 1976, 1977a, Dizdarević 1971, 1977, Hüther 1974).

Because of its worldwide distribution and broad and habitat spectrum, Hüther (1982) and Hüther and Kinkler (2013) regard *A. danicus* as a species complex.

Decapauropus aristatus (Remy, 1936)

Record. **Rhineland-Palatinate**: [cf.] Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

This species is widespread in Western and South East Europe. For Germany, the first and only record comes from Hüther 1982 (as *A*. cf. *aristatus*) from a dry deciduous forest dominated by beech, oak and hornbeam. Scheller (1976, 1977a) found this species at the base of steep rocks (Greece) and in a heap of compost in the garden of the National History Museum in Geneve (Switzerland).

Decapauropus barcinonensis (Remy, 1933)

Records. **Baden-Württemberg**: Schelingen, Badberg, south slope, 23 April 1961 (Scheller 1962). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

This species is widespread in Western Europe and seems to be very eurytopic. It lives in open lands (lush but also dry meadows) as well as in forests and parks under stones, in humus and in leaf litter (e.g. Scheller 1973, Hüther 1982, Remy & Balland 1958, Remy 1941, Loksa 1966, Hüther & Kinkler 2013). Records from caves are also known (Remy 1961a). Even in the drift line at the seashore the species could be found under stones (Remy 1936b).

Decapauropus broelemanni (Remy, 1935)
(Fig. 2)

First record. **Baden-Württemberg**: Blaubeuren, Blautopf, 48.416° N, 9.7859° E, 14 August 2013, hand sampling, leg. & det. JS (ZSM) 1 ♀.

This species is widely distributed in Europe and also known from North Africa and Canada (Andersson et al. 2005). It is found in arable land in Great Britain (Edwards et al. 1967, Remy 1961c), in a birch grove, in *Rhododendron* heaths and a lush pasture in Andorra and Spain (Scheller 1973) as well as in forests (Remy 1938), The highest record comes from 2200 m a. s. l. (Scheller 1973). The species was often found under stones. The German record is from a steep slope on calcareous soil in a karstic area with mixed, mainly deciduous beech forest.

Decapauropus cuenoti Remy, 1931

Previous Records. Between Rhine and Saar, surroundings of Bochum and Braunschweig [general information on collection sites for all species treated in this publication], 1955–1961 (Hüther 1974); **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24 February 1936, 28 August 1936 (Remy 1936a); Baden-Baden, 6 June 1937 (Remy 1938); Tübingen, Bebenhausen, spruce forest, after windthrows, not cleared, 1996 (Krauß et al. 1998, JSC); Tübingen, Bebenhausen, spruce forest, after windthrows, cleared, newly planted deciduous trees, 1996 (Krauß et al. 1998, JSC); Bad Waldsee, spruce forest, after windthrows, not cleared, 1996 (Krauß et al. 1998, JSC); Tübingen, Bebenhausen, spruce forest/beech forest, 1996 (Krauß et al. 1998, JSC); Freudenstadt, Kniebis, 24 February 1936 (Remy 1936a); Offenburg, 1 June 1936 (Remy 1936a); Schelingen, beech forest, 23 April 1961 (Scheller 1962); Schelingen, Badberg, 23 April 1961 (Scheller 1962); Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a); Ulm, Langenau, spruce forest, 1996 (Krauß et al. 1998, JSC). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982). **Saxony**: Görlitz, Berzdorf-Tauchritz, Langteichhalde, brown coal open-cast mine dump with deciduous afforestations 10 year-old, 51.065° N, 14.932° E, 30 March 1962, soil core, 0–5 cm soil depth, leg. WD, det. J. Chalupský (SMNG, Dunger 1966, 1968) 1 ind.; Görlitz, Berzdorf-Tauchritz, Teichhalde, brown coal open-cast mine dump with deciduous afforestations six year-old, 51.065° N, 14.939° E, 7 May 1965, soil core, 5–10 cm soil depth, leg. & det. WD (SMNG, Dunger 1966, 1968) 1 ind.; Görlitz, Kiesdorf, floodplain forest, 51.0391° N, 14.883° E, soil cores, 0–5 and 5–10 cm soil depth, leg. & det. WD (SMNG, Dunger 1966, 1968) 26 June 1962, 1 L10; 21 May 1962, 1 L6; 16 July 1962, 1 L6 (det. J. Chalupský), 10 September 1962, 2 L8.

New Records. **Baden-Württemberg**: Ulm, Herrlingen, Kiesental, 48.4247° N, 9.9082° E, 6 May 1997, substrate sampling, leg. & det. JS (JSC) 5 ♀; Neidlingen, Reußenstein, 48.5662° N, 9.5704° E , 01 May 1997, substrate sampling, leg. & det.

JS (JSC) 2 ♀; Neuffen, Bäuerloch, 48.5501° N, 9.4001° E, 28 June 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀, 1 juv.; Nordheim, 3 km NE Neipperg, 49.1162° N, 9.0863° E, 19 April 1997, substrate sampling, leg. & det. JS (JSC) 1 ♂, 3 ♀; Rudersberg, Steinenberg, 48.8677° N, 9.5523° E, 07 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♂, 3 ♀; Tengen, Riedbachtal, 47.8115° N, 8.6491° E, 29 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀; Vöhrenbach, Linach-Stausee, meadow, 48.0151° N, 8.3113° E, 16 April 1993, flotation process, leg. & det. JS (JSC) 1 ♂. **Saxony**: Hirschfelde, Neisse Valley, deciduous forest, 50.9896° N, 14.9172° E, soil cores, leg. & det. WD (SMNG) 02 June 1961, 1 L3; 27 July 1961, 1 L5; Waltersdorf, Lausche, calcareous beech forest, 5–10 cm soil depth, 50.8507° N, 14,6650° E, 30 April 2012, leg. & det. UB (SMNG) 1 L9.

Decapauropus cuenoti is widely distributed in the western Palearctic, but also in the USA and some oceanic islands, and shows a broad spectrum of biotopes without visible preferences. In Europe the species occurs in deciduous forests (from dry oak-hornbeam forest, through moist beech and mixed deciduous woods to very wet floodplain forests) as well as in coniferous forests (*Picea*). Dry meadows and wasteland were colonized as well as fresh meadows. Also vineyards, gardens and open-cast mining sites were not avoided. Cited by Remy and Hoffmann (1959), Chalupský (1967), Dunger (1968), Dizdarević (1975, 1977), Hüther (1982), Scheller (1954, 1962, 1976) and Krauß et al. (1998). According to Hüther & Kinkler (2013) this species mostly occurs in low numbers albeit widespread. *D. cuenoti* is found in the litter layer, in grass sods, under stones and moss, and also directly in (mostly loamy) soil. Non-calcareous soil can also be colonized by this species (Scheller 1977a, 1982). According to Dizdarević (1971) it prefers the deeper soil layers from 15 cm to 55 cm depth.

Decapauropus distinctus (Bagnall, 1936)

Previous Record. **Baden-Württemberg**: Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a).

New Records. **Baden-Württemberg**: Ulm, Herrlingen, Kiesental, 48.4247° N, 9.9082° E, 6 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♂, 2 ♀; Esslingen, Strümpfelbacher Steige, 48.7515° N, 9.3277° E, 28 December 1990, hand sampling, leg. & det. JS (JSC) 1 ♀; Schelklingen, Sotzenhausen, 48.3726° N, 9.7586° E, 4 August 1993, substrate sampling, leg. & det. JS (JSC) 1 juv.

This species is widespread in Europe, but also known from North Africa and the USA. It was first recorded for Germany by Remy (1936a) from Triberg (Baden-Württemberg) and later confirmed from other parts of Baden-Würtemberg. It is often found in agricultural soil in gardens and in greenhouses (Remy 1941, 1961b, Chalupský 1976, Scheller 1976). Records from forests are rare (Remy 1960, 1961b). In Baden-Württemberg the species was found in a shrubbery near orchards and in two former quarries, now shrubberies. The new record from Bavaria in a doline within alpine meadows at an altitude of 1300 to 1500 m a. s. l. represents the highest known occurrence of a pauropod in Germany.

Decapauropus doryphorus (Remy, 1936)

non *A. doryphorus* Krestewa, 1940

Record. **Saarland**: Wadgassen, mine heap, *Robinia* afforestation, 1975–1976 (Guttmann 1979).

In Germany this species is only recorded from a former mine dump, recultivated with *Robinia* (Guttmann 1979). This rare species is also known from Greece and North Africa. The only note on habitats is given by Remy (1936b): under leaves of a hedge (Greece/Thessaly/Kalabaka).

Decapauropus gracilis (Hansen, 1902)

Previous Records. Between Rhine and Saar, surroundings of Bochum and Braunschweig [general information on collection sites for all species treated in this publication], 1955–1961 (Hüther 1974); **Baden-Württemberg**: Ulm, Langenau, spruce

forest, after windthrows, not cleared, 1996 (Krauß et al. 1998, JSC); Bad Griesbach im Schwarzwald, 24 February 1936 (Remy 1938); Bad Waldsee, spruce and beech forest, 1996 (Krauß et al. 1998, JSC); Tübingen, Bebenhausen, spruce forest, after windthrows, not cleared, 1996 (Krauß et al. 1998, JSC); Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962); Freiburg im Breisgau, Schloßberg, 1 August 1937 (Remy 1938); Hausach, 02 June 1936 (Remy 1936a); Schelingen, Badberg, 23 April 1961 (Scheller 1962); Schelingen, Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a); Triberg im Schwarzwald, Prisenhäusle, under rotting planks, 2 June 1936 (Remy 1938). **Berlin**: Berlin-Zehlendorf, Grunewald, NSG Langes Luch, swamp forest, 1972–1974 (Haupt 1973, 1977). **Hamburg**: Langenhorn, wasteground, 6 June 1957 (Haß 1958). **Hesse**: Marburg (Hansen 1902). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013). **Rhineland-Palatinate**: Mainz, vineyard (Hüther 1959); Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982). **Saarland**: Wadgassen, mine heap, *Robinia* afforestation and ruderal area, 1975–1976 (Guttmann 1979). **Saxony**: Leipzig, Böhlen, dump with deciduous afforestations eight and 11 year-old, 51.202° N 12.387° E, soil cores, 0–5 and 5–10 cm soil depth, leg. & det. WD (SMNG, Dunger 1966, 1968) 24 October 1962 1 L3, 1 L8, 3 September 1963 2 L9, 15 August 1965 1 L9, 1 ♀; Görlitz, Berzdorf-Tauchritz, Langteichhalde, brown coal open-cast mine dump with deciduous afforestations 7–10 year-old, 51.065° N, 14.932° E, soil cores, 0–5 and 5–10 cm soil depth, leg. & det. WD (SMNG, Dunger 1966, 1968) 21 April 1961, 1 L8, 3 ind.; 20 August 1962, 2 L3, 2 L5, 2 L6, 1 L7, 3 L8, 4 L9; 17 September 1962, 4 L3, 3 L6, 5 L9; 12 November 1962, 1 L5, 1 L6, 1 L9; 23 July 1962, 3 L3, 1 L5; 30 April 1965, 1 L6, 1 L9; 21 May 1965, 1 L9; Görlitz, Berzdorf-Tauchritz, Langteichhalde, brown coal open-cast mine dump with afforestation with *Larix decidua* 10 year-old, 51.065° N, 14.932° E, 30 July 1962 soil cores, 0–5 and 5–10 cm soil depth, leg. & det. WD (SMNG, Dunger 1966, 1968) 1 L3, 1 L6; Görlitz, Kiesdorf, floodplain forest, 51.0391° N, 14.8838° E, soil cores, 0–5 and 5–10 cm soil depth, leg. & det. WD (SMNG, Dunger 1966, 1968) 16 July 1962, 1 L3; 10 September 1962 (det. J. Chalupský), 6 Bp; 26 November 1962, 1 L8 , 1 L9; [cf.] Görlitz, Berzdorf-Tauchritz, Langteichhalde, brown coal open-cast mine dump with deciduous afforestations six year-old, 51.065° N, 14.932° E, 8 September 1961, soil core, 0–5 cm, leg. & det. WD (SMNG) 1 L3.

