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Diplopoda and Chilopoda of Thuringia, Germany

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Abstract

Intensive recent sampling in Thuringia has greatly increased the species lists for both Chilopoda (to 30 species) and Diplopoda (to 52 species). First results concerning the species distribution in the different biogeographical regions in Thuringia and the relationship to the European zoogeography of myriapods are presented. The central position of Thuringia in Europe is clearly reflected in its myriapod fauna: most species are central European or pan-European and many species have a distribution limit within Thuringia (e.g. *Polydesmus complanatus*, *P. angustus*, *Haasea germanica*, *H. flavescens*, *Strongylosoma stigmatosum*). Some species are new (*Brachychaeteuma bradeae*, *Boreoiulus tenuis* and *Macrosternodesmus palicola*) or rare (*Glomeris tetrasticha*) in Thuringia. *Haploporatia eremita* was rediscovered almost 100 years after its first recording.

Keywords: zoogeography, faunistics, distribution limits

1. Introduction

The myriapod fauna of Thuringia has been less studied than that of other German states (Bundesstaaten). Nevertheless, this area, located in central Germany (Fig. 1), has a special position in the zoogeography of many species, as they find their distribution limit here.

The first and only comprehensive study was done by Verhoeff (1917), followed by solely selective site investigations: Uhlmann (1940) published a small list of myriapods of the city of Jena and its surroundings, followed by Seifert (1953 ined., 1968) with investigations on the centre of the Saale River valley and by Schleicher (1973 ined.) with studies on Lithobiomorpha of the Thüringer Schiefergebirge. Very intensive ecological investigations of the diplopod and chilopod fauna took place during the years 1972 to 1975 in the Leutra valley near Jena and were published in Dunger & Steinmetzger (now Voigtländer) (1981) and Voigtländer & Dunger (1998). Voigtländer (1987) investigated various meadow associations near Erfurt, while Hensel (1988 ined.) sampled many habitats in and around the city of Gera. Peter & Roth (1996) (det. Voigtländer) gave a species list from the Uhlstädter Heide near Rudolstadt, Bellstedt (1994) (det. Voigtländer) and Voigtländer & Zulka (2007) of the National Park Hainich. Bellstedt (1996) and Eckert & Becker (1996, det. Voigtländer) published data from Thuringian caves. Wernitzsch (1910) and Hauser (2004) focussed their work on the genus *Craspedosoma*. The first author mentioned some additional species from the city of Jena and the Kyffhäuser Mountains (Wernitzsch 1910: 228); the second gave an overview of the distribution of the genus in Europe (Hauser 2004: 31).

To improve our knowledge of the Thuringian myriapod fauna, we have sampled a wider area more intensively in recent years. Preliminary results are presented here.

