

# Millipedes (Diplopoda) of the Aggtelek National Park, Northeast Hungary

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**Abstract.** Twenty-two species of millipedes (Diplopoda) were recorded during a survey of the Aggtelek National Park in north-eastern Hungary, consisting of one-fifth of the total Hungarian millipede fauna. The relatively low representation may be due to the general pitfall trap collecting method, thus leaving out species with special habitat requirements such as bark-dwellers, etc. Species worth mentioning, however, could still be recorded: *Glomeris tetrasticha*, *Polyzonium germanicum*, *Enantiulus tataranus*, and *Unciger transsilvanicus* were only collected in very few occasions. Specimens of *Mastigona bosniensis* Verhoeff, 1897, *M. bosniensis hungaricum* Loksa, 1953, and *M. mehelyi* Verhoeff, 1897 were found so similar and geographically so closely occurring to each other, that they are considered here as synonyms. The same is true for *Enantiulus tataranus evae* (Loksa, 1968) which we consider identical with the nominal form.

## INTRODUCTION

Investigation on the Hungarian National Parks (NP) and exploration of their flora and fauna have been carried out for decades, and monographs have been compiled to represent almost all animal groups of the investigated sites (Kaszab & Mahunka, 1981). The project is quite a unique venture worldwide, as very few works have been done with the aim of complete faunal lists of certain geographical areas (Báldi, 1999). Data acquired in that way do not only give a comprehensive picture for later comparative purposes, but also provide essential records for the conservation biology, too. The millipede fauna of the National Parks of Hungary received relatively little attention up to now (Loksa, 1983; Korsós, 1987; Korsós & Dányi, 2002).

The Aggtelek National Park is situated at the north-eastern border of Hungary, and was founded in 1985. After the survey carried out by the staff of the Hungarian Natural History Museum (HNHM), a two-volume monograph has been written on its fauna (Mahunka, 1999b). Unfortunately, due to lack of time, an overview of the millipede species was left out from that book. The aim of the present study is to fill the gap, and thus

to contribute to a better knowledge of the millipede fauna of Hungary.

## MATERIAL AND METHODS

The project to study the Aggtelek National Park by the Hungarian National History Museum started in 1987, and officially lasted for four years, but additional collectings were performed until 2002. Soil animals and hence millipedes (Diplopoda) were collected from numerous sampling sites, a complete list of which is given by Mahunka (1999a). Sampling times each year covered the usual activity period of millipedes, i.e. from March till November. Material deriving from pitfall traps, siftings and hand-collectings were sorted in the upcoming years.

These data are supplemented by records from an additional National Biodiversity Monitoring Project organized also by the NP in 2002 and 2005. In this way, two additional collecting sites were investigated, which are under the protection and supervisorship of the NP Directorate but do not constitute part of the NP itself. These are the Mohos Peatbogs and the Piroska Hill, both belonging to the municipality of Kelemér, and the latter is being part of the Putnoki Hills. Pitfall

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traps in this project were emptied every second week, from May till October. Millipede records of the monitoring project are incorporated into the present publication.

All millipede specimens were preserved in 70% ethanol, and are deposited in the Myriapod Collection of the HNHM. For identification we used a Nikon SM-800 stereo microscope, and the relevant publications (Blower, 1985; Schubart, 1934). We also compared our results with works dealing with the Slovakian millipede fauna (Mock, 2001, 2008).

Here we present the millipede fauna of the Aggtelek NP in the usual taxonomical arrangement (see e.g. Korsós, 2005). At each species we give the list of localities according to the followings: at first the administrative unit (name of settlement or municipality), and at second the geographical name of the locality. Common geographical names of the latter are translated into English (e.g. hill, lake), but if they constitute an integrated part of the Hungarian name (i.e. they are written merged together), we did not translate them (e.g. Szelcepuszta vs. Szelce-valley).

Exact date and other circumstances of the records (e.g. name of collector) are only presented if the species in question is considered as rare in Hungary or has only sporadic occurrences. Summarized number of localities and occurrences (i.e. collecting dates) are provided in the remark section of each species paragraph, as well as other taxonomical, geographical and ecological observations.

## RESULTS

### POLYXENIDA

#### Polyxenidae

##### *Polyxenus lagurus* (Linnaeus, 1758)

*Scolopendra lagura* Linnaeus, 1758: 637.

*Polyxenus lagurus*: Latreille 1802-1804: 45.

*Polyxenus lagurus*: Latzel 1884: 70., Loksa 1953: 178.

*Localities*. Varbóc, Bokány-hilltop; Jósvafő, Tohonya-crag; Szin, Szelcepuszta.

*Remarks*. Typical bark-dwelling species, once found under barks, twice sifted.

### GLOMERIDA

#### Glomeridae

##### *Glomeris hexasticha* Brandt, 1833

*Glomeris hexasticha* Brandt, 1833: 197.

*Glomeris hexasticha*: Jermy 1942: 21-24., Loksa 1968a: 266-272.

*Localities*. Aggtelek, Aggteleki-lake; Aggtelek, Baradla-hilltop; Aggtelek, Haragistya; Aggtelek, Ménes-valley; Aggtelek, Mihály-láza; Aggtelek, Patkós-side; Aggtelek, former Haragistya Forester House; Jósvafő, Hosszú-valley; Jósvafő, valley of the Kecső-stream; Jósvafő, Lófej-valley; Jósvafő, Nagy-side; Jósvafő, Szelce-valley; Jósvafő, Hotel Tengerszem; Perkupa, Telekes-valley; Háló-valley; Szin, Kuhogy; Szin, Ózes-crag; Szin, Patkós-valley; Szin, Szelcepuszta; Szinpetri, Szőlő-hill; Szögliget, Derenk; Szögliget, Ménes-valley; Szögliget, Ménes-valley, Ménes-lake; Szögliget, Ménes-valley, Ménes-stream; Szögliget, Patkós-side; Szögliget, Patkós-valley; Szögliget, Szádvár; Trizs; Zádorfalva, Szuha-valley; Kelemér, Mohos-peatbogs; Kelemér, Piroška-hill.

*Remarks*. The most abundant species in the Aggtelek NP, with 76 occurrences in 31 localities. Its abundance is not surprising, as *Glomeris hexasticha* is a common forest species in Hungary. We found it in almost all kind of woodland: hornbeam, oak, pine, beech, cherry, hawthorn, and even on open grass slopes and in karst sinkholes. Loksa (1968a, 1979) also reported this species twice in the Bükk Mountains. A complex taxonomical review on the Hungarian glomerid species was written by Jermy (1942).

##### *Glomeris tetrasticha* Brandt, 1833

*Glomeris tetrasticha* Brandt, 1833

*Glomeris connexa*: C. L. Koch 1847: 97.

*Glomeris connexa*: Schubart 1934: 41-43., Jermy 1942: 37-42., Loksa 1953: 178.

*Glomeris tetrasticha*: Hoess 2000: 13., Hoess & Scholl 2001: 18.

*Localities*. Aggtelek, Ménes-valley; Jósvafő, Tohonya-valley; Szin, Ózes-crag; Szin, Patkós-valley; Szin, Patkós-valley, Puska Pál-spring; Szögliget, Ménes-valley; Szögliget, Ménes-stream; Szögliget, Medvekeri-spring; Szögliget, Patkós-side.