New Records. **Baden-Württemberg**: Ulm, Herrlingen, Kiesental, 48.4247° N, 9.9082° E, 06 May 1997, substrate sampling, leg. & det. JS (JSC) 2 ♂, 6 ♀; Neidlingen, Reußenstein, 48.5662° N, 9.5704° E, 1 May 1997, substrate sampling, leg. & det. JS (JSC) 3 ♀; Riesbürg, Goldburghausen, Goldberg, 48.8628° N, 10.4244° E, 9 April 1997, substrate sampling, leg. & det. JS (JSC) 1 ♂; Tengen, Riedbachtal, 47.8115° N, 8.6491° E, 29 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♂, 1 ♀; Waiblingen, Hart, 48.8558° N, 9.2878° E, 14 January 1989, hand sampling, leg. & det. JS (JSC) 1 ♀; Plettenberg, Pyrola-Piceetum, 48.2° N, 8.8° E, 01 August 1998, substrate sampling, leg. & det. JS (JSC) 1 ♀, 3 juv. **Bavaria**: Jetzendorf, ropes course, 48.4405° N, 11.4201 ° E, 14 July 2013, flotation process, leg. & det. JS (ZSM) 1 ad., 1 ♂. **Brandenburg**: [cf.] Großräschen, pine forest, 51.576° N, 14.011° E, 11 November 1968, pitfall trap, leg. & det. WD (SMNG) 1 L5. **Hesse**: Wettenberg, Launsbach, canal embankment between Silbersee – Lahn, under willows, in soil near a concrete wall, 50.6136° N, 8.6732° E, 14 March 2014, leg. AA, det. UB (SMF) 1 L9; Guxhagen, Eder near Grifte, deciduous forest, slope, in dry loose soil under *Urtica*, 50.2879° N, 9.3652° E, 6 July 2014, leg. AA, det. UB (SMF) 1 L9. **Saxony**: Löbau, Löbauer Berg, beech forest, 51.0933° N, 14.6966° E, 21 April 2011, soil corer, leg. & det. UB (SMNG) 1 subad.; Görlitz, Hirschfelde, Neisse Valley, deciduous forest, 50.9896° N, 14.9172° E, soil cores, leg. & det. WD (SMNG) 02 June 1961, 1 L9; 30 June 1961, 1 L6; 25 August 1961, 1 L3, 1 L6; 7 November 1961, 1 ♂; 15 December 1961, 1 L8; Görlitz, Hirschfelde, Neisse Valley, spruce forest, 50.9667° N, 14.9030° E, soil cores, leg. & det. WD (SMNG) 30 June 1961, 1 L6; 27 July 1961, 1 L5; [cf.] Hirschfelde, Neisse Valley, deciduous forest, 50.9896° N, 14.9172° E, soil cores, leg. & det. WD (SMNG) 02 June 1961, 1 L9; 5 May 1961, 1 L9; 17 November 1961, 2 L9; [cf.] Hirschfelde, Neisse Valley, spruce forest, 50.9667° N, 14.9030° E, soil cores, leg. & det. WD (SMNG) 16 April 1962, 1 L8; 20 October 1961, 1 L5; 17 November 1961, 1 L3, 1 L6; 2 L8; Nochten, experimental area for succession study surrounded by meadow dominated by *Dactylis glomerata*, arthropod-free mining substrate from coal mine excavated from 2 m depth in March 2008, cambic Umbisol, gravelly sand, pH 5.2–5.3, 51.4892° N, 14.5756° E, leg. R. Lehmitz, minicontainer-traps, det. UB (SMNG, for more information on the study site and soil parameters see Lehmitz et al. 2012); 14 September 2008, 3 L9, 2 L6; 14 September 2008, 1 L9, 1 L6. **Thuringia**: Jena, Leutratal, Mesobrometum, 50.8722° N 11.5678° E, 19 June 1974, soil core, leg. & det. WD (SMNG) 1 L9.

Decapauropus gracilis is one of the most common species in Central Europe. It occurs in deciduous and also in coniferous forests (e.g. Chalupský 1967, Haupt 1973, Hüther 1982, Krauß et al. 1998, Scheller 1977a, Remy 1960 and new records presented here). Sites with moder-humus (Dunger 1968) and an abundance of dead wood (Hüther & Kinkler 2013) seem to be preferred. But there exist also records from dry meadows and pastures (Hüther 1982, Scheller 1977a). Occurrences in caves (e.g. Kováč et al. 2014) and greenhouses (Remy 1936b; also cited by Eichler 1952) are known. An altitude of 900 m a. s. l. seems to be a limiting factor for the occurrence of *D. gracilis*

(Chalupský 1967), at least in Central Europe. It occurs both under stones and bricks, in the soil, in leaf litter and rotting tree logs and stumps. In addition to clay soils, sandy soils can also be colonized by *D. gracilis*, e.g. in Finland and Great Britain (Scheller 1974, 1982) as well as the new records from Nochten (Germany). According to Dizdarević (1971) it prefers the upper soil layer down to 30 cm, but occurs down to 60 cm depth. In arable land in Great Britain, investigations show most occurrences from 20 to 30 cm (Scheller 1974). In contrast the SMNG material from Berzdorf (Saxony) showed that for the most frequently occurring species, *D. gracilis*, 70% of the specimens were found in the uppermost soil layer of 0 to 5 cm (studied only up to 10 cm depth).

There exist a number of subspecies and variations, e.g. *D. amaudruti* Remy, 1936, *D. sabaudianus* Remy, 1935, and *D. sequanus* Remy, 1930, in Germany. Because *D. gracilis* May comprise a species group (Hüther 1982), the ecological reqirements are given here separately:

Decapauropus amaudruti is found almost exclusively in open lands (dry meadows with *Rosa canina* and *Sarothamnus scoparius*, see Hüther 1982; freshly heaped dumps of open cast mining, see Dunger 1968). Only scattered records come from a beech forest and a floodplain forest (l.c.). One occurrence in a greenhouse is known (Botanical Garden in Strasbourg, Remy 1936b, also cited by Eichler 1952). *D. amaudruti cordieri* Remy 1938 is also listed as a species by some authors. According to Dizdarević (1971) it occurs in the same soils as *D. gracilis*, but is restricted to Fagetalia (Dizdarević 1977, Remy & Balland 1958).

Decapauropus sabaudianus occurs in woods and in gardens (Remy 1960, 1941, 1962, Scheller 1954). In investigated dumps (Guttmann 1979) it colonized a *Robinia* afforestation and an open-land site with high and well developed herb layer. A preference for calcareous soils seems to exist according to records from soil or under stones (Remy 1936a, 1941, 1939, Hüther 1959).

Decapauropus sequanus is known from calcareous beech woods and other deciduous forests (Remy 1939, Scheller 1962) as well as from non-natural locations (under rotten planks, Remy 1938). In Denmark *D. sequanus* is found mostly in gardens (Scheller 1954).

Decapauropus helophorus (Remy, 1936)

Records. **Bavaria**: Würzburg (Hüther 1982). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

This species is widespread in Europe (Portugal to Bulgaria) and was found in forests (Chalupský 1967, Dizdarević 1971) as well as very open biotopes like south facing dry meadows (Hüther 1982). *D. helophorus* was collected in the soil and litter layer.

Decapauropus helveticus (Hansen, 1902)

Previous Records. **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24 February 1936 (Remy 1938); Schelingen, Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962); Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962); Schelingen, Badberg, 23 April 1961 (Scheller 1962). **Bavaria**: Freising, Eichenfeld, Plantage, 3 July 2005 (Spelda 2005). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

New Records. **Baden-Württemberg**: Ulm, Herrlingen, Kiesental, 48.4247° N, 9.9082° E, 6 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♂; Tengen, Riedbachtal, 47.8115° N, 8.6491° E, 29 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀.

Decapauropus helveticus s. str. is not known from outside Europe (Scheller 1973), nor is it very common (e.g. Scheller 1982, Chalupský 1967). The biotope spectrum ranges from south-facing dry meadows, submediterranean garrigue vegetation (e.g. *Cisto-Ericetalia* in Bosnia and Herzegovina), over wet grassland and shrubs, up to deciduous forests (Hüther 1982, Dizdarević 1971,

Remy 1962, Scheller 1977a). Urban areas are not avoided, e.g. the vicinity of Prague (Chalupský 1967). *D. helveticus* is often found under stones and bricks lying on soil or grass, in soil, near the base of steep rocks, but rarely in leaf litter. The soil is in most cases loamy, but in Finland the species was also found at a location with sandy mull (Scheller 1982). The German fauna also includes the variety *obtusicornis* (Remy, 1935). As the taxonomical status of this variety is still in dispute, we here separate the data from *D. helveticus* s. str.

Previous Records. **Baden-Württemberg**: Freiburg im Breisgau, Schloßberg, 1 August 1937 (Remy 1938); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a); **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

New Record. **Bavaria**: Törwang, Samerberg, Hochries, dolines, 1300–1499 m, 47.6317° N, 12.1589° E, 8 October 2014, hand sampling, leg. & det. JS (ZSM) 2 ad., 2 ♂, 1 ♀.

This taxon is distributed throughout Europe and also occurs in North Africa and North America (Scheller 1973). Preferred biotopes seem to be open land with sparse vegetation on loamy soils (e.g. dry meadows, lush pastures, apple orchards, gardens (Hüther 1982, Scheller 1954, 1973), mostly under stones and in the soil. In Finland an area with sparse vegetation on sandy mull was colonized by this species (Scheller 1982).

Decapauropus hessei (Remy, 1935)

Record. **Baden-Württemberg**: Nordheim, 3 km NE of Neipperg, 19 April 1997 (Spelda 2005).

This rare species has not been reported from outside of central and southern Europe (Scheller 1976). It was recorded from Baden-Württemberg for the first and so far only time (Spelda 2005). The species was mostly recorded in beech forests (Remy 1946, 1961b, Chalupský 1967) where it was found in the litter and rotting logs. The German record originates from a soil sample at the border between a forest and a field on shell limestone (Middle Triassic).

Decapauropus kocheri (Remy, 1954)

Record. **Saarland**: Wadgassen, mine heap, *Robinia* afforestation and ruderal area, 1975–1976 (Guttmann 1979).

This rare species has been recorded from Africa and India. For Germany, *D. kocheri* is only known from a recultivated dump in Saarland (Guttmann 1979) at a site with dense graminaceous vegetation, in places with dense moss pads and in a stand of afforested *Robinia*.

Decapauropus meridianus (Remy, 1941)

Record. **Baden-Württemberg**: Schelingen, Badberg, 23 April 1961 (Scheller 1962).

The species has not been reported outside of Europe. It was found only one time in Germany by Scheller (1962). Elsewhere in the distribution area there exist only sporadic records from France (Remy 1941, 1946, 1961b).

Decapauropus multiplex (Remy, 1936)

Previous Records. **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24 February 1936–28 August 1936 (Remy 1936a); Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a); **Saxony**: Görlitz, Berzdorf, brown coal mine, dump with deciduous afforestation three year-old, 12 June 1962, det. J. Chalupský, 1 ind., 3 September 1962 1 ind. (Dunger 1968).

New Records. **Baden-Württemberg**: Ulm, Herrlingen, Kiesental, 48.4247° N, 9.9082° E, 6 May 1997, substrate sampling, leg. & det. JS (JSC) 3 ♂, 1 ♀; Neidlingen, Reußenstein, 48.5662° N, 9.5704° E, 1 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♂.

Remarks. There May be more individuals of *D. multiplex* from Berzdorf in the collection of SMNG labeled as cf. *danicus*/*multiplex*. A revision of the material is intended.

The species is only known from the Western Palaearctic and is not very frequently occurring (Scheller 1977a). It was found in deciduous forests, gardens and arable land (Chalupský 1967, Dunger 1968, Scheller 1954, 1974, 1976). Often *D. multiplex* is found in litter (oak, beech), but also in the (loamy) soil, under stones and at the base of steep rocks as well as under bark of rotting logs (Remy 1962, Chalupský 1967, Scheller 1977a). It occurs mostly in the upper soil layer up to 24 cm soil depth (Scheller 1974).

Decapauropus tenellus (Scheller, 1971)

Previous Record. **Baden-Württemberg**: Schelklingen, Sotzenhausen, 4 August 1993 (Spelda 2005).

New Record. **Hesse**: [cf.] Gießen, meadow under highway B429 bridge, under grass on basalt stones, 50.56525° N, 8.65415° E, 21 July 2014, leg. AA, det. UB (SMF) 1 L10.

This species is probably rare but might be widespread (Sweden, Norway, Finland, France, Scheller 1982), as it is very similar to *D. vulgaris*, thus probably often confused with this species. In the Pyrenees it was found in a lush pasture near a stream at a depth of 10 to 15 cm (Scheller 1973), in Finland in a herb-rich birch forest and on a grazed ridge with mountain ash and alder (Scheller 1982). The first German specimen (Spelda 2005) was found in a former quarry, now a dry meadow with sparse stocks of pine, the second also in a meadow.

Decapauropus thalassophilus (Remy, 1935)

Records. **Rhineland-Palatinate**: Pfalz (Guttmann 1979). **Saarland**: Wadgassen, mine heap, ruderal area, 1975–1976 (Guttmann 1979).

The main distribution area of this species is in France (Remy 1936b, 1941, 1946, 1961b, Scheller 1973). In Germany *D. thalassophilus* is known from a dump in the Saarland where it was found on a ruderal site with high and well developed herb layer (Guttmann 1979). In France the species was mostly found in forests (e.g. Remy 1961b), but the first find was on the seashore under rotting *Posidona* debris (Remy 1935).

Decapauropus viticolus Hüther, 1975

Records. Between Rhine and Saar, surroundings of Bochum and Braunschweig [general information on collection sites for all species treated in this publication], 1955–1961 (Hüther 1974); **Rhineland-Palatinate**: Bad Dürkheim, vineyard, 29 May 1957 (Hüther 1975); Edesheim, vineyard, 1957–1958 (Hüther 1975).

The species was described from a vineyard in Germany and from another locality in Norway (Hüther 1975). The occurences within the vineyard were restricted to sites which were characterized by cambisol. The species was found only in the deeper soil layer from 20 to 50 cm (Hüther 1974).