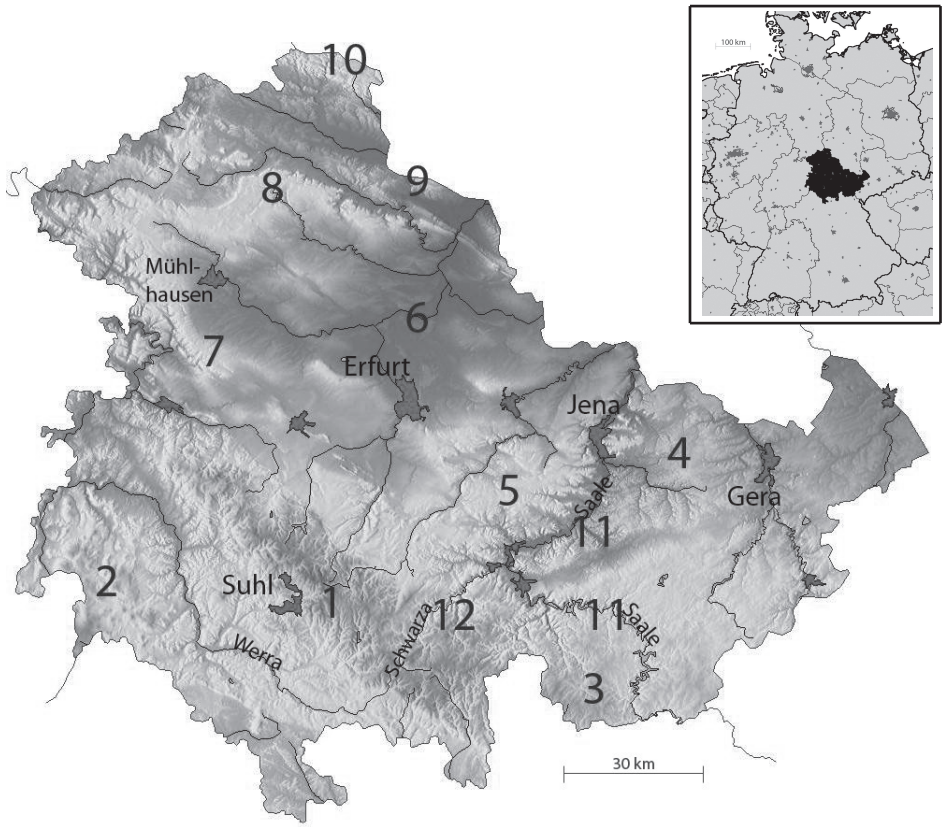

Fig. 1 Location of Thuringia in Germany and its biogeographical regions, for numeration see chapter 2.

2. Landscapes, material and methods

Thuringia consists of the following ten broadly defined biogeographical regions (Fig. 1) (after Hiekel et al. 2004):

– Thüringer Wald (1) with Rhön (2) and Schiefergebirge/Vogtland (3),
Saale-Holzland (4) including the valley of the Saale River (11) and Ilm-Saale-Platten (5) including the valley of the Saale tributary Schwarza River (12),
– Thüringer Becken (6),
– Werra Mountains: Eichsfeld/Hainich (7) and Hainleite (8),
– Kyffhäuser (9) and a smaller part of the Harz Mountains (10).

Parts of the low mountain regions alternate with lowlands, as do areas on new red

sandstone (‘Buntsandstein’) with areas on limestone (‘Muschelkalk’). This climatic and geomorphological diversity, with a consequently high variability of vegetation, is reflected in a high species diversity of myriapods in Thuringia.

Myriapods were sampled by hand and with pitfall traps in all ten of the abovementioned biogeographical regions. Sampling intensity and method was variable for chilopods and diplopods and in the different regions. Chilopods have not yet been sampled in the Vogtland and the Saale-Holzland, and diplopods have been undercollected in the Hainleite, the adjacent Helme River valley (northern Thuringia), the Schiefergebirge and the Elster River valley south of Gera (eastern Thuringia). On the other hand, the surroundings of Jena are much better investigated, partially due to field studies conducted by the University of Jena. We included the data of the collections of the Senckenberg Museum für Naturkunde Görlitz, where much of the material from the studies cited in chapter 1 has been deposited. We also included the data of the papers with the material determined by the second author (compare chapter 1).

Not all literature records could be confirmed by own samples. Doubtful records were excluded from the present study. In all, we considered myriapod records from 121 sites in Thuringia (Fig. 3).

The overview map of Germany/Thuringia (Fig. 1 above right) is based on the country layer of http://www.maps-for-free.com. The topographical maps (Figs 1 below left to 6) are based on SRTM3-elevation data from NASA and DLR (ftp://e0srp01u.ecs.nasa.gov/srtm/version2 /SRTM3/Eurasia) and displayed using Global-Mapper 8 and Adobe Photoshop 9.

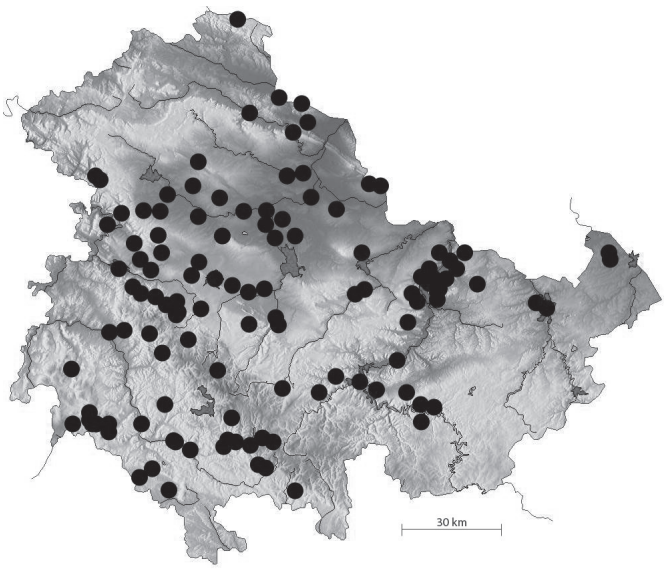

Fig. 2 Studied sites.