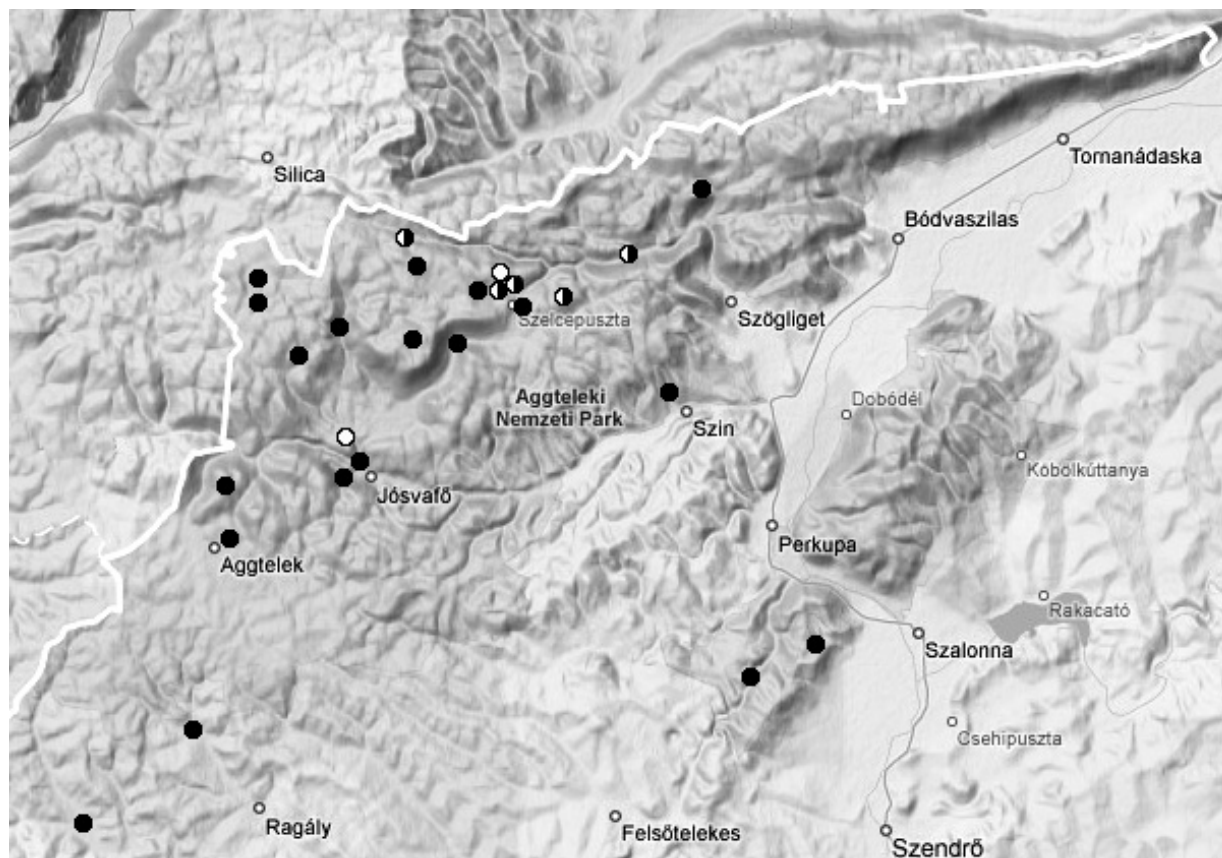


Figure 1. Distribution of *Glomeris hexasticha* (black circles) and *G. tetrasticha* (white circles) in the Aggtelek National Park

*Remarks.* The species occurred 9 times in 10 localities, 6 times together with *G. hexasticha*. The three separate localities are also close to other *G. hexasticha* occurrences so we can assume that the two species have overlapping distributions (Fig. 1). Loksa (1953) and Szlávecz & Loksa (1991) found these two species together in Bátorliget.

#### POLYZONIIDA

##### Polyzoniidae

#### *Polyzonium germanicum* Brandt, 1837

*Polyzonium germanicum* Brandt, 1837: 179.  
*Polyzonium germanicum*: Loksa 1968a: 266.

*Locality.* Jósvalfő, Tohonya-crag.

*Remarks.* A single record is from an oak forest on limestone rock, collected by sifting, 6. Sep.

1989, leg. O. Merkl. Loksa (1968a, 1979) also found this species in oak and beech forests in the Bükk Mountains.

#### CHORDEUMATIDA

##### Mastigophorophyllidae

#### *Mastigona bosniensis* (Verhoeff, 1897)

*Heteroparatia bosniense* Verhoeff, 1897a: 193-195.  
*Mastigona bosniensis*: Jeekel 1971: 67.  
*Heteroparatia bosniense hungaricum* Loksa, 1953: 179. **syn. nov.**  
*Heteroparatia bosniense*: Loksa 1968a: 272-276.  
*Mastigona bosniensis*: Loksa 1988: 164.  
*Heteroparatia mehelyi* Verhoeff, 1897a: 195-196. **syn. nov.**

*Localities.* Jósvalfő, Hosszú-valley; Szögliget, Ménes-valley and Szin, Szelcepuszta.

*Remarks.* *M. bosniensis* was found only once at the first two sampling sites, whereas *M. mehelyi*

three times at the third locality. We found numerous female and juvenile specimen of *Mastigona* spp. at other collecting localities, too, but they could not be assigned to species. Even *Mastigona* males are hard to identify because the specific difference is only the number of teeth (denticles) at the end of the spear-shaped lamella (= „Stachelblatt”) located mesally on the anterior gonopods (in *M. bosniensis* there are 1-4 teeth, in *M. vihorlatica* 6-8, and in *M. mehelyi* there is none). Hauser (2004) considered this small trait too variable, so he suggested *M. vihorlatica* (Attems, 1899) and *M. bosniensis* (Verhoeff, 1897a) to be synonyms (although did not explicitly stated it). Here we tentatively suggest *M. mehelyi* (Verhoeff, 1897a) to be also a junior synonym of *M. bosniensis*, thus in Aggtelek NP only *M. bosniensis* occurs.

Loksa (1953) described a new subspecies of *M. bosniensis* from Bátorliget (*H. bosniense hungaricum*). The original description fits both for *M. bosniensis* and *M. mehelyi*, therefore we suggest the subspecies as a synonym of *M. bosniensis*. Loksa (1968 a, 1979) also recorded *M. bosniensis* several times from Hungary, twice from the Bükk Mountains. A fourth species, *M. transsylvanica*, was described by Verhoeff (1897b) without gonopod illustrations from the South Carpathians. The species was recorded from Northeast Hungary, Jósvalfő, by Matic & Ceuca (1969), but in the light of the above-mentioned observations, we think that this species also needs a careful revision.

## JULIDA

### Julidae

#### *Cylindroiulus arborum* Verhoeff, 1928

*Cylindroiulus arborum* Verhoeff, 1928: 291-294.  
*Cylindroiulus arborum*: Loksa 1962: 160., Korsós & Enghoff 1990: 350-352.