Decapauropus vulgaris (Hansen, 1902)

Previous Records. Between Rhine and Saar, surroundings of Bochum and Braunschweig [general information on collection sites for all species treated in this publication], 1955–1961 (Hüther 1974); **Baden-Württemberg**: Bad Griesbach

im Schwarzwald, 28 June 1936 (Remy 1938); Bad Peterstal, 28 June 1936 (Remy 1936a); Baden-Baden, 6 June 1937 (Remy 1938); Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962); Freiburg im Breisgau, Schloßberg, 01 August 1937 (Remy 1938); Hausach, 2 June 1936 (Remy 1936a); Schelingen, Badberg, 23 April 1961 (Scheller 1962); Schelingen, Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a); Tübingen, Bebenhausen, spruce forest, after windthrows, not cleared, 1996 (Krauß et al. 1998, JSC). **Bavaria**: Freising, Eichenfeld, Plantage, 3 July 2005 (Spelda 2005); Rosenheim, Reschmühlbachstausee, 17 June 2005 (Spelda 2005). **Berlin**: Berlin-Zehlendorf, Grunewald, NSG Langes Luch, swamp forest, 1972–1974 (Haupt 1973, 1977). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982). **Saxony**: Görlitz, Berzdorf-Tauchritz, Teichhalde, brown coal open-cast mine dump with three year-old deciduous afforestations, 51.065° N, 14.939° E, soil cores, 0–5 cm and 5–10 cm soil depth, leg. & det. WD (SMNG, Dunger 1966, 1968) 14 May 1962, 1 ind.; 12 June 1962, 1 ind. (det. J. Chalupský); 6 August 1962, 1 L3; Leipzig, Böhlen, brown coal mine, heap, poplar/black alder afforestation, 1960–1963 (Dunger 1968); Görlitz, Kiesdorf, floodplain forest, 1960–1963 (Dunger 1968, see also Dunger 1966).

New Records. **Baden-Württemberg**: Ulm, Herrlingen, Kiesental, 48.4247° N, 9.9082° E, 6 May 1997, substrate sampling, leg. & det. JS (JSC) 2 ♂, 7 ♀, 3 juv.; Nordheim, 3 km NE Neipperg, 49.1162° N, 9.0863° E, 19 April 1997, substrate sampling, leg. & det. JS (JSC) 1 ♂, 6 ♀; Vöhrenbach, Linach-Stausee, meadow, 48.0151° N, 8.3113° E, 16 April 1993, flotation process, leg. & det. JS (JSC) 1 ♂, 1 ♀; Ludwigsburg, garden, compost heap, 48.910443° N, 9.173799° E, 7 April 2011, substrate sampling, leg. & det. UB (SMNG). **Bavaria**: Eichstätt, 48.9034° N, 11.1565° E, 25 June 2005, flotation, leg. & det. JS (JSC) 1 juv. ♂. **Hesse**: Wetzlar, Blasbach, river bank, under grass and leaves, 50.5914° N, 8.5002° E, 6 June 1987, leg. AA, det. UB (SMF) 1 L9; Guxhagen, Eder near Grifte, deciduous forest, slope, in dry loose soil under *Urtica*, 50.2879° N, 9.3652° E, 6 July 2014, leg. AA, det. UB (SMF) 1 L8; Laubach, Hirtenbach, river bank, under grass at bridge wall, 50.5437° N, 9.01006° E, 27 April 2014, substrate sampling, leg. AA, det. UB (SMF) 2 ♂, 1 L9; Laubach, Schellenbach, river bank, under grass at bridge wall, 50.5437° N, 9.01006° E, 27 April 2014, substrate sampling, leg. AA, det. UB (SMF) 1 L9; Bad Homburg, Ober-Erlenbach, Erlenbach, river bank, 50.22° N, 8.68° E, 7 April 1988, leg. AA, det. UB (SMF) 1 L10. **Mecklenburg-Western Pommerania**: Rostock, Lütten-Klein, Unterwarnow-Aue, Alte-Warnemünde-Chaussee, channel, boggy river bank, under willows, in humus, 54.12° N, 12.06° E, 25 June 2014, leg. H. Nesemann, det. UB (SMF) 1 L9. **North Rhine-Westphalia**: Langerscheid, spruce forest, 50.52131° N, 6.34056° E, 7 May 2014, soil core, 0–5 cm, leg. SMNG, det. UB (SMNG) 1 L8; Schlitterley, oak forest, 50.62028° N, 6.49382° E, 7 May 2014, leg. SMNG, det. UB (SMNG) 1 ♂.

This species is widespread and common in Europe. According to Hüther (1974) *D. vulgaris* is very eurytopic but mainly colonizes biotopes with a closed plant cover with a preference for coniferous forests. However, in its overall distribution area records from deciduous forests predominate (Haupt 1973, 1977, Dizdarević 1971, 1975, 1977, Loksa 1966, Chalupský 1967, Dunger 1968, Krauß et al. 1998). Occurrences in dry meadows, arable land and gardens are also known (Scheller 1954, Hüther 1974, 1982, Scheller 1974). But all these locations have calcareous soil in common (e.g. lessivé, stagno-gleyic lessivé, rendzic leptosol). This seems to be a precondition for occupation by *D. vulgaris*. Hüther (1974) found the species mostly in soil depth from 10 to 50 cm but also under decaying wood. According to Dizdarević (1971) it prefers the upper soil layer (5 to 10 cm), but occurs sporadically up to 60 cm depth.

Pauropus bagnalli Remy, 1935

Records. **Baden-Württemberg**: Hausach, 2 June 1936 (Remy 1936a); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a).

The species was described from the Vosges (Remy 1935) and was found in adjacent regions in Baden-Würtemberg. All later citations refer to these records (e.g. Gisin 1947, Schubart 1963). Only Chalupský (1967) gives a note on habitat: from a beech primeval forest, in litter and rotting timber.

Pauropus furcifer Silvestri, 1902

Previous Records. **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24 February 1936 – 28 August 1936 (Remy 1936a, 1938); Bad Peterstal, 28 June 1936 (Remy 1938); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a); Schelingen, Badberg, 23 April 1961 (Scheller 1962).

New Records. **Hesse**: Schöffengrund, bank on the Wetzbach near Streichs-Mühle, under moss and grass, 50.49945° N, 8.491° E, 27 June 1987, leg. AA, det. UB (SMF) 1 L9. **Thuringia**: [cf.] Jena, Leutratal, deciduous wood, 50.8722° N, 11.5678° E, 24 May 1972, soil core, leg. & det. WD (SMNG) 1 L3.

P. furcifer is widespread in western, central and southern Europe. It is almost exclusively known from deciduous and coniferous forests (Chalupský 1961, 1967, Dizdarević 1977, Scheller 1973, 1977a) and has been found in moist leaf and coniferous litter, under stones, at the base of steep rocks, in the soil, under bricks and in moss. Occurences in caves are also known (Remy & Husson 1938, Griepenburg 1939). According to Dizdarević (1971) the species prefers the upper soil layer 0 to 20 cm whilst it occurs up to 60 cm depth.

Pauropus huxleyi Lubbock, 1867

Previous Records. Between Rhine and Saar, surroundings of Bochum and Braunschweig [general information on collection sites for all species treated in this publication], 1955–1961 (Hüther 1974). **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24 February 1936 – 28 August 1936 (Remy 1936a); Bad Peterstal, 28 June 1936 (Remy 1936a); Baden-Baden, 6 June 1937 (Remy 1938); Tübingen (Hansen 1902); Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962); Freiburg im Breisgau, Schloßberg, 1 August 1937 (Remy 1938); Hausach, 2 June 1936 (Remy 1936a); Oppenau, Rehberg, 25 February 1936 (Remy 1936a); Schelingen, Badberg, 23 April 1961 (Scheller 1962); Schelingen, beech forest, 23 April 1961 (Scheller 1962); Schelingen, Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a). **Bavaria**: Weissenburg, Laubenthal, 25 June 2005 (Spelda 2005, specimens not checked); **Hamburg**: Horn, under bark of linden tree, 23 October 1932 (Haß 1958). **Hesse**: Marburg (Hansen 1902); Petersberg, Felsenkeller am Rauschenberg, adit, 12 July 1996 (Zaenker 2008). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013).

New Records. **Baden-Württemberg**: Forchtenberg, 49.2784° N, 9.5541° E, 3 April 1997, hand sampling, leg. & det. JS (JSC) 1 L6; Rudersberg, Steinenberg, 48.8677° N, 9.5523° E, 7 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀, 1 L8.

The specimens of Krauß et al. (1998) have been re-examined and assigned to the correct species (*P. lanceolatus*). Because *P. huxleyi* has been often confused with *P. lanceolatus* Remy, 1937 it is now impossible to delimit its distribution area according to Scheller (1977a) and Hüther and Kinkler (2013). They recommend all records before 1937 to be re-checked. This species is known as a common inhabitant of forests and floodplains in soil, litter, rotting timber and under stones (Latzel 1884, Chalupský 1967, Loksa 1966, Hüther 1974, Scheller 1954, 1973, 1977a). Hüther (1974) found it often in open land, but rarely in vineyards.

Pauropus lanceolatus Remy, 1937

Previous Records. Between Rhine and Saar, surroundings of Bochum and Braunschweig [general information on collection sites for all species treated in this publication], 1955–1961 (Hüther 1974). **Baden-Württemberg**: Baden (region) (Remy 1938); Schelingen, Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962); Schelingen, Badberg, 23 April 1961 (Scheller 1962). **Hamburg**: Hamburg (Remy 1938). **Hesse**: Marburg (Remy 1938). **Lower Saxony**: Clausthal-Zellerfeld, Clausthaler Gruben, adit, 1936 (Remy 1938, Mühlmann 1942). **Rhineland-Palatinate**: Mainz, compost heap (Hüther 1959, Remy 1961b); Niederzissen, Bausenberg, 1976–1979 (Hüther 1982); Otterberg, Stollen am Messersbacherhof, adit, 17 July 1988 (Weber 1995, 2001, 2012).

New Records. **Baden-Württemberg**: 4 km E Schriesheim, 49.4788° N, 8.7142° E, 28 April 1998, substrate sampling, leg. & det. JS (JSC) 1 ♂, 1 L8; Kirchardt, Berwangen, 49.1837° N, 8.9986° E, 19 April 1997, hand sampling, leg. & det. JS (JSC) 1 ♀; Schwäbisch Gmünd, Degenfeld, 48.7325° N, 9.8741° E, 2 May 1994, hand sampling, leg. & det. JS (JSC) 3 ♂, 2 ♀, 1 L8; Weinstadt, Pfaffenholz, 48.7952° N, 9.4301° E, 3 October 1990, substrate sampling, leg. & det. JS (JSC) 1 L8; Altdorf, Silbersandgrube, spruce forest, 9.0216° E, 48.5865° N, 4 June 1996, substrate sampling, 6 ♂, 3 ♀; same data, after windthrows, cleared, 3 ♂, 2 ♀; same data, after windthrows, not cleared, natural regeneration, 1 ♂, 1 ♀; same data, 26 November 1996, spruce forest, 1 L6; same data, after windthrows, cleared, 3 ♂, 8 ♀, 8 L8, 3 L6; same data, after windthrows, not cleared, natural regeneration, leg. & rev. JS (JSC) (all wrongly cited as *P. huxleyi* for Bebenhausen

in Krauß et al. 1998); Neidlingen, Reußenstein, 48.5662° N, 9.5704° E , 1 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀; Neidlingen, Bahnhöfle, 48.55° N, 9.55° E , 27 June 1998, substrate sampling, leg. & det. JS (JSC) 3 L8, 3 L6, 2 L5; ♀; Gomadingen, Gestüt Marbach, 48.3897° N, 9.4199° E, 21 August 1993, hand sampling, leg. & det. JS (JSC) 1 ♀; Langenau, Englenghäu, 48.5192° N, 10.0559° E, 1 November 1994, substrate sampling, leg. H. Bellmann, det. JS (JSC) 3 ♂; Langenau, Englenghäu, 10.0559° E, 48.5192° N, 29 October 1996, substrate sampling, leg. & rev. JS 1 ♂, 1 ♀, 1 L8 (wrongly cited as *P. huxleyi* for Langenau in Krauß et al. 1998); Schelklingen, Sotzenhausen, 48.3726° N, 9.7586° E, 4 August 1993, substrate sampling, leg. & det. JS (JSC) 1 ♂, 3 ♀; Wolpertswende, Röschenwald, 9.6436° E, 47.9011° N, 29 October 1996, substrate sampling, leg. & rev. J. Spelda (JSC) 2 ♀ (wrongly cited as *P. huxleyi* for Bad Waldsee in Krauß et al. 1998); Isny im Allgäu, Luegensland, 47.6891° N, 10.0966° E, 27 August 1990, hand sampling, leg. & det. JS (JSC) 1 L8. **Bavaria**: Jetzendorf, ropes course, 48.4405° N, 11.4201 ° E, 14 July 2013, flotation process, leg. & det. JS (ZSM) 1 ♂, 1 ♀.

Pauropus lanceolatus is known to occur from Norway to France and reported as well from USA and Australia. It is mostly found in coniferous as well as deciduous forests, although it also occurs in dry meadows, quarries, vineyards, arable land and in compost heaps (Hüther 1959, 1974, Scheller 1974, 1982, Leinaas 1974). It is one of the few pauropods which occur occasionally in high abundances (Hüther 1974). In Norwegian coniferous forests the species was mainly found in the humus horizon (up to 9 cm) and even in living moss (Leinaas 1974).

Stylopauropus pedunculatus (Lubbock, 1867)

Previous Records. **Baden-Württemberg**: Schelingen, Badberg, 23 April 1961 (Scheller 1962). **Bavaria**: Eichstätt, Blumenberg, 25 June 2005 (Spelda 2005); Weissenburg, Laubenthal, 25 June 2005 (Spelda 2005); Freising, Marzlinger Au, 30 April 2005 (Spelda 2005); Rosenheim, Reschmühlbachstausee, 17 June 2005 (Spelda 2005). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September1979 (Hüther 1982). **Saarland**: Wadgassen, mine heap, *Robinia* afforestation, 1975–1976 (Guttmann 1979). **Saxony**: Görlitz, Kiesdorf, floodplain forest, 51.0391° N, 14.8838° E, 13 August 1962, soil core, 0–5 cm soil depth, leg. WD, det. WD & J. Chalupský (SMNG, Dunger 1966, 1968) 1 ind. **Saxony-Anhalt**: Rübeland, Hermannshöhle, cave, 1936 (Remy 1938, Mühlmann 1942); Rübeland, Baumannshöhle, cave, 1936 (Remy 1938, Mühlmann 1942); Rübeland (Griepenburg 1939).