3. Results

3.1. Chilopoda

The chilopod fauna of Thuringia consists of 30 species (Tab. 1) which is approximately 50 % of the total for Germany.

Most of the Thuringian chilopod species (70 %) are widespread and mostly common in Central Europe or in Europe as a whole (Tab. 1). Others are restricted to western Europe (west Palaearctic) and eastern Europe (central Asiatic- or Sibiric-European). Species of southern European origin (or western European with a concentration near the Mediterranean) were few, often occurring sparsely and restricted to climatically favourable habitats within villages or cities.

Most of the species could be found at the Thüringer Becken and at the Ilm-Saale-Platten.

The species spectrum of lowlands (regions 4 to 6) and mountainous areas (regions 1 to 3 and 7 to 10) show clear distributional differences, but no differences in the distribution types (excluding the synanthropic species *Cryptops anomalans*, *Henia vesuviana* and *Stigmatogaster subterranea*):

Species only occurring in lowlands: *Cryptops parisi*, *Geophilus carpophagus*, *G. electricus*, *Lamyctes emarginatus* (Fig. 3), *Lithobius austriacus*, *L. melanops*, *L. muticus*. With the exception of the eurytopic *L. austriacus*, these chilopods are inhabitants of dry and very dry meadows, both in Thuringia and in Germany as a whole.

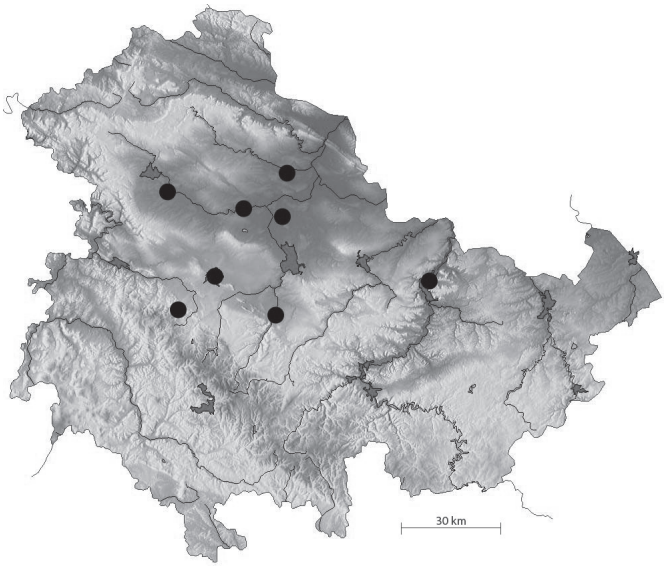

Fig. 3 Distribution of *Lamyctes emarginatus* in Thuringia.

Tab. 1 Species list of Chilopoda and their distribution in Thuringia.

Species	Main distribution	Thuringian biogeographical regions				
		Thüringer Becken (6)	Ilm-Saale-Platte (5)	Werra Mountains Eichsfeld/Hainich (7) and Hainleite (8)	Thüringer Wald (1), Rhön (2) and Kyffhäuser (9) and Harz Mountains (10)	
Lithobius agilis C. L. Koch, 1847	central European	X	X		X	
Lithobius dentatus C. L. Koch, 1844	central European	X	X	X	X	
Lithobius mutabilis L. Koch, 1862	central European	X	X	X	X	X
Lithobius muticus C. L. Koch, 1847	central European	X	X			
Lithobius nodulipes Latzel, 1880	central European	X	X	X	X	X
Lithobius tenebrosus Meinert, 1872	central European	X	X	X	X	X
Geophilus alpinus Meinert, 1870	pan-European	X				
Geophilus carpophagus Leach, 1815	pan-European	X			X	X
Geophilus electricus (Linnaeus, 1758)	pan-European	X	X			
Lithobius calcaratus C. L. Koch, 1844	pan-European	X	X	X		
Lithobius crassipes L. Koch, 1862	pan-European	X	X	X	X	X
Lithobius erythrocephalus C. L. Koch, 1847	pan-European			X	X	
Lithobius forficatus (Linnaeus, 1758)	pan-European	X	X		X	X
Lithobius melanops Newport, 1845	pan-European	X	X			
Lithobius microps Meinert, 1868	pan-European	X	X	X	X	X
Lithobius pelidnus Haase, 1880	pan-European			X	X	X
Lithobius piceus L. Koch, 1862	pan-European	X	X	X	X	X
Schendyla nemorensis (C. L. Koch, 1837)	pan-European	X	X	X	X	
Strigamia acuminata (Leach, 1814)	pan-European	X	X	X	X	
Strigamia crassipes (C. L. Koch, 1835)	pan-European	X	X		X	
Cryptops anomalans Newport, 1844	southern European	X				
Cryptops parisi Brölemann, 1920	central-southern European	X	X		X	
Henia vesuviana (Newport, 1844)	southern European	X				
Strigamia transsilvanica (Verhoeff, 1928)	east-southern European		X		X	
Lamyctes emarginatus (Newport, 1844)	southern Hemisphere	X		X		
Litjobius macilentus L. Koch, 1862	western European	X	X	X	X	
Stigmatogaster subterranea (Shaw, 1789)	West Palaearctic				X	
Lithobius austriacus L. Koch, 1862	central Asiatic-European		X			
Lithobius curtipes C. L. Koch, 1847	central Asiatic-European	X			X	
Geophilus flavus (De Geer, 1778)	Sibiric-European	X	X	X	X	
Number of species		25	21	15	21	11

