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Woodlice (Isopoda: Oniscidea) and the centipede Scutigera coleoptrata (Chilopoda) collected from Hungary by the British Myriapod Group in 1994: Notes and observations

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Abstract – Twenty-seven species of woodlice are recorded from Hungary in 1994 during a joint collecting trip undertaken by the British Myriapod Group and Hungarian experts. Five species, *Armadillidium vulgare* (LATREILLE, 1804), *Protracheoniscus politus* (C. KOCH, 1841), *Trachelipus rathkii* (BRANDT, 1833), *Platyarthrus hoffmannseggii* BRANDT, 1833 and *Trachelipus nodulosus* (C. KOCH, 1838), were widely recorded and accounted for 48% of the 1,200 specimens collected. The first Hungarian record of *Trichoniscus provisorius* RACOVITZA, 1908 is given. Records of the apparently rare species, including *Trichoniscus steinboecki* VERHOEFF, 1931, *Hyloniscus vividus* (C. KOCH, 1841), *Haplophthalmus montivagus* VERHOEFF, 1941 and *Lepidoniscus minutus* (C. KOCH, 1838) are presented for semi-natural habitats. It is suggested that some of these species, particularly *H. montivagus*, may have been over looked and consequently may be under recorded.

Other apparently rare species, including *Androniscus roseus* (C. KOCH, 1838), *Oniscus asellus* Linnaeus, 1758, *Porcellio spinicornis* SAY, 1818 and *Armadillidium nasatum* BUDDE-LUND, 1885 are recorded from synanthropic sites. The potential value of synanthropic habitats for Oniscidea is highlighted. A record for the centipede, *Scutigera coleoptrata* LINNAEUS, 1758 is given.

Key words – Woodlice, *Scutigera coleoptrata*, faunistics, Hungary.

INTRODUCTION

Although the first Hungarian woodlouse records were made in 1857, the study of the distribution of the terrestrial Oniscidea had remained relatively under-recorded until the 1980's. At this time the field of isopodology became more popular and research into the occurrence and distribution of woodlice was undertaken, particularly in protected areas such as national parks and biosphere reserves. It was during this phase of recording activity that the British Myriapod Group was invited to Hungary in 1994 to undertake the fieldwork reported here. FORRÓ & FARKAS (1998) gives a full review of past recording of woodlice in Hungary to that date. This publication includes a checklist of 42 species and preliminary distribution maps.

Since the late 1990s there has been a substantial increase in recorder activity. Many species have been recently added to the Hungarian list. Some regions, such as south-western Hungary (Southern Transdanubia) (*e.g.* FARKAS 2004*a*, 2004*b*, 2005, 2006) and northern regions (*e.g.* KONTSCHÁN 2001, 2004), have been relatively well worked. Recently, some species have been added through increased awareness of the value of synanthropic sites. Other, 'cryptic' species have been revealed by detailed examination of species aggregates, particularly within the genus *Trichoniscus* (FARKAS & VILISICS 2006, VILISICS 2007). Currently 57 species are listed as occurring in Hungary (VILISICS 2007). This includes a number of introduced species confined to heated glasshouses (KORSÓS *et al.* 2002).

In 1994 the British Myriapod Group and the British Isopod Study Group (now merged to form the British Myriapod and Isopod Group) was invited to undertake fieldwork in Hungary. The trip was organised by Hungarian researchers, and supported by the Szent István University (then University of Agricultural Sciences), Gödöllő, and the Hungarian Natural History Museum, Budapest. The aim of the joint field meeting was to

collect as many records as possible during a short field trip to the south-western part of Hungary, primarily counties Zala, Somogy and Baranya.

This region was targeted for three main reasons. Firstly, at the time (1994), it was relatively under recorded for millipedes (Diplopoda), centipedes (Chilopoda) and woodlice (Isopoda: Oniscidea). Secondly, there are large tracts of extant semi-natural habitat, including forested limestone hills, some steppe grassland and Europe's largest freshwater lake, Lake Balaton. Finally, the region also has an interesting mix of Atlantic, Mediterranean and Continental climatic influences, which makes for a potentially interesting fauna and flora.

The results for Diplopoda, Chilopoda and Arachnida (spiders and harvestmen) are reported by KORSÓS *et al.* (2006). The intention was to include the terrestrial Isopoda (Oniscidea) within that paper, but it proved difficult to satisfactorily identify several species, primarily in the family Trichoniscidae. Due to the recent interest in this group in Hungary (VILISICS 2007, FARKAS & VILISICS 2006) it was now possible to determine these specimens. This paper completes the picture by presenting the results for the Oniscidea. An additional centipede record, inadvertently omitted from the original paper, is also included.

MATERIALS AND METHODS

Surveys were mainly undertaken in semi-natural habitats, such as old forest and steppe grassland. However, a few synanthropic habitats, including gardens, were also sampled. At most sites specimens were collected by hand searching. As many micro-sites as possible were examined on each site. This mostly entailed searching the underside of large stones and fallen timber as well as the superficial soil layer beneath. Searches were also made in leaf-litter and under the bark of fallen and standing dead wood, especially in damp spots. In addition, at a few sites leaf litter was sieved and pitfall traps were set up.

The list of the collecting localities is given in Table 1, with a basic habitat characterization and UTM grid references. Specimens were collected by STEVE GREGORY, TONY BARBER, DICK JONES, DESMOND KIME, JOHN LEWIS and HELEN READ. The species determinations were made by STEVE GREGORY and specimens are stored in 70% ethanol, principally retained in his personal collection in Oxfordshire, UK. A representative collection has been deposited in the Hungarian Natural History Museum, Budapest.