New Records. **Baden-Württemberg**: Neuffen, Balzholz, 48.5643° N, 9.3875° E, 7 June 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀; Neuffen, Bäuerloch, 48.5501° N, 9.4001° E, 28 June 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀, 1 juv.; **Bavaria**: Rosenheim, Reschmühlbachstausee, 47.6317° N, 12.1589° E, 17 June 2005, flotation process, leg. & det. JS (JSC) 1 ♀, 1 juv.; Törwang, SSW Grainbach, 12.2331° N, 47.7692° E, 8 October 2014, hand sampling, leg. & det. JS (ZSM) 1 ♂; Benediktbeuern, Lainbach valley, 47.6906° N, 11.4371° E, 17 August 2013, hand sampling, leg. & det. JS (ZSM) 2 juv. **Hesse**: Ehringshausen, river bank at the Dill between Dillheim and Daubhausen, under grass, 50.60375° N, 8.3672° E, 15 August 1987, leg. AA, det. UB (SMF) 1 ♀; Gießen, Heuchelheimer Straße, drainage channel, bridge wall, under blackberry in soil, 50.5836° N, 8.6545° E, 28 February 2014, leg. AA, det. UB (SMF) 1 L9. **Rhineland-Palatinate**: Au am Rhein, Neuhofen, Wildpark, 49.4321° N, 8.4185° E, 24 April 1997, hand sampling, leg. & det. JS (JSC) 1 ♀.

Stylopauropus pedunculatus is a widespread, but not very frequently occurring species in Europe. It can be found in deciduous (oak, beech) and floodplain forests as well as coniferous forests (Remy 1960, Dunger 1968, Dizdarević 1971, 1975, 1977, Guttmann 1979, Loksa 1966, Scheller 1977a, Hüther 1982). In Greece even *Ilex*-forests were colonized (Scheller 1977a). The species also occurs on dry meadows or rocky grassland, but in lower densities than in forests (Loksa 1966, Hüther 1982). As studies in the Dinaric Alps (Bosnia and Herzegovina) show, *S. pedunculatus* reaches up to 1800 m a. s. l. (Dizdarević 1971). Occurrences in caves are also known (Kováč et al. 2014). It is mostly found in soil, under stones, in litter and humus with underlying roots (Scheller 1954, 1977a,).

A variation relevant for Germany is *S. p.* var. *brevicornis* Remy, 1935:

Previous Records. **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24 February 1936 – 28 August 1936 (Remy 1936a); Bad Peterstal, 28 June 1936 (Remy 1936a); Hausach, 2 June 1936 (Remy 1936a); Oppenau, Rehberg, 25 Febru-

ary 1936 (Remy 1936a); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

New Records. **North Rhine-Westphalia**: Overath, Immekeppel, Immekeppel pond, river bank, between roots and leaf litter in sandy soil, 50.9587° N, 7.2390° E, 30 August 2014, leg. AA, det. UB (SMF) 2 L9. **Saxony**: Görlitz, Hirschfelde, Neisse Valley, deciduous forest, 50.9896° N, 14.9172° E, 25 August 1961, soil core, leg. & det. WD (SMNG) 1 ♀; Görlitz, Hirschfelde, Neisse Valley, spruce forest, 50.9667° N, 14.9030° E, 30 June 1961, soil core, leg. & det. WD (SMNG) 2 ♂.

It is mostly found in deciduous forests, where it occurs in litter, under decaying wood, under bark, under stones and in the soil (e.g. Chalupský 1967). Hüther (1982), who treats it as a separate species, found it also on a south-facing slope under shrubs and in a beech wood.

Stylopauropus pubescens Hansen, 1902

Previous Records. **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24 February 1936 – 28 August 1936 (Remy 1936a); Bad Peterstal, 28 June 1936 (Remy 1936a); Tübingen, Bebenhausen, spruce forest, after windthrows, not cleared, 1996 (Krauß et al. 1998, JSC); Freiburg im Breisgau, Schloßberg, 1 August 1937 (Remy 1938); Schelingen, Badberg, 23 April 1961 (Scheller 1962); Schelingen, beech forest, 23 April 1961 (Scheller 1962); Schelingen, Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962); Triberg im Schwarzwald, 1–2 June 1936 (Remy 1936a). **Bavaria**: Weissenburg, Laubenthal, 25 June 2005 (Spelda 2005); Freising, Marzlinger Au, 30 April 2005 (Spelda 2005). **Hesse**: Marburg (Hansen 1902). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

New Records. **Hesse**: Waldsolms, slope east of Griedelbach, under leaf litter and grass, 50.44815° N, 8.53185° E, 23 May 1987, leg. AA, det. UB (SMF) 1 L8. **Baden-Württemberg**: Neuffen, Bäuerloch, 48.5501° N, 9.4001° E, 28 June 1997, substrate sampling, leg. & det. JS (JSC) 2 ♂; Nonnenmattweiher, Piceetum, 47.7833° N, 7.8° E, 15 August 1998, substrate sampling, leg. & det. JS (JSC) 1 ♂; Tengen, Riedbachtal, 47.8115° N, 8.6491° E, 29 May 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀, 1 juv. ♂.

Stylopauropus pubescens is widespread in Europe and is a typical woodland species (e.g. Remy 1962, Dizdarević 1975, Scheller 1976, Chalupský 1967), which can be found in the soil and under stones.

Scleropauropus lyrifer Remy, 1936

Records. **Baden-Württemberg**: Hausach, Hinterhof, 02 June 1936 (Remy 1936a); Schelingen, Badberg, 23 April 1961 (Scheller 1962).

This species is widely distributed in Europe. *S. lyrifer* occurs in forests (*Fagus*, *Quercus*, *Pinus*, *Picea*) but also in grasslands, like *Arrhenateretes* and *Festucetes* (Chalupský 1967, Gisin 1947, Dizdarević 1971, 1975). Scheller (1977a) found this species at the base of steep rocks.

Family Polypauropodidae

Polypauropus duboscqi Remy 1932

Previous Records. **Saarland**: [cf.] Wadgassen, mine heap, ruderal area, 1975–1976 (Guttmann 1979).

New Records. **Saxony**: Görlitz, Berzdorf-Tauchritz, Teichhalde, brown coal open-cast mine dump with deciduous afforestations six year-old, 51.065° N, 14.939° E, 7 May 1965, soil cores, 5–10 cm soil depth, leg. & det. WD (SMNG) 1 L5, 1 L8, 1 L9; [cf.] Görlitz, Kiesdorf, floodplain forest, 51.0391° N, 14.8838° E, 26 June 1962, soil cores, 0–5 cm soil depth, leg. & det. WD (SMNG) 1 L3, 1 L8.

Polypauropus duboscqi is a widely distributed species reported mainly from the southern half of Europe, but known also from Africa, USA, Argentina, Ceylon and Australia (Scheller 1973). The record of this species is listed in Guttmann (1979) as *Polypauropus* cf. *dubosqui* var. *inflatisetus*

Remy, 1938. The species is found in diverse grassland, arable land, degraded and ruderalised forests, dumps with ruderal vegetation cover and in a garden (Dizdarević 1971, 1975, Guttmann 1979, Scheller 1974, 1976). It occurs mostly in 28 to 55 cm depth of soil (Scheller 1973, 1974).

Family Amphipauropodidae

Amphipauropus rhenanus (Hüther, 1971)

Records. Between Rhine and Saar, surroundings of Bochum and Braunschweig [general information on collection sites for all species treated in this publication], 1955–1961 (Hüther 1974). **Rhineland-Palatinate**: Edesheim, vineyard, 11 February 1957, 9 April 1957, 16 May 1957, 30 August 1957, 25 October 1957, 22 November 1957, 20 December 1957, 4 March 1958 (Hüther 1971); Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982). **Baden-Württemberg**: Mannheim (Andersson et al. 2005, perhaps a misplacement of the type locality).

The species was described from Rhineland-Palatinate and subsequently found in Denmark, Norway and Sweden (Andersson et al. 2005). Hüther (1974) regarded it as markedly stenotopic and restricted to vineyards which were characterised by lessivé. It was found in soil from 0 to 50 cm. Later, Hüther (1982) recorded *A. rhenanus* from the Bausenberg, where the species was found on a dry meadow with a closed herb layer and a dense stock of *Echium vulgare* and *Rosa canina*. The soil was very loose and gravel-like. In Scandinavia the species was found in sandy soils at the seashore. This species might be synonymous with the insufficiently described *Amphipauropus mosellus* (Remy, 1960).

Family Brachypauropodidae

Brachypauropus hamiger Latzel, 1884

Previous Records. **Baden-Württemberg**: Triberg im Schwarzwald, Prisenhäusle, under rotting planks, VI.1936 (Remy 1936a). **Bavaria**: Rosenheim, Reschmühlbach-Stausee, 17 June 2005 (Spelda 2005).

New Records. **Saxony**: [cf.] Görlitz, Hirschfelde, Neisse Valley, deciduous forest, 50.9896° N, 14.9172° E, 30 June 1961, leg. & det. WD (SMNG) 1 ind.

This rare species is not known outside of Southern Europe (Scheller 1977a). It was recorded by Remy (1936a) for the first time for Germany when described as *B. tuberosus* from Triberg (Black Forest). It was later synonymized by Scheller (1976). *B. hamiger* is a woodland species which mostly occurs in beech woods, but also in coniferous forests (Rafalski 1977, Dizdarević 1971, 1977, Gisin, 1947) and moist localities, as under stones and under peat moss (Latzel 1884) or under rotting planks (Remy 1936a).The record from Bavaria was from a forested slope in waterlogged soil.

Brachypauropus strebeli Hüther, 1971

Records. **Rhineland-Palatinate**: Gau-Algesheim, Gau-Algesheimer Kopf, deciduous forest, 11 November 1955 (Hüther 1971); Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

This species has only been recorded from Germany. Hüther (1982) found *B. strebeli* in a dry meadow with very loose, gravel-like, partly uncovered soil or with *Rosa* and *Sarothamnus scoparius* and a dry deciduous forest in a vineyard region (Hüther 1971).

Family Eurypauropodidae

Trachypauropus cordatus (Scheller, 1974)
(Figs 2–3)

Previous Record. **North Rhine-Westphalia**: [cf.] Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013).

New Records. **Bavaria**: München-Feldmoching, 48.218° N, 11.5212° E, 3 October 2009, leg. J. Kapfenberger, det. JS (ZSM) 1 ♀. **Hesse**: Bürgel, Kuhmühlgraben, 50.1096° N, 8.7908° E, 4 February 2014, substrate sampling, leg. AA, det. UB (SMF) 1 L8, 1 L9; Eschborn, Westerbach, 50.1367° N, 8.5771° E, 6 February 2014, substrate sampling, leg. AA, det. UB (SMF) 1 L9; Laubach, Hirtenbach, border of a wood, 50.5461° N, 9.0088° E, 27 April 2014, substrate sampling, leg. AA, det. UB (SMF) 1 L8; Laubach, Hirtenbach, bridge Lange Hohl, river bank in a open site, linden tree avenue, under grass at bridge wall, 50.5438° N, 9.0100° E, 27 July 2014, substrate sampling, leg. AA, det. UB (SMF) 1 L8; Laubach, Schellenbach, river bank, open site, big oak, no *Impatiens*, under grass at bridge wall, 50.5438° N, 9.0101° E, 7 September 2014, substrate sampling, leg. AA, det. UB (SMF) 1 L6. **North Rhine-Westphalia**: Overath, Immekeppel, Immekeppel pond, 50.9589° N, 7.2407° E, 18 April 2014, substrate sampling, leg. AA, det. UB (SMF) 1 ♀; Overath, Immekeppel pond, Sülz, bridge wall, *Acer pseudoplatanus*, hornbeam, *Impatiens glandulifera*, 50.9587° N, 7.2390° E, 30 August 2014, substrate sampling, leg. AA, det. UB (SMF, SMNG) 44 ind.

The species has a subcosmopolitan distribution (Scheller 1982). In Germany it has been found nine times so far. Hüther & Kinkler (2013) recorded it (as *T.* cf. *cordatus*) in the nature protection area "Gronenborner Teiche", at the edge of a meadow overgrown with shrubs (*Rubus*), grass and herbs, and which was waterlogged after rain. All new material was identified according to the detailed description of *T. cordatus* by Scheller (1974a, 1977b) and the related species by Hasenhütl (1984, 1985, 1986, 1987).