Submontane or montane species (*Lithobius macilentus* – Fig. 4, *L. nodulipes*, *L. tenebrosus*, *Strigamia transsilvanica*) occur widely and abundantly in the low mountains (Thüringer Wald and Harz/Kyffhäuser), but they are not restricted to these areas. They also occur in flatlands, provided the sites are higher than 200 m. This is notably the case in the Uhlstädter Heide (Ilm-Saale-Platten), where the flora is also characterised by boreal-montane elements (Peter & Roth 1996).

All species recorded from Thuringia more or less confirm the general knowledge of their habitats.

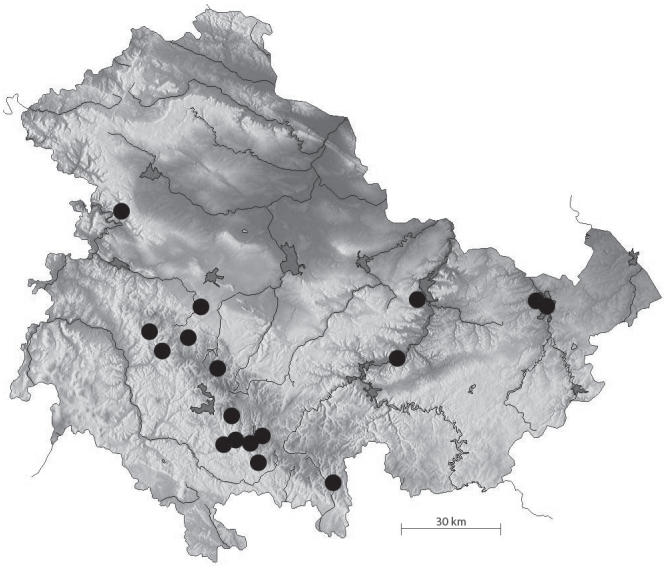

Fig. 4 Distribution of *Lithobius macilentus* in Thuringia.

3.2. Diplopoda

Presently 52 diplopod species are known from Thuringia (Tab. 2). The central position of this area is reflected in faunistic relationships. Most (35 %) are common and distributed over Central Europe or Europe as a whole. Another 27 % of species are mainly distributed in western Europe, 21 % in eastern Europe and 6 % in northern or southern Europe. Many species have a distribution limit in Thuringia. The mountainous Thüringer Wald and the rivers Saale and Schwarza divide the fauna into western (e.g. *Glomeris marginata*, *Leptoiulus belgicus*, *Polydesmus angustus*), eastern (e.g. *Polydesmus complanatus*, *Strongylosoma stigmatosum*) and central (alpine) European species groups (e.g. *Haasea germanica*, *H. flavescens*, *Ochogona caroli*). For *Chordeuma silvestre*, *Melogona voigti* (Fig. 5) and *Propolydesmus testaceus* (Fig. 6), the Saale River valley is the main area of occurrence in Thuringia.

Because sampling was particularly intensive around Jena, 43 diplopod species were recorded from there. The faunistically most interesting species are *Glomeris tetrasticha*,

Brachychaeteuma bradeae, *Boreoiulus tenuis* and *Macrosternodesmus palicola*, the last three in synanthropic habitats. These species tend to be rare in Thuringia. Almost 100 years after its first recording by Wernitzsch (1910: 227) and Verhoeff (1917: 36 and 142–143), *Haploporatia eremita* was rediscovered in the Pennickental near Jena.