*Locality.* Szin, Patkós-valley.

*Remarks.* The single record is from beech litter, 15.Nov.1988, leg. Z. Korsós. It is a central and eastern European species, living in forests but sometimes in man-made habitats as well (Schu-

bart, 1934). We found only one female specimen, but according to the structure of the vulvae, metazonital striae, and number of setae on the anal valves it could well be distinguished from other species of the *Cylindroiulus truncorum*-group (Korsós & Enghoff, 1990; Schubart, 1934). This is the second occurrence in Hungary, the first record was in the same region, in Lillafüred (Loksa; 1962).

#### *Enantiulus nanus* (Latzel, 1884)

*Julus nanus* Latzel, 1884: 264-267.

*Leptophyllum nanum*: Verhoeff 1910: 56., Loksa 1968b: 266-288, 1979: 88, 91.

*Enantiulus nanus*: Hoffman 1980: 110.

*Localities.* Aggtelek, Hosszú-valley; Aggtelek, Patkós-side; Jósvalfő, Tengerezem; Jósvalfő, Vass Imre-cave; Szin, Patkós-valley; Szin, Patkós-valley, Puska Pál-spring; Szinpetri, Szőlő-hill; Szögliget, Ménes-valley; Szögliget, Ménes-valley, Ménes-lake; Trizs, Eresztvény-hilltop.

*Remarks.* This is a relatively widespread species in the NP, it occurred 10 times in 10 localities. Loksa (1968 a) found it as a dominant species in the Bükk Mountains, too.

#### *Enantiulus tatranus* (Verhoeff, 1907)

*Leptophyllum tatranum* Verhoeff, 1907: 319-320.

*Leptophyllum tatranum evae* Loksa, 1968a: 61-62. **syn. nov.**

*Enantiulus tatranus*: Hoffman 1980: 110.

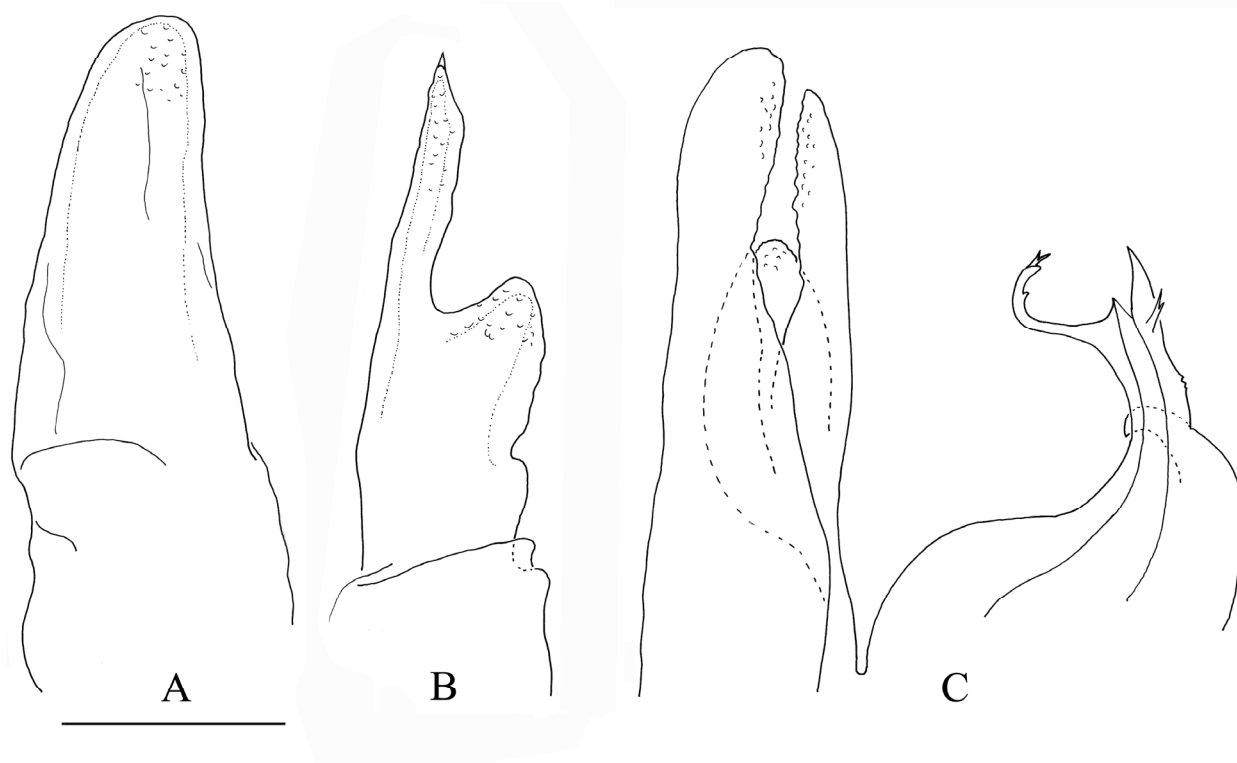
*Locality.* Szögliget, Ménes-valley.

*Remarks.* It was found only at a single locality, 26. Sep. 1988, leg. Z. Korsós.

Loksa (1968b) described a new subspecies of *Leptophyllum* (= *Enantiulus*) *tatranum* from the neighbouring Bükk Mts. (*L. tatranum evae*), based on differences in the structure of the promerite and mesomerite (Figs. 28–29 in Loksa, 1968b). Verhoeff (1907), when describing the species *L. nanum*, also gave illustrations of the opisthomerite and the mesomerite (Fig. 45 in Verhoeff, 1907), but not of the promerite. Even so, when comparing the two descriptions, no substantial difference can be observed. Our two male specimens did also not confirm the validity of the subspecies (Figs. 2–3), so we regard *Leptophyl-*

*lum tatanum evae* Loksa, 1968 as a synonym of *Enantiulus tatanus* (Verhoeff, 1907). It seems that *E. nanus* and *E. tatanus* can coexist, because

the latter was also found twice in the Ménes-valley. Loksa (1968a, 1968b) found both species in the Bükk Mountains, too.



**Figures 2.** *Enantiulus tatanus* male gonopods. A = right promerite, caudal view. B = right mesomerite, frontal view. C = entire left gonopod, mesal view. (Scale 0.1 mm)

### ***Julus terrestris* Linnaeus, 1758**

*Julus terrestris* Linnaeus, 1758: 639., Loksa 1973: 81., 1988: 170.

*Locality.* Varbóc, Bokány-hilltop.

*Remarks.* Finding this species at a single locality (under bark, 9. May 1989, leg. O. Merkl) is surprising, because in Transdanubia, Western Hungary, *Julus terrestris* is a quite common forest-dweller. Loksa found it in several places in Eastern Hungary (e.g. Loksa, 1953, 1983), but did not mention it from the Northern Mountain Range.

### ***Kryphioiulus occultus* (C. L. Koch, 1847)**

*Allajulus occultus* C. L. Koch, 1847: 117-118.

*Cylindroiulus occultus*: Verhoeff 1907: 284., Loksa 1953: 179.