It is known from literature that this species lives in deciduous forests (maple forest, under *Arbutus*) in Greece as well as under *Cypressus*, where it can be found in the soil and litter (Scheller 1974a, 1977b). In Spain Scheller (1974a) collected it from fern stems. All records, including the

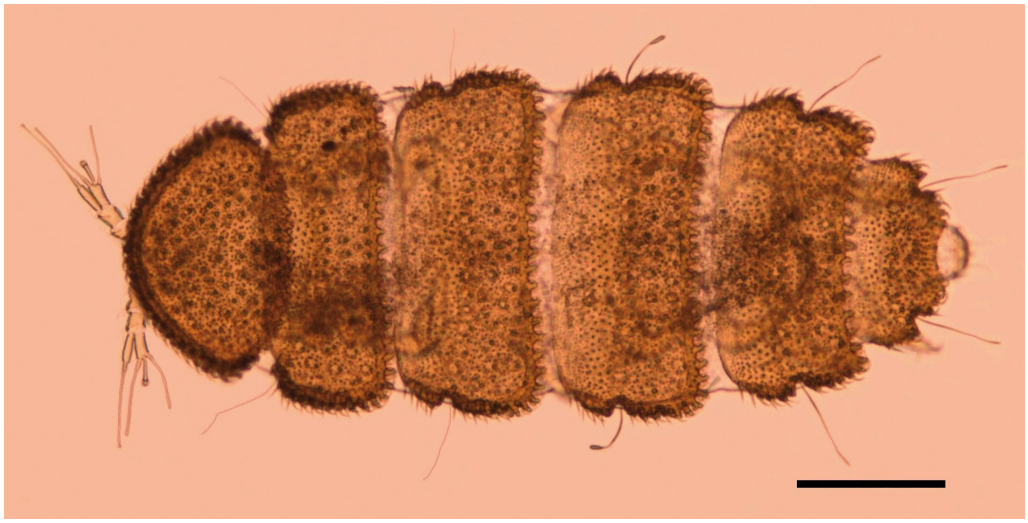

Fig. 3. Dorsal view (photo montage, SMNG) of *Trachypauropus cordatus* (Scheller, 1974) from Eschborn, Hesse. Scale bar – 200 µm.

new ones, indicate that *T. cordatus* prefers humid to wet habitats, where the species is found under litter and grass, in dead wood and in soil.

Acopauropus asper (Scheller, 1974)

Record. **Hesse**: Wiesbaden, Adamstal, from ground water filtration, 11 August 1964 (Scheller 1974).

Outside of Germany this species has only been recorded from Switzerland (Scheller 1976).

Acopauropus ornatus (Latzel, 1884)
(Figs. 2, 4–5)

First record. **Bavaria**: Törwang, Samerberg, WSW Mittelstation of Hochriesbahn, 900–930 m, 47.7601° N, 12.2378° E, 8 October 2014, leg. & det. JS (JSC) 2 ad., 2 ♂, 1 ♀, 2 juv.

The known distribution of *A. ornatus* was previously restricted to Austria, Bohemia, Italy and France. As shown by Hasenhütl (1985) this ornamental species was already known from the Austrian Salzach valley not far from the German border. The species was redescribed by Hasenhütl (1987). *A. ornatus* is a very rare woodland species, which is rarely found in dry places, e.g. in a quarry or in a garden (Latzel 1884, Remy 1946, Schuster 1960, Chalupský 1967, Hasenhütl 1985). The Bavarian series was collected in a *Picea abies* forest under logs with black rotting.

Nomina nuda

The following four species are given in Hüther (1982) for the Bausenberg area (dry meadows, dry coppice) but without any description or diagnostic characters. All are listed as nomina nuda in Scheller (2008).

***Decapauropus cursor* Hüther, 1982**

Record. **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982); Rheintal (Hüther 1982).

***Decapauropus trichosphaera* Hüther, 1982**

Record. **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

***Decapauropus unicus* Hüther, 1982**

Record. **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

***Fagepauropus breviseta* Hüther, 1982** (not *A. brevisetus* Silvestri, 1902)

Record. **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

Class Symphyla

Family Scolopendrellidae

Symphylella elongata Scheller, 1952

Previous Records. **Baden-Württemberg**: Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962). **Berlin**: Berlin-Zehlendorf, Grunewald, NSG Langes Luch, 1972–1974 (Haupt 1977).

New Records. **Baden-Württemberg**: Crailsheim, Heldenmühle, 49.1509° N, 10.0625° E, 19 April 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀, 1 juv.; Lauda-Königshofen, Frauenberg, 49.5373° N, 9.7146° E, 3 April 1997, substrate

Fig. 4. Living specimen of *Acopauropus ornatus* (Latzel, 1884) from Hochries, Bavaria. Photo by J. Spelda.

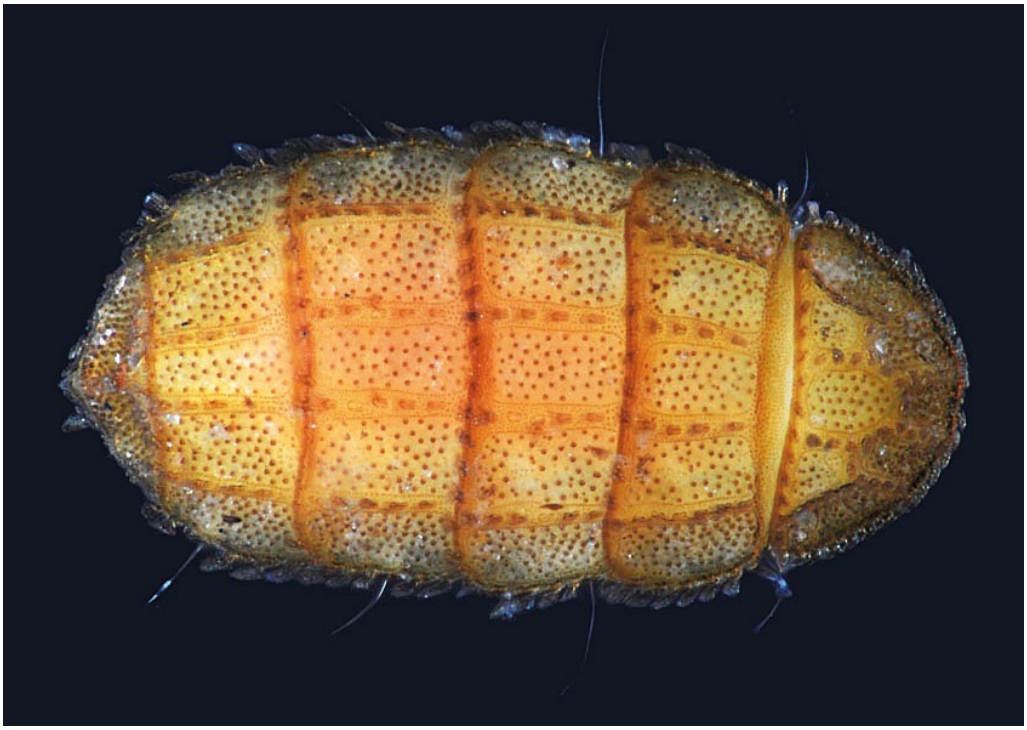

Fig. 5. Dorsal view (photo montage, ZSM) of *Acopauropus ornatus* (Latzel, 1884) from Hochries, Bavaria.

sampling, leg. & det. JS (JSC) 1 juv.; Altlußheim, 49.3071° N, 8.4834° E, 8 April 2010, hand sampling, leg. & det. JS (ZSM), 1 juv. **North Rhine-Westphalia**: [cf.] Langerscheid, spruce forest, 50.52131° N, 6.34056° E, 7 May 2014, leg. SMNG, soil core, 0–5 cm, det. UB (SMNG).

The species has not yet been found outside Europe (Scheller 1968). Some records from Corsica (Hirschenberger 1953), Menorca (Jubertie-Jupeau 1961) and the eastern Pyrenees (Rochaix 1954) are doubtful (Scheller 1968). Scheller (1952) described the type locality in South Sweden (Fågelsång, Scania) in great detail: at a depth of 5 cm on the underside of a stone, which was partly embedded in a well-moistened mould-soil on a beech-covered slope against above a brook. The ground was nearly bare, with sparse *Mercurialis perennis* and *Galeobdolon luteum*. In Germany the species was found in an alder swamp forest (Haupt 1977). Scheller (1962) has not specified the biotope type of his German records. In the Dinaric Alps the species lives mostly in woodland (Dizdarević 1971, 1975) between 50 and 1550 m a. s. l. In France the species was found in a ravine surrounded by macchia near a road on a morainic slope, beside *Rhododendron* heath, and in Spain in a lush pasture (Scheller 1973). In Austria it is recorded by the same author from a heap of manure in a garden (Scheller 1968). *S. elongata* is mostly found under stones, at different depths up to 60 cm, but not in the upper layer (0 to10 cm; Scheller 1968, 1973, Dizdarević 1971). Leinaas (1974) recorded the species in Norwegian coniferous forests mostly at a depth between 6 and 9 cm.

Symphylella isabellae (Grassi, 1886)

Previous Records. **Baden-Württemberg**: Tübingen, Bebenhausen, spruce forest, after windthrows, cleared, newly planted deciduous trees, 1996 (Krauß et al. 1998, JSC); Tübingen, Bebenhausen, spruce forest, after windthrows, cleared, 1996 (Krauß et al. 1998, JSC); Tübingen, Bebenhausen, spruce forest, after windthrows, not cleared, natural regeneration, 1996 (Krauß et al. 1998, see also Spelda 2005, JSC); Tübingen, Bebenhausen, spruce forest/beech forest, 1996 (Krauß et al. 1998, JSC); Bad Waldsee, spruce forest, 1996 (Krauß et al. 1998, see also Spelda 2005, JSC); Bad Waldsee, Durlesbach, Röschenwald, 29 October 1996 (Spelda 2005); Schelklingen, Sotzenhausen, 4 August 1993 (Spelda 2005); Dotternhausen, Plettenberg, Pyrola-Piceetum, 1 August 1998 (Spelda 2005); Welzheim-Rudersberg, forest, 7 May 1997 (Spelda 2005). **Bavaria**: Freising, Eichenfeld, Plantage, 3 July 2005 (Spelda 2005). **Lower Saxony**: Göttingen (Hüther 1982); Wolfenbüttel (Hüther 1982). **Saxony**: Leipzig, between Gundorf and Schkeuditz, Fraxino-Ulmetum, floodplain forest (Dunger 1967).

New Records. **Baden-Württemberg**: Rheinfelden, Hagenbacher Wald, 47.6033° N, 7.7293° E, 16 June 1998, substrate sampling, leg. LFU Baden-Württemberg, det. JS (JSC). **Hesse**: Wörsdorf, Henriettenthal, Wörsbach, under leaf litter, 50.2582° N, 8.2459° E, 9 June 1987, leg. AA, det. UB (SMF) 1 L10. **North Rhine-Westphalia**: Langerscheid, spruce forest, 50.52131° N, 6.34056° E, 7 May 2014, leg. SMNG, soil core, 0–5 cm, det. UB (SMNG) 1 ♂, 1 ♀, 1 L10. **Saxony**: Gröditz (Weißenberg), Gröditzer Skala, deciduous forest, near little creek, 51.2075° N, 14.63857° E, 20 May 2012, soil corer, Berlese Tullgren funnel, leg. PD & UB, det. UB (SMNG) 1 L10; Lückendorf, Steinigter Weg, spruce forest, 50.82627° N, 14.79255° E, 1 May 2012, soil corer, Berlese Tullgren funnel, leg. & det. UB (SMNG) 1 subad.

This species is known from Europe and Madagascar, the records from California (USA) being doubtful (Scheller 1973). *S. isabellae* seems to be a typical woodland species and is most commonly found in many forest associations, such as Fraxino-Ulmetum, Querco-Carpinetum, Abieti-Fagetum (Gisin 1949, Dunger 1968, Dizdarević 1971, Hüther 1982). Records from pastures or meadows are rather rare (Dizdarević 1971, Gisin 1949). Scheller (1973) found the species in a ravine surrounded by macchia. Occurrences in caves are known from France (Strinati 1969). This species was found under stones and in leaf litter (Scheller 1973, Juberthie-Jupeau & Tabacaru 1967).

Symphylella major Scheller, 1961

Record. **Baden-Württemberg**: Niederstotzingen, Vogelherdhöhle, cave, 1966 (Dobat 1975).

Symphylella major is a true mountain species, since the localities hitherto known are all situated in the mountains from 480 to 2400 m a. s. l. (Scheller 1968). Occurrences in caves are known from Switzerland (Scheller 1961), Slovakia (Kováč et al. 2014) and Germany (Dobat 1975). In the caves the species was collected in a very moist layer of clay deep within the cave (Scheller 1961, Dobat 1975), in Čertova diera in a passage with dark humic sediment (Kováč et al. 2014). In the Alps it was found by Scheller (1968) under stones surrounded by moss lying next to a melting snow patch.

Symphylella vulgaris (Hansen, 1903)

Previous Records. **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24 February 1936 (Remy 1943); Tübingen (Hansen 1903); Tübingen, Bebenhausen, spruce forest, on uncleared windthrow gaps, 1996 (Krauß et al. 1998, JSC); Bad Waldsee, spruce and beech forest, 1996 (Krauß et al. 1998, JSC). **Bavaria**: Flintsbach am Inn, forest at parking area near Falkenstein, 7 August 2004 (Spelda 2005); Freising, Eichenfeld, Plantage, 3 July 2005 (Spelda 2005); Pfaffenhofen, Scheyern, Scheyernforst, 9 November 2000 (Spelda 2005). **Berlin**: Berlin, Berlin-Dahlem Botanical Garden, greenhouses, 2000 (Scheller 2002); Berlin-Zehlendorf, Grunewald, NSG Langes Luch, 1972–1974 (Haupt 1977); **Brandenburg**: Schwedt, Oder valley, Lunow-Stolper Polder, dyked land, hardwood alluvial forest, 27 October 1993 – 22 October 1996 (Zerm 1996, 1997, 1999); Schwedt, Oder valley, Lunow-Stolper Polder, dyked land, hay meadow, 27 October 1993 – 22 October 1996 (Zerm 1996, 1997, 1999). **Hesse**: Marburg (Hansen 1903). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013); Wesseling-Keldenich, Dikopshof, arable land, 1952–1953 (Herbke 1962); Kierspe, Hülloch, cave, 1932 (Griepenburg 1939, Lengersdorf 1961, Weber 1991). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982). **Saarland**: Wadgassen, mine heap, *Robinia* afforestation, 1975–1976 (Guttmann 1979). **Saxony**: Leipzig, Böhlen, brown coal mine, heap, poplar/black alder afforestation, 1960–1963 (Dunger 1968); Görlitz, Berzdorf-Tauchritz, Langteichhalde, brown coal open-cast mine dump with deciduous afforestations 24 year-old, 51.065° N, 14.932° E, pitfall traps, leg. & det. WD, teste UB (SMNG, Dunger 1966, 1968) 6 July 1976, 1 ind.; 27 July 1976, 1 ind.; 20 July 1976, 1 ind.; 29 June 1976, ind.; Görlitz, Kiesdorf, floodplain forest, 1960–1963 (Dunger 1968, see also Dunger 1966, b); Leipzig, between Gundorf and Schkeuditz, *Fraxino-Ulmetum*, floodplain forest, 1955–1956 (Dunger 1958, see also Dunger 1967).