Trachysphaera costata has been collected in the Erzgebirge (Saxony) near the border to Thuringia (specimens stored in the collection of the Senckenberg Museum für Naturkunde Görlitz). This small glomerid species could therefore perhaps also be found in the Thuringian Vogtland (compare Verhoeff 1917: 36 in the species list and page 136 for the Elstertal), although we have not yet searched there.

Amphitomeus attemsi, *Cylindroiulus truncorum* and *Oxidus gracilis*, which are often found in European hothouses, were also collected in the Jena Botanical Garden.

Tab. 2 Species list of Diplopoda and their distribution in Thuringia.

Species	Main distribution	Thuringian biogeographical regions				
		Thüringer Becken (6)	Holzland (4) and Ilm-Saale-Platte (5)	Werra Mountains Eichsfeld/Hainich (7) and Hainleite(8)	Thüringer Wald (1), Rhön (2) and Vogtland (3)	Kyffhäuser (9) and Harz Mountains (10)
Polyxenus lagurus (Linnaeus, 1758)	Holarctic		X	X	X	
Boreoiulus tenuis (Bigler, 1913)	northern European		X			
Ophyiulus pilosus (Newport, 1843)	northern European	X	X			
Proteriulus fuscus (Am Stein, 1857)	northern European		X		X	
Allaiulus nitidus (Verhoeff, 1891)	central European		X	X	X	X
Craspedosoma rawlinsii Leach, 1815	central European	X	X	X	X	X
Enantiulus nanus (Latzel, 1884)	central European					
Glomeris tetrasticha Brandt, 1833	central European		X	X		
Glomeris pustalata (Latreille, 1804)	central European			X	X	
Glomeris undulata C. L. Koch, 1844*	central European		X	X	X	X
Julus scandinavius (Latzel, 1884)	central European	X	X	X	X	X
Melogona voigti (Verhoeff, 1899)	central European		X			
Mycogona germanica (Verhoeff, 1892)	central European		X	X		
Propolydesmus testaceus (C. L. Koch, 1847)	central European		X			
Haasea flavescens (Latzel, 1884)	central (alpine) European		X	X		
Haasea germanica (Verhoeff, 1901)	central (alpine) European		X	X		
Haploporatia eremita (Verhoeff, 1909)	central (alpine) European		X	X		
Ochogona caroli (Rothenbühler, 1900)	central (alpine) European				X	
Brachychaeteuma bradeae (Brölemann & Brade-Birks, 1917)	pan-European		X	X		
Brachydesmus superus Latzel, 1884	pan-European	X	X			
Blaniulus guttulatus (Bosc, 1792)	pan-European	X	X			
Choneiulus palmatus (Nemec, 1895)	pan-European		X			

Tab. 2 cont.

Species	Main distribution	Thuringian biogeographical regions				
		Thüringer Becken (6)	Holzland (4) and Ilm-Saale-Platte (5)	Werra Mountains Eichsfeld/Hainich (7) and Hainleite(8)	Thüringer Wald (1), Rhön (2) and Vogtland (3)	Kyffhäuser (9) and Harz Mountains (10)
Cylindroiulus caeruleocinctus (Wood, 1864)	pan-European	X	X	X	X	X
Nemasoma varicorne C. L. Koch, 1847	pan-European		X	X	X	
Nopoiulus kochii (Gervais, 1847)	pan-European		X			
Ommatoiulus sabulosus (Linnaeus, 1758)	pan-European	X	X	X	X	X
Polydesmus denticulatus C. L. Koch, 1847	pan-European		X	X	X	X
Brachychaeteuma bagnalli Verhoeff, 1911	western-European				X	
Chordeuma silvestre C. L. Koch, 1847	western European	X	X			
Cylindroiulus britannicus (Verhoeff, 1891)	western European		X			
Cylindroiulus punctatus (Leach, 1815)	western European		X		X	
Glomeris marginata (Villers, 1789)	western European		X	X	X	X
Leptoiulus belgicus (Latzel, 1884)	western European	X	X		X	
Macrosternodesmus palicola Brölemann, 1908	western European		X			
Melogana gallica (Latzel, 1884)	western European		X			
Tachypodoiulus niger Leach, 1815	western European	X	X	X	X	X
Polydesmus angustus Latzel, 1884	western European		X	X	X	
Polydesmus inconstans Latzel, 1884	western European	X	X		X	
Brachyiulus pusillus (Bosc, 1792)	western European	X	X			X
Glomeris hexasticha Brandt, 1833	eastern European		X	X	X	X
Kryphioiulus occultus (C. L. Koch, 1847)	eastern European	X	X			X
Leptoiulus proximus (Němec, 1896)	eastern European		X		X	
Leptoiulus cibdellus (Chamberlin, 1921)	eastern European	X				
Mastigona bosniensis (Verhoeff, 1897)	eastern European		X			X
Megaphyllum projectum Verhoeff, 1894	eastern European		X	X	X	
Megaphyllum unilineatum (C. L. Koch, 1838)	eastern European	X	X			
Polydesmus complanatus illyricus Verhoeff, 1893	eastern European		X		X	
Strongylosoma stigmatosum (Eichwald 1830)	eastern European		X	X		
Unciger foetidus (C. L. Koch, 1838)	eastern European	X	X	X	X	
Number of species		17	44	19	30	13
Amphitomeus attemsi (Schubart, 1934)	cosmopolite	Jena, Botanical Garden, hothouses				
Oxidus gracilis (C. L. Koch, 1847)	cosmopolite					
Cylindroiulus truncorum (Silvestri, 1896)	cosmopolite					