*Kryphioiulus occultus*: Read 1990: 107.

*Locality.* Jósvafő, Nagy-side.

*Remarks.* Single record on a hillside, under stones and bark, 25. Apr. 1990, leg. O. Merkl.

### ***Leptoiulus proximus* (Nemec, 1896)**

*Julus (Leptoiulus) proximus* Nemec, 1896: 3-4.

*Julus (Leptoiulus) ciliatus buekkensis*: Verhoeff 1899: 201.

*Leptoiulus trilobatus buekkensis*: Verhoeff 1908: 441.

*Leptoiulus proximus*: Attems 1927: 137., Loksa 1979: 88, 91.

*Localities.* Aggtelek, Ménes-valley; Aggtelek, Mihály-láza; Aggtelek, Patkós-side; Bódvarákó, Esztramos-hill; Jósvafő, Nagy-side; Jósvafő, Szelce-valley; Jósvafő, Tohonya-valley; Jósvafő, Vass Imre-cave; Perkupa, Telekes-side; Perkupa, Telekes-valley; Szin, Háló-valley; Szin, Szelcepuszta; Szinpetri, Szőlő-hill; Szögliget, Patkós-valley.

*Remarks.* A widespread species in the Aggtelek NP, it has occurred in 18 times (at 14 localities), but in the Mohos-peatbogs at Kelemér, and in the Putnoki Hills, Piroska-hill, it is replaced by *L. trilobatus*. *L. proximus* was also found in the Bükk Mountains (Loksa, 1979).

#### ***Leptoiulus trilobatus* (Verhoeff, 1894)**

*Julus trilobatus* Verhoeff, 1894a: 12.

*Julus (Leptoiulus) ciliatus*: Verhoeff 1897b: 115-116.

*Leptoiulus trilobatus*: Verhoeff 1908: 440.

*Localities.* Kelemér, Mohos-peatbogs; Kelemér, Piroska-hill.

*Remarks.* It is a characteristic species for closed, undisturbed forests in good condition, but was only found 8 times at the Mohos-peatbogs, and 7 times on the Piroska-hill. In the latter place we found it four times in a mass occurrence, i.e. in more than 100 individuals.

#### ***Megaphyllum projectum* Verhoeff, 1894**

*Megaphyllum projectum* Verhoeff, 1894b: 323-324.

*Brachyiulus projectus*: Verhoeff 1897b: 111-112.

*Chromatoiulus projectus*: Schubart 1934: 278-280., Loksa 1979: 88.

*Chromatoiulus projectus dioritanus*: Loksa 1968a: 268.

*Megaphyllum projectum*: Hoffman 1980: 104.

*Megaphyllum projectum dioritanum*: Loksa 1988: 164., 1991: 131-132.

*Localities.* Aggtelek, Ménes-valley; Aggtelek, Patkós-side; Aggtelek, Szelcepuszta; Jósvalfő, Fertős-hilltop; Jósvalfő, Nagy-side; Jósvalfő, Szelce-valley; Jósvalfő, Tohonya-valley; Jósvalfő, Vass Imre-cave; Szin, Háló-valley; Szin, Ózes-crag; Szin, Patkós-valley; Szin, Szelcepuszta; Szögliget, Derenk; Szögliget, Ménes-valley; Szögliget, Patkós-valley; Trizs; Kelemér, Mohos-peatbogs; Kelemér, Piroska-hill.

*Remarks.* A typical forest species, found in hornbeam, oak, pine, and slope woodlands. It had 55 occurrences at 18 sampling sites with lots of specimens, especially in Piroska-hill, where it had at almost each occasion a mass occurrence. Loksa (1979) and Szlávecz and Loksa (1991) found the species very common in Hungary, also in the Bükk Mountains.

#### ***Megaphyllum unilineatum* (C. L. Koch, 1838)**

*Iulus unilineatus* C. L. Koch, 1838: 22.

*Brachyiulus (Chromatoiulus) unilineatus*: Verhoeff 1897b: 114-115.

*Chromatoiulus unilineatus*: Attems 1927: 220.

*Chromatoiulus unilineatus*: Loksa 1953: 179; 1983: 68.

*Megaphyllum unilineatum*: Hoffman 1980: 104, 113.

*Megaphyllum unilineatum*: Loksa 1988: 162-164, 170.

*Localities.* Aggtelek, Baradla-hilltop; Bódvarákó, Ostromosalja; Jósvalfő, Nagy-side; Jósvalfő, Patkós-spring; Szin, Patkós-valley; Szögliget, Ménes-valley; Tornanádaska, Kétágú-hill.

*Remarks.* It is a common species in dry, disturbed habitats (e.g. Loksa, 1983); its limited occurrence (7 times in 7 localities) in the Aggtelek NP is not outstanding.

#### ***Nemasoma varicorne* C. L. Koch, 1847**

*Nemasoma varicorne* C. L. Koch, 1847: 116.

*Isobates varicornis*: Latzel 1884: 240-243., Loksa 1957: 194.

*Nemasoma varicorne*: Enghoff 1985: 41.

*Localities.* Jósvalfő, Nagy-side; Jósvalfő, Szelce-valley; Szendrő, Közép-hill; Szin, Háló-valley; Szögliget, Ménes-valley.

*Remarks.* The species is a typical bark-dweller, therefore its relatively low abundance (7 occurrences in 5 localities) in the pitfalls is not surprising.

#### ***Ophiulus pilosus* (Newport, 1842)**

*Julus pilosus* Newport, 1843: 316.

*Iulus fallax*: Meinert 1868: 15-16.

*Iulus (Leptoiulus) fallax*: Verhoeff 1898: 132, 135.

*Ophiulus fallax*: Verhoeff 1908: 433., Loksa 1962: 160-162.

*Ophiulus pilosus*: Chamberlin 1922: 9., Loksa 1988: 170.

*Localities.* Aggtelek, Haragistya; Aggtelek, Hosszú-valley; Aggtelek, Patkós-side; Jósvalfő, Lófej-valley; Szendrő, Határ-valley; Szin, Háló-valley; Szinpetri, Szőlő-hill; Szögliget, Patkós-valley; Trizs.

*Remarks.* We found only female specimens (10 occurrences, from April till August, but mainly in May and June, in 9 localities, in various habitats), which is surprising because the species is rather frequent in other Hungarian forests, and even in synanthropic habitats. A review of the Hungarian subspecies of *O. pilosus* was made by Loksa (1962), but most of them are based on possibly random morphological variation which needs a more careful mass analysis to decide their taxonomical status.

***Unciger foetidus* (C. L. Koch, 1838)**

*Iulus foetidus* C. L. Koch, 1838: 22.

*Oncoiulus foetidus*: Verhoeff 1899: 190-191.

*Unciger foetidus*: Lohmander 1925: 60-61., Loksa 1953: 179.

*Localities.* Aggtelek, Ménes-valley; Aggtelek, Patkós-side; Aggtelek, Szelcepuszta; Bódvarákó, Esztramos-hill; Jósvalfő, Hotel Tengersizem; Jósvalfő, Tohonya-valley; Szin, Patkós-valley; Szin, Szelcepuszta; Szögliget, Patkós-valley; Kelemér, Mohos-peatbogs; Kelemér, Piroska-hill.