New Records. **Baden-Württemberg**: Crailsheim, Heldenmühle, 49.1509° N, 10.0625° E, 19 April 1997, substrate sampling, leg. & det. JS (JSC) 1 juv.; Hüfingen, Schächer, Fürstenberg, 47.8886° N, 8.5764° E, 16 April 1993, flotation process, leg. & det. JS (JSC) 7 juv.; Reichertshausen 4 km WSW Möckmühl, 49.3117° N, 9.3097° E, 4 April 1997, hand sampling, leg. & det. JS (JSC) 1 juv.; Riesbürg, Goldberg, 48.8628° N, 10.4244° E, 9 April 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀, 2 juv.; Schelklingen, Sotzenhausen, 48.3726° N, 9.7586° E, 4 August 1993, substrate sampling, leg. & det. JS (JSC); Tengen, Talheim, Riedbachtal, 47.8115° N, 8.6491° E, 29 May 1997, substrate sampling, leg. & det. JS (JSC) 2 ♀, 1 juv. ♀, 2 juv.; Waiblingen, Hegnach, Hart, 48.8558° N, 9.2878° E, 14 January 1989, hand sampling, leg. & det. JS (JSC). **Bavaria**: Jesenwang, Wildmoos, oak forest, 48,16201° N, 11,11067° E, 19 September 2012, soil corer, High-Gradient-Extractor (modified), leg. & det. UB (SMNG) 1 subad.; Jetzendorf, ropes course, 48.4405° N, 11.4201° E, 14 July 2013, flotation process, leg. & det. JS (ZSM) 2 ♀; Petershausen, 48.406° N, 11.4804° E, 28 July 2013 (ZSM) 1 ♀; Petershausen, Wendelstein, 11.4804° N, 48.4058° E, 20 July 2013, flotation process, leg. & det. JS (ZSM) 1 ♀; Kochel am See, Kesselberg, 11.3559° N, 47.6336° E, 21 July 2013, flotation process, leg. & det. JS (ZSM) 1 ♂. **Hesse**: Weilmünster, Lützendorf, bridge over the Weil, bridge wall, 50.4442° N, 8.3631° E, 30 May 1987, leg. AA, det. UB (SMF) 1 L12; Ober-Mörlen, Maiberg, at the bridge over the Usa, 50.3676° N, 8.6729° E, 4 June 1987, leg. AA, det. UB (SMF) 2 L12; Wetzlar, Hermannstein, Blasbach, under highway bridge, at the bridge, 50.5950° N, 8.4998° E, 6 June 1987, leg. AA, det. UB (SMF) 1 L12, 1 L10; Wetzlar, tributary brook 3 km north of Blasbach, 50.6301° N, 8.5135° E, 6 June 1987, leg. AA, det. UB (SMF) 1 L11; Schöffengrund, bank on the Wetzbach near Streichs-Mühle, 50.4995° N, 8.491° E, 27 June 1987, det. UB (SMF) 1 L10; Babenhausen, Hergershausen, Gersprenz, Langfelds-Mühle, bridge, 49.9439° N, 8.90268° E, 2 August 1987, leg. AA, det. UB (SMF) 2 L10. **Saxony**: Königshain, granite quarry nature trail, 51.19303° N, 14.84466° E, 5 April 2010, substrate sampling, leg. & det. UB (SMNG); Waltersdorf, parking area, on concrete traffic island, 50.85943° N, 14.654696° E, 28 April 2012, soil corer, Berlese Tullgren funnel, leg. & det. UB (SMNG).

This cosmopolitan species is one of the most common and widespread species of Symphyla in Central Europe. *S. vulgaris* is very eurytopic and occurs in forests as well as different meadow associations, suburban areas, caves, vineyards and any other biotopes (Gisin 1949, Scheller 1954, Dumitrescu & Orghidan 1969, Loksa 1966, Juberthie-Jupeau & Tabacaru 1968, Dizdarević

1975). It is one of the few symphylan species which also occur in arable land (Hüther 1982). In afforested dumps of an open cast coal mining area (Berzdorf/Germany) the species prefers the middle developmental stages and avoids the closed forest (Dunger 1968). In high mountains (Alps, Dinaric Alps) the species reaches above the timberline between up to 2300 and 2400 m a. s. l. (Gisin 1949, Dizdarević 1971). Intensive investigations on the ecology of this species (Dizdarević 1967, 1971, 1975) show that *S. vulgaris* occurs on all types of substrates (limestone, dolomite, serpentine, silicate), in all types of soil (syrosem, rendzina, rancer, brown, limestone, lessivé), and in 30 of 34 investigated plant communities. Densities are greater on northern slopes than on southern slopes. Seasonal vertical migrations are pronounced. It occurs under stones, in leaf litter, in dead wood and under moss (Bagnall 1914, Scheller 1954, Juberthie-Jupeau & Tabacaru 1968) and has even been recorded under large flowerpots (Scheller 1954). *S. vulgaris* occurs at all soil depths up to 60 cm with a preference of 10 to 30 cm (Dizdarević 1971).

S. vulgaris probably represents a species-group and needs a revision. Hüther observed nearly a dozen significantly differing forms in Central Europe, each of which May be a good species (Hüther & Kinkler 2013).

Scolopendrellopsis arvernorum (Ribaut, 1931)

Previous Records. **Baden-Württemberg**: Eberbach, Gammelsbach, 1 April 1997 (Spelda 2005); Crailsheim, Heldenmühle, 19 April 1997 (Spelda 2005); Schwäbisch Hall, Ruine Limpurg, 18 May 1997 (Spelda 2005). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

New Record. **Bavaria**: Pfaffenhofen, Scheyern, Scheyernforst, 48.4912° N, 11.4418° E, 9 November 2000, Berlese-funnel, leg. L. Beck, J. Römbke, J. Spelda et al., det. JS (JSC) 1 juv.

Scolopendrellopsis arvernorum is known from France, Great Britain and Italy. It was recorded in Germany by Hüther (1982) in a coppice (dominated by *Quercus* and *Carpinus*) at the Bausenberg and was subsequently recorded from southern Germany (Baden-Württemberg, Bavaria). The species was mainly found in forests, often on calcareous soil, and on a waste land (Remy 1961b, Hüther 1982).

Scolopendrellopsis subnuda (Hansen, 1904)

Previous Records. **Baden-Württemberg**: Triberg im Schwarzwald, 2 June 1936 (Remy 1943); Tübingen, Bebenhausen, spruce forest, after windthrows, cleared, newly planted deciduous trees, 1996–1996 (Krauß et al. 1998, JSC); Tübingen, Bebenhausen, spruce forest, after windthrows, cleared, 1996 (Krauß et al. 1998, JSC); Tübingen, Bebenhausen, spruce forest, after windthrows, not cleared, natural regeneration, 1996 (Krauß et al. 1998, JSC); Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962); Schelingen, beech forest, 23 April 1961 (Scheller 1962); Schelingen, Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962); Konstanz, Mainau (Hüther 1982). **Bavaria**: Weissenburg, Laubenthal, 25 June 2005 (Spelda 2005); Rosenheim, Reschmühlbachstausee, 17 June 2005 (Spelda 2005); Pfaffenhofen, Scheyern, Scheyernforst, 9 November 2000 (Spelda 2005). **Berlin**: Berlin-Zehlendorf, Grunewald, NSG Langes Luch, 1972–1974 (Haupt 1977). **Hesse**: Marburg (Hansen 1903). **North Rhine-Westphalia**: Wesseling-Keldenich, Dikopshof, arable land, 1952–1953 (Herbke 1962); **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982). **Saarland**: Wadgassen, mine heap, *Robinia* afforestation, 1975–1976 (Guttmann 1979). **Saxony**: Berzdorf-Tauchritz, Langteichhalde, brown coal open-cast mine dump with deciduous afforestations 13 year-old, 51.065° N, 14.932° E, 30 April 1965, soil core, 0–10 cm, leg. & det. WD (SMNG, Dunger 1966, 1968,) 1 L9; Leipzig, Böhlen, brown coal mine, heap, poplar/black alder afforestation, 1960–1963 (Dunger 1968). **Thuringia**: Jena (Uhlmann 1940).

New Records. **Baden-Württemberg**: Lauda-Königshofen, Frauenberg, 49.5373° N, 9.7146° E, 3 April 1997, substrate sampling, leg. & det. JS (JSC) 1 ♀; Neuffen, Bäuerloch, 48.5501° N, 9.4001° E, 28 June 1997, substrate sampling, leg. & det. JS (JSC) 1 juv.; Rudersberg, Steinenberg, 48.8677° N, 9.5523° E, 7 May 1997, substrate sampling, leg. & det. JS (JSC) 1 juv. **Bavaria**: Rosenheim, Reschmühlbachstausee, 47.6317° N, 12.1589° E, 17 June 2005, flotation process, leg. & det. JS (ZSM) 1 juv. **Hesse**: Wetzlar, Blasbach, river bank, under grass and leaves, 50.5914° N, 8.5002° E, 6 June 1987, leg. AA, det. UB (SMF) 1 L12. **Mecklenburg-Western Pommerania**: Müritz National Park, Serrahner Berge,

beech forest, 53.3398° N, 13.2053° E, 16 October 2013, leg. SMNG, det. UB (SMNG) 1 L11. **North Rhine-Westphalia**: Langerscheid, spruce forest, 50.52131° N, 6.34056° E, 7 May 2014, leg. SMNG, soil core, 0–5 cm, det. UB (SMNG) 1 L9; Gemünd, oak forest, 50.5803° N, 6.5020° E, 7 May 2014, leg. SMNG, soil core, 0–5 cm, det. UB (SMNG) 1♂, 2 ♀, 2 L12, 2 L10, 1 L9; Gemünd, oak forest, leaf litter, 50.5803° N, 6.5020° E, 7 May 2014, leg. SMNG, det. UB (SMNG) 1 L12; Weiersheld, oak forest, 50.6263° N, 6.4154° E, 7 May 2014, leg. SMNG, soil core, 0–5 cm, det. UB (SMNG) 1 L11; Schlitterley, oak forest, 50.62028° N, 6.49382° E, 07 May 2014, leg. SMNG, soil core, 0–5 cm, det. UB (SMNG) 1 L11; Schlitterley, oak forest, leaf litter, 50.62028° N, 6.49382° E, 7 May 2014, leg. SMNG, det. UB (SMNG). **Saxony**: Ostritz, Neiße valley, Saupantsche, 50.97072° N, 14.90275° E, 28 October 2011, substrate sampling, leg. KV, det. UB (SMNG); Ostritz, parking area, bare ground with sparse *Veronica* sp., 51.0161° N, 14.9389° E, 17 April 2011, soil corer, Berlese Tullgren funnel, leg. & det. UB (SMNG) 1 subad.

Scolopendrellopsis subnuda is native to Europe and North Africa and introduced to Hawaii (Scheller 1968). It is widespread and mostly frequent. Hüther (1982) assumed that the species is probably parthenogenetic. The biotope spectrum of *S. subnuda* is broad and ranges from very wet localities such as floodplain forests and swamp forests (Franz et. al. 1959, Haupt 1977), through moist deciduous or mixed forests, dryer coniferous forests (Hansen 1903, Scheller 1962, Scheller 1954, Juberthie-Jupeau & Tabacaru 1968, Bagnall 1914, Dizdarević 1971, 1975, Dunger 1968, Guttmann 1979), to both fresh and dry grasslands and other open land types (Gisin 1949, Dizdarević 1971, Bagnall 1914, Scheller 1968). In Greece the species occurs in macchia (Scheller 1968). It was also found in gardens (Scheller 1968, Scheller 1954) and in a quarry (Bagnall 1914). Intensive investigations in the Dinaric Alps (Dizdarević 1967, 1971, 1975) showed that *S. subnuda* is found in all types of substrates (limestone, dolomite, serpentine, silicate), in all types of soil (syrosem, rendzina, rancer, brown, limestone, lessivé), and in 20 of 34 investigated plant communities. The densities are greater on southern than on northern slopes. Great seasonal differences in densities were found, the greatest being in spring and in autumn. The species occurs from 50 to 2300 m a. s. l. (Dizdarević 1971). *S. subnuda* was found to occur under stones (e.g. Scheller 1973, Juberthie-Jupeau & Tabacaru 1967) and in the upper soil layer up to 60 cm depth (Scheller 1973, Dizdarević 1971, Guttmann 1979). Bagnall (1914) found the species in Great Britain under stones on sea banks and under a deeply embedded stone in a large wood on the banks of the Wear.