* Until a well-founded elaboration of a modern taxonomy of the genus *Glomeris* is available, we maintain the name *Glomeris undulata*. The justification to synonymise the name *G. undulata* C. L. Koch, 1844 with *G. klugii* Brandt, 1833 as given by Golovatch (2003: 258) is not adequate (Reip, in prep.).

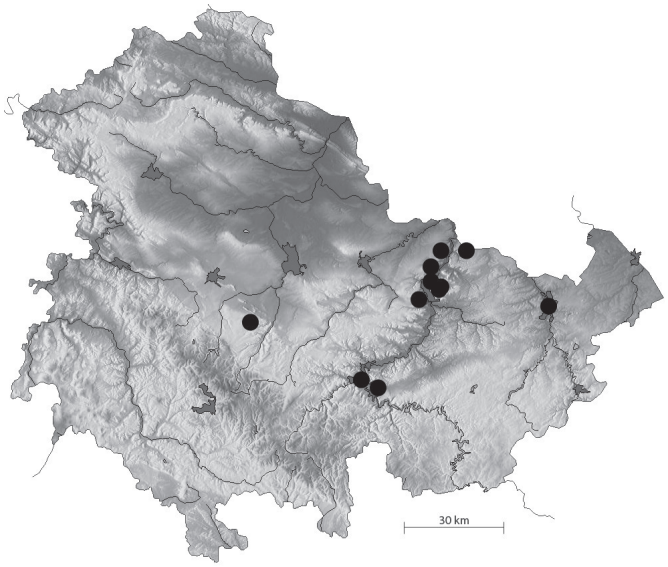

Fig. 5 Distribution of *Melogona voigti* in Thuringia.

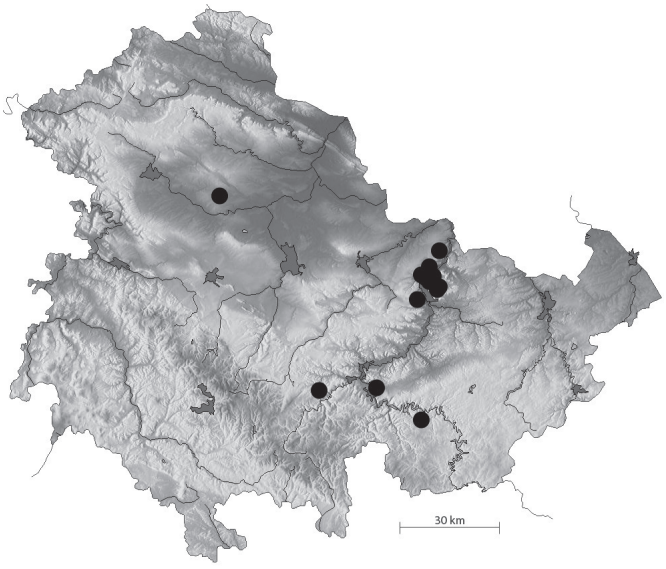

Fig. 6 Distribution of *Propolydesmus testaceus* in Thuringia.

4. Conclusions

Intensive recent sampling has approximately doubled the number of Thuringian myriapod species as recorded by Verhoeff (1917) and revealed interesting faunistic relationships. Nevertheless, the grade of investigation is still low. Further sampling, particularly in northern and eastern Thuringia, can be expected to add more species and to clarify details of distribution.

5. Acknowledgements

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