*Remarks.* It has occurred 2 times in Kelemér, once on Piroska-hill, and 15 times in the other 9 localities. The species is characteristic for closed, undisturbed deciduous forests in good condition (e.g. Loksa, 1953).

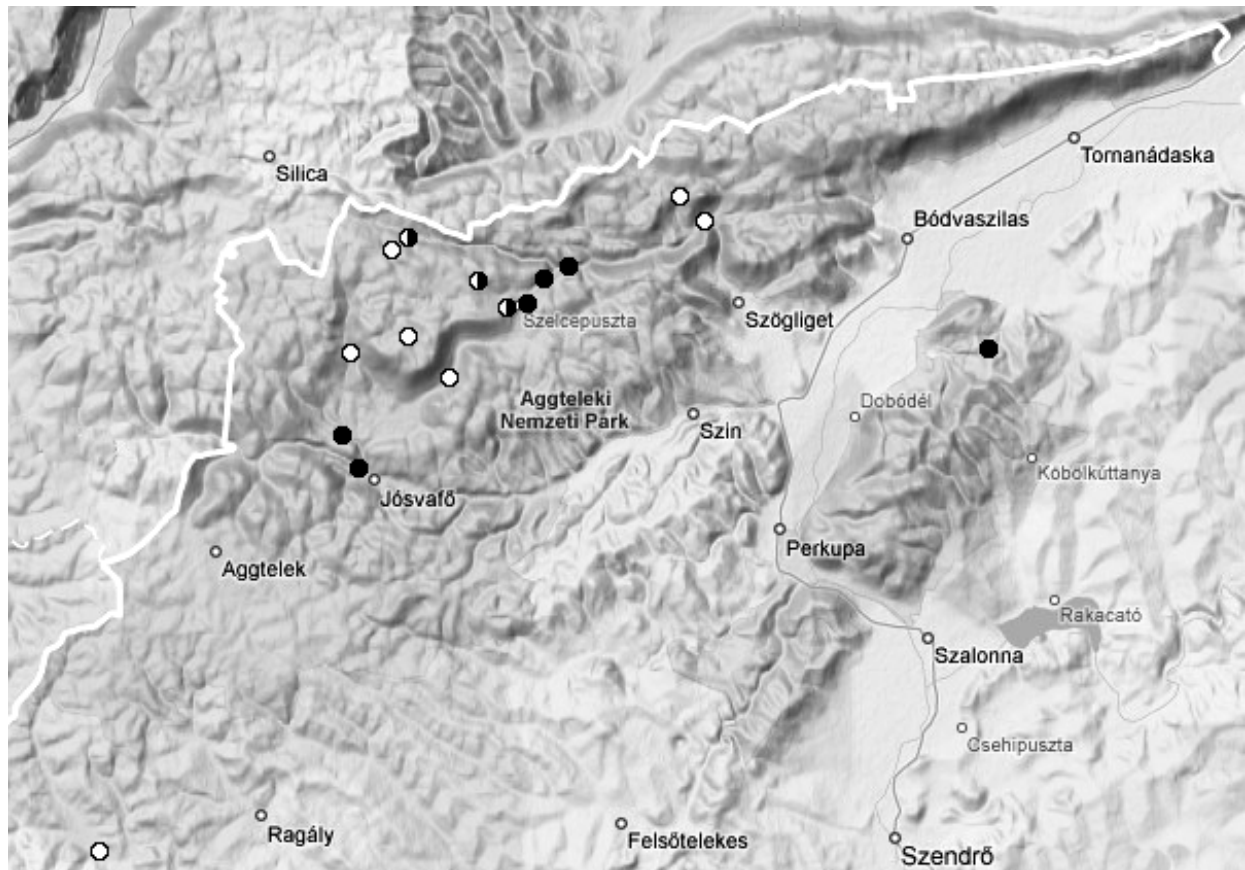
***Unciger transsilvanicus* (Verhoeff, 1899)**

*Oncoiulus foetidus transsilvanicus* Verhoeff, 1899: 191.

*Unciger transsilvanicus*: Jeekel 1971: 168.

*Localities.* Aggtelek, Ménes-valley; Aggtelek, Mihály-láza; Aggtelek, Patkós-side; Jósvalfő, Hosszú-valley; Jósvalfő, Nagy-side; Jósvalfő, Szelce-valley; Szin, Szelcepuszta; Szögliget, Derenk; Szögliget, Ménes-valley; Zádorfalva, Szuha-valley.

*Remarks.* Similarly frequent forest species like *U. foetidus*, with 17 occurrences in 10 localities. It seems that the two species have overlapping distributions, they co-occurred several times (in 3 localities of the 10) (Fig. 3).



**Figure 3.** Distribution of *Unciger foetidus* (black circles) and *U. transsilvanicus* (white circles) in the Aggtelek National Park

## POLYDESMIDA

### Polydesmidae

#### ***Brachydesmus superus* Latzel, 1884**

*Brachydesmus superus* Latzel 1884: 130-132.

*Brachydesmus superus* Loksa 1955: 386.

*Locality.* Zádorfalva, Szuha-valley.

*Remarks.* Only a single record: 2. May 1988, leg. Z. Korsós, but this can be due to the bark-dwelling habit of the species, hence difficult to catch in pitfalls. Loksa (1955) found it in great mass near Lake Velence.

#### ***Polydesmus complanatus* (Linnaeus, 1761)**

*Julus complanatus* Linnaeus 1761: 502.

*Polydesmus illyricus*: Verhoeff 1893: 273-275.

*Polydesmus complanatus* Porat 1870: 820., Lohmander 1925: 16-17., Loksa 1954: 217-218.

*Localities.* Aggtelek, Haragistya; Aggtelek, Ménes-valley; Aggtelek, Mihály-láza; Aggtelek, Patkós-side; Bódvarákó, Esztramos-hill; Jósvalfő, Fertős-hilltop; Jósvalfő, Hosszú-valley; Jósvalfő, Nagy-side; Jósvalfő, Tengersizem; Szin, Háló-valley; Szin, Patkós-valley; Szin, Szelcepuszta; Szögliget, Ménes-valley; Szögliget, Patkós-valley; Trizs; Kelemér, Mohos-peatbogs; Kelemér, Piroska-hill.

*Remarks.* The species occurred 7 times in Kelemér, 9 times on Piroska-hill, and 24 times in the other 17 Aggtelek NP localities. *Polydesmus complanatus* is one of the most common millipede species in Hungary, with little requirement limitations in almost every kind of habitats. Despite its bark-dwelling way of life, it is also quite conspicuous and easy to collect for non-specialist entomologists as well. A review and identification key to the *Polydesmus* species and subspecies of the Carpathian Basin was made by Loksa (1954).

#### ***Polydesmus denticulatus* C. L. Koch, 1847**

*Polydesmus denticulatus* C. L. Koch, 1847: 135.

*Polydesmus denticulatus* Loksa 1954: 217, 220.

*Locality.* Szögliget, Patkós-valley.