Scolopendrella notacantha Gervais, 1844

Previous Records. **Baden-Württemberg**: Sigmaringen (Hüther 1982); Triberg im Schwarzwald (Remy & Hoffmann 1959); Oppenau, 25 February 1936 (Remy 1943); Bad Waldsee, spruce and beech forest, 1996 (Krauß et al. 1998, JSC); **Bavaria**: Weissenburg, Laubenthal, 25 June 2005 (Spelda 2005). **Hamburg**: Hamburg-Eilbek, Garten, 1894 (Latzel 1895). **North Rhine-Westphalia**: Eifel, southwest of Euskirchen (Hüther 1982). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976–September1979 (Hüther 1982); Zweibrücken (Hüther 1982). **Thuringia**: Jena, Pennickental, shrubs (Seifert 1953); Jena, Wöllmisse (Seifert 1953).

New Records. **Baden-Württemberg**: Bad Wurzach, Knobel, gravel-pit II, 47.9428° N, 9.8743° E, May 1991, substrate sampling, leg. D. Rothmund, det. JS (JSC); Blaubeuren, quarry Merkle, 48.3947° N, 9.8211° E, 13 April 1993, flotation process, leg. & det. JS (JSC); Hüfingen, Schächer, Fürstenberg, 47.8886° N, 8.5764° E, 16 April 1993, flotation process, leg. & det. JS (JSC) 1 ♀; Isny im Allgäu, Buchenstock, Luegensland, 47.6891° N, 10.0966° E, 27 August 1990, hand sampling, leg. & det. JS (JSC); Rheinfelden, Hagenbacher Wald, 47.6033° N, 7.7293° E, 16 June 1998, substrate sampling, leg. LFU Baden-Württemberg, det. JS (JSC); Schelklingen, Sotzenhausen, 48.3726° N, 9.7586° E, 4 August 1993, substrate sampling, leg. & det. JS (JSC); Stühlingen, 47.7361° N, 8.4491° E, 16 June 1998, substrate sampling, leg. LFU Baden-Württemberg, det. JS (JSC); Vöhrenbach, Linach-Stausee, marsh area, 48.0151° N, 8.3113° E, 16 April 1993, flotation process, leg. & det. JS (JSC) 11 ♂, 6 ♀. **Bavaria**: Kochel am See, Pessenbach, Pessenbach valley, 47.6791° N, 11.4011° E, 21 July 2013, flotation process, leg. & det. JS (ZSM) 1 juv.

Scolopendrella notacantha is a widely distributed species in the Palaearctic, with a distribution area ranging from England and Belgium to the Caucasus (Scheller 1973). It is most frequently recorded from forests, but also found in pastures of *Arrhenatherion elatioris* and in gardens or

recultivated quarries (e.g. Hüther 1982, Dizdarević 1971, Gisin 1949, Juberthie-Jupeau & Tabacaru 1967). This species occurs in moist places in leaf litter and under stones (Seifert 1953, Scheller 1973, Juberthie-Jupeau & Tabacaru 1967), but never in sandy soils (Seifert 1953).

Geophilella pyrenaica Ribaut, 1913

Records. **Baden-Württemberg**: Hüfingen, Schächer, Fürstenberg (Spelda 2005). **North Rhine-Westphalia**: Blankenheim, Alendorf (Hüther 1982). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

The species is restricted to the south-western Palaearctic region and is rarely found in Central Europe (Scheller 1973). In addition to occurrence in forest stands the species has mostly been recorded from various meadow associations (Dizdarević 1971, 1975, Gisin 1949), in Germany especially from dry meadows and the successional shrub stages. It was recorded also in alpine low tussock grassland up to 2300 m a. s. l. (Spanish Pyrenees, Scheller 1973). Its occurrence in Italian caves has been reported by Franciscolo (1955). The species is found at a soil depth between 10 and 30 cm, rarely down to 60 cm (Dizdarević 1971). It was also found under stones (Scheller 1973).

Family Scutigerellidae

Hanseniella nivea (Scopoli, 1763)

Previous Record. **Saxony**: Zwickau, Fraureuth, Gospersgrün, adit in Gospersgrüner Tal, Ziegelei (Büttner 1963).

New Records. **Saxony**: Deutsch-Paulsdorf, Spitzberg, deciduous forest (*Fraxinus excelsior*, *Fagus sylvatica*, *Carpinus betulus*), 330 m a. s. l., 51.0998° N, 14.8194° E, 17 September 2014, soil core, 0–5 cm, leg. SMNG, det. KV & UB (SMNG) 1 ♀ L12.

This species is widespread in Central and Southern Europe. It occurs mostly in forests, but also pastures and in steep and dry meadows up to 2200 m a. s. l. (e.g. Brölemann 1899, Loksa 1966, Dizdarević 1971, 1975). In Yugoslavia and Greece macchia is also inhabited (Scheller 1968). Records from caves exist for Germany (Büttner 1963) and Romania (Juberthie-Jupeau & Tabacaru 1967, Dumitrescu & Orghidan 1969). Gisin (1949) found it in Italy under willows in gravel.

Hanseniella oligomacrochaeta Scheller, 2002

Record. **Berlin**: Berlin-Dahlem Botanical Garden, greenhouses, 2000 (Scheller 2002).

Only known from the type locality in a greenhouse in Berlin.

Hanseniella orientalis (Hansen, 1903)

Record. **Berlin**: Berlin-Dahlem Botanical Garden, greenhouses, 2000 (Scheller 2002).

The species seems to be widespread in the tropics in Asia and America (Scheller 2002).

Scutigerella Ryder, 1882

The genus *Scutigerella* is very problematic. The original description of the type species *Scutigerella immaculata* is short with only few details (Newport 1845), the type material is lost, the type locality (St. John's Wood near London) destroyed (pers. comm. Scheller), and no redescription

was ever made. Prior to the revision of Michelbacher (1942) all specimens of *Scutigerella* have been assigned to this species. During his revision Michelbacher (1942) noticed it to host a species complex, but only adult specimens with completely differentiated penultimate scutum can be determined without doubt. Apart from six anamorphic stadia there are additional six moult stages in the epimorphic state, thus it is only possible for a small percentage of collected specimens to assign them to a certain species. All other specimens have to be labeled as *Scutigerella* sp. A critical examination showed that the German material represents two groups, which show a remarkable variation in the characters used by Michelbacher (1942) for the separation of the species. Group 1 shows only a slight emargination in the first scutum, thus the specimens have formally assigned to *S. causeyae*, as no specimen showed coxal sacs on leg pair 8, a character of *S. verhoeffi*. These specimens occur mostly, but not always in natural biotopes, such as forests. Group 2 represents the specimens with a deeper emargination of the first scutum, including *S. immaculata*, *S. nodicercus*, *S. palmonii* and *S. remyi*. Specimens of this group are often found in synanthropic biotopes, such as gardens or greenhouses.

Scutigerella causeyae Michelbacher, 1942

Previous Records. **Baden-Württemberg**: Schelingen, beech forest, 23 April 1961 (Scheller 1962). **Bavaria**: Wiesenttal, Neudorf, Schönsteinhöhle, cave, 1974–1975 (Plachter & Plachter 1988). **Berlin**: Berlin-Zehlendorf, Grunewald, NSG Langes Luch, 1972–1974 (Haupt 1976, 1977). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

New Records. **Baden-Württemberg**: Irndorf, Eichfelsen, 48.06356° N, 8.9926° E, 19 October 2013, sieving, leg. KV, det. UB (SMNG); Ludwigsburg, Fröbelstraße, hedge, 48.90546° N, 9.17905° E, 30 June 2013, substrate sampling, leg. & det. UB (SMNG); Ludwigsburg, garden compost heap, 48.910443° N, 9.173799° E, 24 June 2012, exhaustor, leg. & det. UB (SMNG); Ludwigsburg, garden, compost heap, 48.910443° N, 9.173799° E, 07 April 2011, substrate sampling, leg. & det. UB (SMNG); Ludwigsburg, Salonwald, 48.88711° N, 9.1994° E, 30 June 2013, substrate sampling, leg. & det. UB (SMNG) 1 subad.; Irndorf, Eichfelsen, deciduous forest with oak, beech and maple, slope edge to Donau, 48.0636° N, 8.9926° E, 19 October 2013, leg. KV, det. UB (SMNG); Fridingen an der Donau, Knopfmacherfelsen, 48.0301° N, 8.9504° E, 20 October 2013, leg. KV, det. UB (SMNG); Ratshausen, spruce forest, spring area with tall forbs, *Impatiens*, *Sambucus*, moss, 48.2036° N, 8.8176° E, 18 October 2013, leg. KV, det. UB (SMNG); Bubsheim, street to Egesheim, deciduous forest with beech, oak and maple, *Mercurialis perennis*, 48.1258° N, 8.8287° E, 20 October 2013, leg. KV, det. UB (SMNG). **Bavaria**: Kochel am See, Lainbach falls, 48.648° N, 11.3688° E, 30 August 2013, hand sampling, leg. & det. JS (ZSM) 1 ♀; Kochel am See, Kesselberg, 47.634° N, 11.3559° E, 21 July 2013, flotation process, leg. & det. JS (ZSM) 1 ♀; Jetzendorf, ropes course, 48.4405° N, 11.4201 ° E, 14 July 2013, flotation process, leg. & det. JS (ZSM) 1 ♂. **Hesse**: Nieder-Brechen, Emsbach, Berger Kirche, slope, 50.3625° N, 8.1481° E, 2 October 1987, leg. AA, det. UB (SMF) 1 L10; Hofheim, Burkhards-Mühle, dam at Schwarbach, 50.0924° N, 8,4318° E, 24 July 1987, leg. H. Nesemann, det. UB (SMF) 1 L12. **North Rhine-Westphalia**: Langerscheid, spruce forest, 50.52131° N, 6.34056° E, 7 May 2014, leg. SMNG, soil core, 0–5 cm, det. UB (SMNG) 1 L12; Dedenborn, spruce forest, 50.55002° N, 6.34147° E, 7 May 2014, leg. SMNG soil core, 0–5 cm, det. UB (SMNG) 2 ♀; Dedenborn, spruce forest, leaf litter, 50.55002° N, 6.34147° E, 7 May 2014, leg. SMNG, det. UB (SMNG) 1 L12; Erkensruhr, beech forest, leaf litter, 50.5698° N, 6.3601° E, 7 May 2014, leg. SMNG, det. UB (SMNG) 1 L11; Schlitterley, oak forest, 50.62028° N, 6.49382° E, 7 May 2014, leg. SMNG, soil core, 0–5 cm, det. UB (SMNG) 1 L12, 1 L11; Schlitterley, oak forest, leaf litter, 50.62028° N, 6.49382° E, 7 May 2014, leg. SMNG, det. UB (SMNG) 1 ♂, 1 L12, 1 L10. **Saxony**: Sohland am Rotstein, Rotstein, deciduous forest with basalt boulder, 51.10823° N, 14.76663° E, 13 May 2012, soil corer, Berlese Tullgren funnel, leg. UB & PD, det. UB (SMNG); Weißkollm, pine forest on sandy soil, leaf litter, 51.489° N, 14.383° E, 20 May 2014, leg. SMNG, det. UB (SMNG) 1 ♀.

Scutigerella causeyae is one of the most frequently occurring symphylan species in Central Europe (Hüther & Kinkler 2013), but this May be due to the fact that it is easily recognizable, due to its subtruncate second scutum. Nevertheless it is easily confused with *S. verhoeffi*, especially if the records originate from the Alps. The species lives at very different locations, such as on open lands, grassy slopes and other meadows, in stony scree material, in various wood and shrub lands and vineyards (Scheller 1962, 1968, Dizdarević 1971, Haupt 1977, Hüther 1982). The

record with the highest altitude was at 2500 m a. s. l. in front of a glacier with sparse vegetation (Scheller 1968).

Scutigerella immaculata (Newport, 1845)

Records. **Baden-Württemberg**: Bad Griesbach im Schwarzwald, 24–25 February 1936, 28 June 1936 (Remy 1943); Bad Urach, Eppenzillhöhle, cave, 29 June 1968 (Dobat 1975); Endingen am Kaiserstuhl, Katharinaberg, 25 April 1961 (Scheller 1962); Eschenbach (Württemberg), Luitpoldhöhle, cave (Dobat 1978); Freiburg, Schloßberg, 1 August 1936 (Remy 1943); Hausach, 2 June 1936 (Remy 1943); Schelingen, Badberg, south slope, 23 April 1961 (Scheller 1962); Tübingen, Spitzberg, 1958–1965 (Schmid 1966). **Bavaria**: Erlangen, bumblebee nest, 1940–1950 (Postner 1951a, b); Markt Nordheim, Höllern, cave (Dobat 1978); Garmisch-Partenkirchen, Partnachklamm, March–May 1900 (Verhoeff 1901). **Berlin**: Berlin-Zehlendorf, Grunewald, NSG Langes Luch (Haupt 1969, 1971). **Brandenburg**: Schwedt, Oder valley, Lunow-Stolper Polder, dyked land, hay meadow, 27 October 1993 – 22 October 1996 (Zerm 1996, 1997, 1999). **Hamburg**: Hamburg-Niendorf, 1894 (Latzel 1895); Hamburg, Bezirk Hamburg-Harburg, Harburger Berge, Haake, 1894 (Latzel 1895). **Hesse**: Marburg, 1904 (Ellingsen 1905); Marburg (Hansen 1903). **Lower Saxony**: Rosengarten, Sottorf, 1894 (Latzel 1895). **Mecklenburg-Western Pommerania**: [cf.] Ludwigslust, palace garden, 2005–2007 (Jueg 2009). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013); Warstein, Bilsteinhöhle, cave, April 1929 (Griepenburg 1941, Lengersdorf 1961, Weber 1991); Schwelm, Brunnenstube Strickerberg „Pütt“, cave (Schubart 1938, Lengersdorf 1961, Weber 1991). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982). **Saxony**: Görlitz, Berzdorf, brown coal-cast mine dump with afforestation, 1960–1963 (Dunger 1968, see also 1966, 1967, 1969); Görlitz, Kiesdorf, floodplain forest, 51.0391° N, 14.8838° E, soil core, 0–5 cm and 5–10 cm soil depth, leg. & det. WD (SMNG, Dunger 1966, 1968) 13 August 1962, 1 L12; 14 May 1965, 2 L9, 1 L12; Erzgebirge, Kranichsee (Dunger 1967); Torgau, Dahlener Heide (Dunger 1967); Zwickau, Grünau (Langenweißbach), Grünauer Höhle, cave (Büttner 1963); Zwickau, Grünau (Langenweißbach), cave in marble quarry (Büttner 1926). **Schleswig-Holstein**: Aumühle-Friedrichsruh, Sachsenwald, 1894 (Latzel 1895). **Thuringia**: Jena (Uhlmann 1940).