*Remarks.* The single locality is at 350 m a.s.l., in an open woodland, collected by pitfall trap, May–Aug. 1987, leg. Gy. Szél & L. Ádám. The

species can be much more frequent but due to its bark-dwelling habit, may not easily be caught by pitfalls. The only other species in our pitfall trap was *P. complanatus*. The co-occurrence of the two species is not surprising, Loksa (1953, 1955, 1991) found them together many times.

#### ***Strongylosoma stigmatosum* (Eichwald, 1830)**

*Julus stigmatosus* Eichwald, 1830: 124.

*Strongylosoma pallipes*: Latzel 1884: 168-170., Loksa 1953: 179.

*Strongylosoma stigmatosum*: Jeekel 1967: 166., Szlávecz & Loksa 1991: 804.

*Localities.* Aggtelek, Ménes-valley; Perkupa, Telekes-valley; Szin, Patkós-valley; Szögliget, Ménes-valley; Szögliget, Patkós-valley.

*Remarks.* Having 10 occurrences in 5 localities, the species is a rather typical forest-dweller, preferring undisturbed deciduous woodlands. According to Loksa (1953), the species prefers humid forests and riversides.

## DISCUSSION

The present list of the Aggtelek NP contains 22 millipede species which makes up 21.5% of the Hungarian millipede fauna (Korsós, 1994, 1998, 2005). This low representation may be due to the major usage of pitfall traps because even if most of the Hungarian millipede species are surface-dwellers, some other species live in special habitats (e.g. under bark), in need of special collecting techniques. In the Aggtelek project we applied hand-collecting and sifting, too, but some species were still quite rare, and could be obtained only by these methods, e.g. *Polyxenus lagurus*, *Polyzonium germanicum*, *Julus terrestris*, *Kryphoiulus occultus*.

If we wanted to compare the species of different habitats, there are several problems blurring the results. In case of many samples we did not have information on the habitat, but frequency comparison and habitat choice is also difficult to judge because some regions of the Aggtelek NP were more frequently visited than others. We can also assume that the most abundant species have



more widespread distribution, hence they live in very different habitats. In a typical oak–hornbeam forest (*Quercus–Carpinetum*) the most common species was *Megaphyllum projectum* and *Leptoiulus trilobatus*, whereas in the non-native pine forests *Glomeris hexasticha* and *Polydesmus complanatus* were collected most frequently. *Unciger foetidus* is also a typical deciduous forest-dweller, and it is worth mentioning that in the north-eastern part of the country it co-exists with *U. transsilvanicus*.

There are several species which are interestingly missing from our list, though they are present in the millipede fauna of neighbouring Slovakia (Mock, 2001, 2008). We could expect to find several *Trachysphaera* species for instance, *T. costata* (Waga, 1858) and *T. acutula* (Latzel, 1884); from the polyzoniidans *Polyzonium eburneum* Verhoeff, 1907 and *P. transsilvanicum* Verhoeff, 1898; from the chordeumatidans *Haasea flavescens* (Latzel, 1884), *Craspedosoma rawlinsii* Leach, 1814, and *Hylebainosoma tatanum* Verhoeff, 1899. In the case of the latter species, Loksa (1962) even described a subspecies (*H. tatanum josvaense*) from the Aggtelek NP, but we could not recollect it.

From the julidans, about a dozen species are lacking, such as the three blaniulids (*Blaniulus guttulatus* (Fabricius, 1798), *Nopoiulus kochii* (Gervais, 1847), *Proteroiulus fuscus* (Am Stein, 1857)); julids like *Brachyiulus bagnalli* (Curtis, 1845), *Cylindroiulus boleti* (C.L. Koch, 1847), *Julus curvicornis* Verhoeff, 1899, *Julus scandinavicus* Latzel, 1884, *Leptoiulus baconyensis* (Verhoeff, 1899), *L. tussilaginis* (Verhoeff, 1907), *Ommatoiulus sabulosus* (Linnaeus, 1758), and *Xestoiulus imbecillus* (Latzel, 1884). From the polydesmidans, one could expect *Polydesmus montanus* Daday, 1889, *P. polonicus* Latzel, 1884, and *P. tatanus* Latzel, 1882. Apart of these species, recent additions to the Slovakian millipede fauna were *Cylindroiulus caeruleocinctus* (Wood, 1864) (Mock, 2006) and *Polydesmus inconstans* Latzel, 1884 (Mock, 2004), both from the territory of the city of Kosice, East Slovakia. They both could occur in the Aggtelek NP, too.

Unfortunately, all these species are still demanding from our list. It may mean that: (1) our faunistical survey was incomplete due to plain methodology (emphasis on pitfall traps, and with relatively little effort put into other collecting methods); or (2) there are important zoogeographical differences between the territories of north-eastern Hungary and adjoining Slovakia.

It should also be mentioned that one of the major attractions of the Aggtelek NP, the Baradla–Domica karst cave system was completely left out from our project. Although there are not any troglobiont millipedes known from the Hungarian part of this cave habitat, new records exist from the Western Carpathian caves showing that the subterranean fauna can still contain surprises (Mock & Tajovsky, 2008).

**Acknowledgements** – We would like to express our sincere gratitude to the Directorate of the Aggtelek National Park for supporting the Museum during the faunistical survey and for the permits issued to collect and preserve millipede samples. Viktor Virók (Aggtelek NP) is acknowledged for his organisation to provide the biodiversity monitoring samples for identification. László Dányi and Jenő Konsthán (Hungarian Natural History Museum) gave helpful comments during the preparation of the manuscript.

## REFERENCES

- ATTEMS, C. (1927): Über palaearktische Diplopoden. *Archiv für Naturgeschichte*, 92(1-2): 1–256.
- BÁLDI, A. (1999): Biodiversity in Hungary: advantages and limits of taxonomically complete faunal inventories. *Natural Areas Journal*, 19: 73–78.
- BRANDT, J. F. (1833): Tentaminum quorundam monographicorum Insecta Myriapoda Chilognathi Latreillii spectantium prodromus. *Bulletin de la Société Impériale des Naturalistes de Moscou*, 6: 194–209.
- BRANDT, J. F. (1837): Note sur un ordre nouveau de la classe des Myriapodes et sur l'établissement des sections de cette classe d'animaux en général. *Bulletin Scientifique publié par l'Académie Impériale des Sciences de Saint-Pétersbourg*, 1(23): 178–179.
- BLOWER, J. G. (1985): Millipedes. Synopses of the British Fauna, N. S., No. 35, E.J. Brill, London, 242 pp.
- CHAMBERLIN, R. V. (1922): Further notes on the nomenclature of North American Julidae and Nema-