The records of this species suggest a cosmopolitian distribution. It has been reported mainly from forests, although the species can also colonize meadows (e.g. Scheller 1954, Dizdarević 1971, 1975, Seifert 1953, Loksa 1966). Records from caves are also known (Pax 1936, Büttner 1963, Dobat 1975). Sufficient humidity seems to be an important pre-condition for *S. immaculata* (Friedel 1928). Bagnall (1914) found the species even at the seashore in Great Britain. Occasionally the species occurs in ant nests under stones (Evans 1907). Sometimes *S. immaculata* can be a pest in greenhouses (Michelbacher 1942, Scheller 1960). There is no altitude preferred by the species. It is known up to 1600 m a. s. l. *S. immaculata* can be found very frequently in leaf litter, under stones, in moss, on tree-stumps and under planks (e.g. Scheller 1954). Due to the doubtful status of *S. immaculata* all records and this ecological evaluation should be treated with caution.

Scutigerella linsleyi Michelbacher, 1942

Record. Southern Germany (Scheller, 1968).

Records of this species are very rare. It is known from the type locality in California (Michelbacher 1942), Italy, Germany (Scheller 1968), Bosnia and Herzegovina (Dizdarević 1971, 1975, Živadinović et al. 1967), and England (Edwards 1959b). At the type locality it was found in a loamy soil on a slope covered with rather dense brush (Michelbacher 1942). In England it was found in the upper layers of the soil in extremely large numbers causing considerable damage to the roots of cabbage plants. Dizdarievic (1971, 1975) and Živadinović et al. (1967) found *S. linsleyi* especially in forests (deciduous and coniferous forests), but also on semi-dry grassland and in *Molinio Arrhenateretea*.

Scutigerella nodicercus Michelbacher, 1942

Previous Records. **Baden-Württemberg**: along highway between Heidelberg and Karlsruhe, 29 April 1954 (Juberthie-Jupeau 1957); Schelingen, Vogelsang, deciduous forest, 23 April 1961 (Scheller 1962). **Bavaria**: Oberbayern

(Michelbacher 1942). **Rhineland-Palatinate**: [cf.] Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

New Records. **Baden-Württemberg**: Stuttgart, Zuffenhausen, Hummelgraben, garden, 48.8415° N, 9.1787° E, 12 August 2013, hand sampling, leg. & det. JS (ZSM) 1 ♂. **Bavaria**: Petershausen, Wendelstein, 48.4058° N, 11.4804° E, 20 July 2013, flotation process, leg. & det. JS (ZSM) 1 ♀.

Scutigerella nodicerus is distributed in Western and Central Europe. The species lives in Germany in woodland (beech and dryer woods of oak and hornbeam) and gardens (new records). Scheller (1962) quoted it from the Kaiserstuhl from "deciduous forest" without specification. Scheller (1973) found *S. nodicerus* in France in a ravine surrounded by macchia, but also in lush and steep pastures. In Spain he recorded it from a slate talus under *Buxus sempervirens* and in a lush pasture. The highest occurrence arises from the Dolomite Alps at 2000 m a. s. l. (Marcuzzi 1956). This species was found under stones and in soil cores (Hüther 1982, Scheller 1973).

S. nodicercus is very similar to *S. palmonii*. Hüther (1982) does not exclude synonymy with *S. remyi*.

Scutigerella palmonii Michelbacher, 1942

Records. **Baden-Württemberg**: Glems (Metzingen), Glemser Hölloch, cave, 20 January 1967 (Dobat 1975). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976 – September 1979 (Hüther 1982).

This species is also known from Palestine (type locality), Great Britain (Edwards 1959b), Italy and Austria (Hüther 1982). The species seems to be eurytopic. It occurs in woodland as well as in dry meadows, pastures and waste land (Hüther 1982). Dobat (1975) recorded it from a cave in the Swabian Alb (Glemser Hölloch).

Hüther (1982) assumed a species complex is hiding under this name.

Scutigerella remyi Juberthie-Jupeau, 1963

Records. **Bavaria**: Oberau, Moorloch, cave, 1974–1975 (Plachter & Plachter 1988). **North Rhine-Westphalia**: Leverkusen, Gronenborn, NSG Gronenborner Teiche, 2005–2011 (Hüther & Kinkler 2013). **Rhineland-Palatinate**: Niederzissen, Bausenberg, September 1976–September 1979 (Hüther 1982).

The species has not been reported from outside Europe. In the Austrian and Italian Alps the species was found by Scheller (1968) in different alpine biotopes up to 2500 m a. s. l., such as grass-heath, dry broom-heath, scrub-heath with dwarf pines, between dwarf-like pines near a stream and melting snow patches. At lower altitudes the species occurs in different forest types (Juberthie-Jupeau 1963, Hüther 1982). One time it was found in a cave in Austria (Scheller 1968). In the Spanish Pyrenees *S. remyi* was found in a lush pasture (Scheller 1973). Often found under stones, in leaf litter and in soil cores (Juberthie-Jupeau & Tabacaru 1967, Scheller 1973, Hüther 1982)
A clear separation from *S. nodicercus* is not always given (Hüther & Kinkler 2013).

Scutigerella verhoeffi Michelbacher, 1942

Records. "Probably from the Austrian Alps in Southern Germany" (Michelbacher 1942).

According to Michelbacher (1942) the holotype of the species comes "probably from the Austrian Alps in southern Germany. Four specimens were sent me by K. W. Verhoeff with a letter dated April 14, 1938. The label on the vial is poorly written, but examples are presumably from the locality above mentioned". The record of Würmli (1972) for Austria refers to this as well as the record of Schubart (1964) for Southern Germany (without details of the locations). Scheller (1968)

mistrusts the occurrence of this species in Austria. *S. verhoeffi* is also known from Switzerland (Gisin 1951), but also without any information on the locality. It is probably often admixed with *S. causeyae*.

DISCUSSION

The distributions of Pauropoda and Symphyla species are very insufficiently known. According to our study, currently altogether 36 species of Pauropoda and 18 species of Symphyla are known from Germany. Most of them are very widespread or even cosmopolitan species, and so far only *D. broelemanni*, *D. multiplex*, and *P. huxleyi* seem to be more restricted in range, but the German species are all found in various parts of the Western Palaearctic.

Due to their wide ranges, some of these 'species' have been suspected to host cryptic species complexes, and for uncovering those an integrated taxonomic approach should at best be applied, including molecular methods as well as additional morphological characters, and especially detailed data on distribution and habitat parameters.

Comprehensive ecological studies on Pauropoda and Symphyla are rare, and if information is available at all, it is mostly confined on mere habitat information. However, the investigations of Dizdarević (1967, 1971, 1975) provide a noteworthy counterexample.

Based on our review of the literature and our own sampling data most of the German symphylan species seem to be eurytopic (e.g., *S. causeyae*, *G. pyrenaica*) and do not avoid synanthropic localities like gardens or arable land (*S. subnuda*, *S. vulgaris* group). In contrast, *S. remyi* is also eurytopic, but did not occur in urban areas.

Many Symphyla species are usually found in woodland with some tendencies to also occupy open land such as meadows or pastures (e. g. *S. notacantha*, *S. immaculata*, *S. nodicercus*, *H. nivea*). *S. isabellae* seems to be a typical woodland species.

In some cases the sparse records with information on habitat data available did not allow any deduction of habitat preferences, e.g. for *S. arvernorum*, *S. verhoeffi* and *S. elongata.*

In contrast to symphylan species with a more or less broad range of possible habitats, pauropods seem to be more specific in their habitat requirements. About half of the German pauropods show more or less distinct preferences for a special habitat type. Woodland species are *S. pubescens*, *B. hamiger* and *A. ornatus*, while *A. danicus*, *D. hessei*, *P. furcifer*, *P. lanceolatus*, *S. pedunculatus*, *S. lyrifer*, *D. thalassophilus* and *D. tenellus* prefer forests to open land. *T. cordatus* May also be a woodland species with a preference for wet habitats, but currently there are too few records for a clear statement. However, Schuster's (1978) conclusion that Eurypauropodidae seem to avoid coniferous forests is not confirmed by the new records of *A. ornatus*. In general pauropods are rare in coniferous forests in Northern Europe with low pH-values and low average temperatures, whereas in coniferous forests in Central and South Europe on limestone and with higher average temperatures pauropods are more numerous.

Only two taxa seem to be restricted to open land (*D. gracilis amaudruti* and *D. helveticus obtusicornis*), while for *B. strebeli* a clear pattern cannot be derived. *D. viticolus* and *A. rhenanus* are stenotopic in vineyards according to Hüther (1982).

Among the pauropods there are also some species that frequently or exclusively occur in human-influenced or disturbed habitats (*D. distinctus*, *D. gracilis sequanus, P. duboscqi*).

Some species (*D. cuenoti*, *D. gracilis*, *D. helveticus*, *D. barcinonensis*, *D. helophorus*, *D. multiplex*, *D. vulgaris*, *P. huxleyi*) are very probably also eurytopic.

For a number of other species the ecological preferences are unclear due to lack of records (*D. aristatus, D. doryphorus, D. kocheri, D. meridianus, P. bagnalli, S. pedunculatus* var. *brevicornis* and *A. asper*).

Symphyla and Pauropoda, especially woodland species, are often found in caves or mines under moist and cool conditions. So far, the following species are known from German caves: *S. causeyae*, *S. immaculata*, *S. vulgaris*, *S. major*, *S. palmonii*, *H. nivea, A. danicus*, *P. lanceolatus*, *P. huxleyi* and *S. pedunculatus*.

From caves outside of Germany the following species are known: *G. pyrenaica*, *S. isabellae*, *S. vulgaris, S. remyi*, *P. furcifer*, *D. barcinonensis*, *D. gracilis* and *S. pedunculatus* s. str.

Vegetation cover and structure of the soil are the main factors affecting the distribution of Symphyla and Pauropoda. Which of these ecological factors has greater significance varies for each species (Dizdarević 1971).

Michelbacher (1949) and Starling (1944) stated that Symphyla and Pauropoda are found in all types of soils, but most of them prefer loamy and cohesive soils. Only in exceptional cases sandy soils can also be colonized (*D. gracilis*, *D. helveticus*). Edwards (1958) emphasized that sandy soils are least favourable for symphylans.

Special investigations about the preferred soil depth of Symphyla and Pauropoda are very rare (Salt et al. 1948, Michelbacher 1949, Edwards 1958, 1961, Leinaas 1974). Dizdarević (1971), who investigated many pauropod and symphylan species, stated that the majority of species are not confined to a definitive layer of soil. By reviewing all data available it can be seen that some species, e.g. *S. subnuda* and *S. elongata,* occupy all soil horizons up to 50 or 60 cm, while other species prefer soil depths between 10 and 30 cm (*S. vulgaris* and *G. pyrenaica*). Why Symphyla prefer the deeper soil layers of the mineral horizon is not known but one factor might be the well-buffered temperatures in deeper layers. Apart from other factors such as temperature, food resources, or life cycle, there is probably a certain dependency on the relative soil or air humidity, which causes a seasonal vertical migration (Edwards 1961). Such migrations were investigated by Michelbacher (1930, California), Sawa (1930, Japan), Belfield (1956, Great Britain) and Edwards (1961, Great Britain). There is a positive correlation between soil moisture content, relative humidity (preferably 100%) and the occurrence of Symphyla. In spring and early summer *S. immaculata* and *S. vulgaris* migrate in high numbers to the soil surface. In warm summer periods, when the upper soil dries out, the populations withdraw to deeper soil layers, and in autumn a smaller number compared to spring abundances migrate to the soil surface (Edwards 1959c).

For Pauropoda information about preferred soil depths for different species is even rarer than for Symphyla. The literature data indicates that most pauropod species prefer upper soil layers (*D. vulgaris*, *P. lanceolatus*, *P. furcifer*) but May occur down to 60 cm depth. *D. gracilis* and *D. cuenoti* live in deeper soil layers, and are mostly found at depths between 15 and 30 cm. The deepest records for these species are from 70 cm, 75 cm and 80 cm respectively (Scheller 1974, Hågvar 1997).

Dizdarević (1971) could show that each species has a special seasonal dynamic, reaching maximum and minimum density in different months.

The conclusions given here summarise our current knowledge of the taxonomy, distribution and habitat preferences of Symphyla and Pauropoda in Germany, which without doubt is far from being comprehensive. As such, our conclusions are to be taken with some caution, as future research, when applying a more integrated eco-taxonomic approach as mentioned above, will not only deepen our knowledge on both classes but surely also resolve some topics of symphylan and pauropod biology that today still remain enigmatic or ambiguous.

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