- somidae. *Proceedings of the Biological Society of Washington*, 35: 7–10.
- EICHWALD, E. (1830): *Zoologia specialis. Pars altera. Vilnae*, IV+233 pp.
- ENGHOFF, H. (1985): The millipede family Nemasomatidae. With the description of a new genus, and a revision of *Orinisobates* (Diplopoda: Julida). *Entomologica Scandinavica*, 16: 27–67.
- HAUSER, H. (2004): Zur taxonomie und Systematik von *Mastigona bosniensis* (Verhoeff, 1897) und *Mastigona vihorlatica* (Attems, 1899) (Diplopoda, Chordeumatida, Mastigophorophyllidae). *Entomologische Nachrichten und Berichte*, 48(2-3): 215–218.
- HOESS, R. (2000): Bestimmungsschlüssel für die *Glomeris*-Arten Mitteleuropas und angrenzender Gebiete. *Jahrbuch des Naturhistorischen Museums Bern*, 13: 3–20.
- HOESS, R. & SCHOLL, A. (2001): Allozyme and literature study of *Glomeris guttata* Risso, 1826, and *Glomeris connexa* Koch, 1847, a case of taxonomic confusion (Diplopoda: Glomeridae). *Zoologischer Anzeiger*, 240: 15–33.
- HOFFMAN, R. L. (1980): *Classification of the Diplopoda*. Muséum d'Histoire naturelle, Genève, 237 pp.
- JEEKEL, C. A. W. (1967): Notes on the nomenclature and taxonomy of European Paradoxosomatidae (Diplopoda, Polydesmida). *Entomologische Berichten*, 27: 166–172.
- JEEKEL, C. A. W. (1971): *Nomenclator generum et familiarum Diplopodorum: A list of the genus and family-group names in the class Diplopoda from the 10<sup>th</sup> edition of Linnaeus, 1758, to the end of 1957*. Monografieën van de Nederlandse Entomologische Vereniging 5: 1–412.
- JERMY, T. (1942): Rendszertani tanulmány a magyarországi plesioceratákról. (Diplopoda) (Systematische Studien an ungarländischen Plesioceraten [Diplopoda].) *Matematikai és Természettudományi Közlemények*, 39: 1–82. (in Hungarian, with German summary)
- KASZAB, Z. & MAHUNKA, S. (1981): Introduction. In: Mahunka, S. (ed.): *The fauna of the Hortobágy National Park, I*. Hungarian Natural History Museum, Budapest, pp. 9–13.
- KOCH, C. L. (1838): Deutschlands Crustaceen, Arachniden und Myriopoden. Ein Beitrag zur deutschen Fauna. Heft 22, Regensburg.
- KOCH, C. L. (1844): Deutschlands Crustaceen, Arachniden und Myriopoden. Heft 40, Regensburg.
- KOCH, C. L. (1847): System der Myriapoden mit den Verzeichnissen und Berichtigungen zu Deutschlands Crustaceen, Myriapoden und Arachniden. In: PANZER & HERRICH-SCHÄFFER, A.: *Kritische Revision der Insectenfauna Deutschlands*, III. Bändchen, Regensburg, 196 pp.
- KORSÓS, Z. (1987): Diplopoda and Chilopoda of the Kiskunság National Park. – In: Mahunka, S. (ed.): *The fauna of the Kiskunság National Park, II*. Akadémiai Kiadó, Budapest, pp. 73–77.
- KORSÓS, Z. (1994): Checklist, preliminary distribution maps, and bibliography of millipedes in Hungary (Diplopoda). *Miscellanea zoologica hungarica* 9: 29–82.
- KORSÓS, Z. (1998): Az ikerszelvényesek (Diplopoda) faunisztikai és taxonómiai kutatásának helyzete és irányai Magyarországon. (Status and directions of faunistic and taxonomical research of millipedes in Hungary.) *Folia historico naturalia Musei Matraensis*, 22: 85–98.
- KORSÓS, Z. (2005): The millipede fauna (Diplopoda) of Hungary: a zoogeographical account. *Abstracts of lectures and posters, 13<sup>th</sup> International Congress of Myriapodology*, 25–29 July 2005, Bergen, Norway, p. 24.
- KORSÓS, Z. & DÁNYI, L. (2002): Millipedes (Diplopoda) and centipedes (Chilopoda) of the Fertő-Hanság National Park, Hungary. In: MAHUNKA, S. (ed.): *Fauna of the Fertő-Hanság National Park*. HNHM, Budapest, pp. 183–190.
- KORSÓS, Z. & ENGHOFF, H. (1990): The *Cylindroiulus truncorum*-group (Diplopoda: Julidae). *Entomologica Scandinavica*, 21: 345–360.
- LATREILLE, P. A. (1802–1804): *Histoire naturelle, générale et particulière des Crustacés et des Insectes*. Dufart, Paris, 467 pp.
- LATZEL, R. (1884): *Die Myriopoden der Österreichisch-ungarischen Monarchie. Zweite Hälfte. Die Symphylen, Pauropoden und Diplopoden*. Alfred Hölder, Wien, 414 pp.
- LINNAEUS, C. (1758): *Systema Naturae per Regnia tria Naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Editio 10, reformata. 823 pp.
- LINNAEUS, C. (1761): *Fauna Svecica sistens Animalia Sveciae Regni: Mammalia, Aves, Amphibia, Pisces, Insecta, Vennes*. Editio altera. Stockholm, XLVIII+578 pp.
- LOHMANDER, H. (1925): Sveriges Diplopoder. *Göteborgs Kungliga Vetenskaps- och Vitterhets-Samhälles handlingar, 4. Följden* 30(2): 1–115.
- LOKSA, I. (1953): Bátorliget ikerszelvényes-faunája, Diplopoda [Millipede fauna of Bátorliget]. In: Székessy, V. (ed.): *Bátorliget élővilága. [The fauna and flora of Bátorliget.]* Akadémiai Kiadó, Budapest, pp. 178–181 (in Hungarian).

- LOKSA, I. (1954): Die *Polydesmus*-Arten des Faunengebietes des Karpatenbeckens. *Annales historico-naturales Musei nationalis hungarici*, 5: 215–224.
- LOKSA, I. (1957): Ergebnisse der Überprüfung einer Diplopodensammlung von J. Daday. *Annales Universitatis Scientiarum Budapestinensis de Rolando Eötvös Nominatae, Sectio Biologica*, 1: 189–195.
- LOKSA, I. (1962): Einige neue und wenig bekannte Diplopoden aus Ungarn. *Annales Universitatis Scientiarum Budapestinensis de Rolando Eötvös Nominatae, Sectio Biologica*, 5: 157–170.
- LOKSA, I. (1968a): Einige Diplopodenformen aus Ungarn. *Opuscula Zoologica Budapest*, 8(1): 57–62.
- LOKSA, I. (1968b): Quantitative Makrofauna-Untersuchungen in den Waldböden des Bükkgebirges (Ungarn). *Annales Universitatis Scientiarum Budapestinensis de Rolando Eötvös Nominatae, Sectio Biologica*, 9-10: 266–289.
- LOKSA, I. (1973): Bodenzoologische Untersuchungen in den Alkali-Waldsteppen von Margita, Ungarn. I. Untersuchungen der Arthropoden-Makrofauna, nebst Bemerkungen über die Oniscinea-Arten. *Opuscula Zoologica Budapest*, 11: 79–93.
- LOKSA, I. (1979): Quantitative Untersuchungen über die Makrofauna der Laubstreu in Zerreichen- und Hainsimsen-Eichen-Beständen des Bükk-Gebirges. *Opuscula Zoologica Budapest*, 16: 87–96.
- LOKSA, I. (1983): Diplopoda and Chilopoda from the Hortobágy National Park. In: Mahunka, S. (ed.): *The fauna of the Hortobágy National Park*. Akadémiai Kiadó, Budapest, pp. 67–69.
- LOKSA, I. (1988): Über einige Arthropoden-Gruppen aus dem Biosphäre-Reservat des Pilis-Gebirge (Ungarn) 1. Die Diplopoden, Chilopoden, Weberknechte und Spinnen vom Szamár-Berg. *Opuscula Zoologica Budapest*, 23: 159–176.
- LOKSA, I. (1991): Über einige Arthropoden-Gruppen aus dem Pilis-Biosphären-Reservat (Ungarn) 2. Die Diplopoden, Chilopoden, Weberknechte und Spinnen aus dem Gebiet zwischen Kakas-Berg (Piliszentkereszt) und Ispán-Wiese (Mikula-haraszrt). *Opuscula Zoologica Budapest*, 24: 129–141.
- MAHUNKA, S. (1999a): Thoughts on the occasion of the 25<sup>th</sup> anniversary of national park research in Hungary – Introduction. In: Mahunka, S. (ed.): *The fauna of the Aggtelek National Park, I*. Hungarian Natural History Museum, Budapest, pp. 11–20.
- MAHUNKA, S. (1999b): *The fauna of the Aggtelek National Park, I–II*. Hungarian Natural History Museum, Budapest, 775 pp.
- MATIC, Z. & CEUCA, T. (1969): Contribuții la cunoașterea miriapodelor (Chilopoda și Diplopoda) din fauna R. P. Ungare. *Studia Universitatis Babeș-Bolyai, Seria Biologia*, 14(1): 105–110.
- MEINERT, F. V. A. (1868): Danmarks chilognather. *Naturhistorisk Tidskrift*, 3(5): 1-32.
- MOCK, A. (2001): Millipedes of the Slovak Republic. *Myriapodologica Czecho-Slovaca*, 1: 25-38.
- MOCK, A. (2004): First record of *Polydesmus inconstans* Latzel, 1884 (Diplopoda, Polydesmidae) in Slovakia. *Biologia*, Bratislava, 59(5): 552.
- MOCK, A. (2006): First record of *Cylindroiulus caeruleocinctus* (Diplopoda, Julidae) in Slovakia. *Biologia*, Bratislava, 61(2): 144.
- MOCK, A. (2008): Distribution of millipedes (Diplopoda) along a climatic inversion compared to their thermopreferences: a case study from the Zadiel Gorge (Slovakia). In: Voigtländer, K. (ed.): Abstracts 14th International Congress of Myriapodology, Görlitz, Germany. *Peckiana*, 6: 67.
- MOCK, A. & TAJOVSKY, K. (2008): *Mecogonopodium carpathicum* n. sp. (Diplopoda: Chordeumatida: Attemsidae), a new troglophilic millipede from Slovakia. *Zootaxa*, 1778: 26–36.
- NÉMEC, B. (1896): Zur Kenntnis der Diplopoden Böhmens. *Sitzungsberichte der königlichen böhmischen Gesellschaft der Wissenschaften, Mathematisch-naturwissenschaftliche Classe*, 1896: 1–8.
- NEWPORT, G. (1843): Description of a new British Julus, *Iulus sandvicensis* and *I. pilosus*. *Annals and Magazine of Natural History*, 11: 316.
- OLIVIER, A. G. (1792): *Encyclopédie méthodique. Dictionnaire des Insectes*, 7. Paris, IV+ 827 pp.
- PORAT, C. O. (1870): Om några Myriapoder från Azorererna. *Öfversigt af Kongliga Vetenskaps-Akademiens förhandlingar* 27(7): 813–823.
- READ, H. J. (1990): The generic composition and relationships of the Cylindroiulini – a cladistic analysis (Diplopoda, Julida: Julidae). *Entomologica Scandinavica*, 21: 97–112.
- SCHUBART, O. (1934): Tausendfüßler oder Myriapoda I: Diplopoda. In: Dahl, F. (ed.): *Die Tierwelt Deutschlands und der angränzenden Meeressteile, Teil 28*. Gustav Fischer Verlag, Jena, 318 pp.
- SZLÁVE CZ, K. & LOKSA, I. (1991): Diversity of soil arthropods in the Bátorliget Nature Reserve, Hungary. In: Zombori, L. & Peregovits, L. (1992): *Proc. 4th ECE/XIII. SIEEC, Gödöllő 1991*, pp. 801-807.
- VERHOEFF, K. W. (1893): Neue Diplopoden aus dem österreichischen Küstenlande. *Berliner Entomologische Zeitschriften*, 38: 267–278.
- VERHOEFF, K. W. (1894a): Beiträge zur Diplopoden-Fauna Tirols. *Verhandlungen der Zoologisch-botanischen Gesellschaft in Wien*, 44: 9–34.
- VERHOEFF, K. W. (1894b): Zur Kenntnis der Copulationsorgane der Juliden, über eine neue Juliden-Gat-

- tung und eine neue *Tachypodojulus*-Art. *Zoologischer Anzeiger*, 17(456): 321–325.
- VERHOEFF, K. W. (1897a): Ueber Diplopoden aus Bosnien, Herzogowina und Dalmatien. *Archiv für Naturgeschichte*, 63: 139–156; 181–204.
- VERHOEFF, K. W. (1897b): 1. Beiträge zur vergleichenden Morphologie, Gattungs- und Artsystematik der Diplopoden, mit besonderer Berücksichtigung derjenigen Siebenbürgens. *Zoologischer Anzeiger*, 20(528): 97–125.
- VERHOEFF, K. W. (1898): Über Diplopoden aus Bosnien, Herzogowina und Dalmatien. IV. Theil: Julidae. *Archiv für Naturgeschichte*, 64: 119–160.
- VERHOEFF, K. W. (1899): Beiträge zur Kenntniss paläarktischer Myriopoden. IX. Aufsatz: Zur Systematik, Phylogenie und vergleichenden Morphologie der Juliden sowie über einige andere Diplopoden. *Archiv für Naturgeschichte*, 65 (1): 183–220.
- VERHOEFF, K. W. (1907): Bekannte und unbekannte Diplopoden aus Deutschland und Österreich-Ungarn. *Mitteilungen aus dem Zoologischen Museum in Berlin*, 3: 261–337.
- VERHOEFF, K. W. (1908): Über Diplopoden. 10. (30.) Aufsatz: Zur Kenntnis der Juliden und über einige Polydesmiden. *Archiv für Naturgeschichte*, 73(1): 423–474.
- VERHOEFF, K. W. (1910): Über Diplopoden. 18. (38.) Aufsatz: Die nordböhmisch-sächsische Fauna und ihre Bedeutung für die Zoogeographie Mitteleuropas. *Sitzungsberichte und Abhandlungen. Naturwissenschaftliche Gesellschaft ISIS, Dresden. 1910 (1911) Abh. S.*, 20–66.
- VERHOEFF, K. W. (1928): Beiträge zur Systematik, Morphologie und Geographie europäischer Ascospermophoren. *Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere*, 54: 243–314.