The species records are summarised in Table 2, which lists the number of localities from which each species was recorded and gives details of the number of specimens collected. In total 1,200 specimens were collected during the field meeting, comprising 27 species of Oniscidea. The scutigeromorph centipede *Scutigera coleoptrata* was also recorded.

Full details of species records are given in the taxonomic listing presented below. The records consist of the locality number (Table 1), the number of collected specimens (differentiated into males, females and immatures) and comments about the collection of the specimens and the known occurrence in Hungary and Europe. Oniscidea species nomenclature follows SCHMALFUSS (2004).

Table 1. List of localities from which woodlice were collected (after KORSÓS *et al.* 2006)

Locality	UTM	County	Site details and outline habitat	Date
No. 1	XP 60	Győr-Moson-Sopron	Hegyeshalom, motorway service station	28 May 1994
No. 3	CT 02	Fejér	Székesfehérvár, M7 motorway, Shell service station	29 May 1994
No. 4	YM 29	Somogy	Szántódpuszta, museum village	29 May 1994
No. 5	XM 97	Somogy	Balatonfenyves, Hotel Fenyves	29 May 1994
No. 6	XM 77	Somogy	Balatonkeresztúr, Keresztúri Forest	29 May 1994
No. 7	XM 77	Somogy	Balatonfenyves, Nagyberek	29 May 1994
No. 8	XM 77	Somogy	Balatonszentgyörgy, Gulya Restaurant	30 May 1994
No. 9	XM 78	Zala	Keszthelyi Mts, Keszthely, Meleg Hill, open scrub	30 May 1994
No. 10	XM 78	Zala	Keszthelyi Mts, Keszthely, Meleg Hill, *Quercus* woodland	30 May 1994
No. 11	XM 78	Zala	Keszthelyi Mts, Vállus, Meleg Hill, *Pinus* woodland	30 May 1994
No. 12	XM 78	Zala	Keszthelyi Mts, Balatongyörök, Meleg Hill, *Fagus* woodland	30 May 1994
No. 14	XM 69	Zala	Keszthelyi Mts, Nagygörbő, Kovácsi Hill, *Carpinus*, *Quercus*, *Castanea* forest	30 May 1994
No. 15	XM 85	Somogy	Hosszúvíz, *Alnus* & *Tilia* forest	31 May 1994
No. 17	XM 84	Somogy	Szenyér *Quercus* forest	31 May 1994
No. 18	XM 94	Somogy	Boronka Landscape Protection Area, Nagybajom, *Pinus* forest	31 May 1994
No. 19	YM 12	Somogy	Zselic Landscape Protection Area, Zselickisfalud, tourist house	31 May 1994
No. 20	YM 13	Somogy	Szenna, Museum Village	01 June 1994
No. 21	YM 12	Somogy	Zselic Landscape Protection Area, Bőszénfa, Kardosfapuszta, *Quercus* woodland	01 June 1994
No. 22	YM 12	Somogy	Zselic Landscape Protection Area, Bőszénfa, Ropolypuszta, *Quercus* woodland	01 June 1994
No. 23	YM 10	Baranya	Csertő reservoir	01 June 1994
No. 24	BS 80	Baranya	Pécs, Fő Square	01 June 1994
No. 25a	BS 81	Baranya	Mecsek Mts, Orfű, camping, lakeside	01 June 1994
No. 26	BS 81	Baranya	Mecsek Mts, Orfű, Remete Meadow, *Pinus* woodland	02 June 1994
No. 28	BS 80	Baranya	Mecsek Mts, Pécs, Rózsa Hill, *Fagus* forest	02 June 1994
No. 30	BS 70	Baranya	Mecsek Mts, Pécs, Sötét Valley, *Fagus* & *Carpinus* forest	02 June 1994
No. 31	BS 71	Baranya	Mecsek Mts, Orfű, Körtvélyes, 450 m asl, *Fagus* & *Carpinus* woodland	02 June 1994
No. 32	BS 71	Baranya	Mecsek Mts, Orfű, Körtvélyes, 300 m asl	02 June 1994
No. 33	BS 81	Baranya	Mecsek Mts, Orfű, Camping, pitfall traps	03 June 1994
No. 34	BS 81	Baranya	Mecsek Mts, Orfű, Lake Pécsi, pitfall traps	03 June 1994
No. 35	BS 81	Baranya	Mecsek Mts, Orfű, Camping, pitfall traps, Pine wood	03 June 1994
No. 36	CS 33	Tolna	Gemenc Landscape Protection Area, Szekszárd, Keselyűs, grassland	03 June 1994

Table 1. (continued)

Locality	UTM	County	Site details and outline habitat	Date
No. 39	DS 01	Csongrád	Ásotthalom, Memorial Forest	03 June 1994
No. 40	DS 32	Csongrád	Szeged, Szív Street, E. Hornung's garden	03 June 1994
No. 42	DS 25	Bács-Kiskun	Pusztaszer Landscape Protection Area, Pusztaszer, Büdösszék	04 June 1994
No. 43	DS 25	Bács-Kiskun	Pusztaszer Landscape Protection Area, Tömörkény, Újmajori Forest, *Quercus* woodland	04 June 1994
No. 44	DS 35	Bács-Kiskun	Pusztaszer Landscape Protection Area, Baks, Palásti Forest, *Quercus* woodland	04 June 1994
No. 45	CT 82	Pest	Pusztavacs, *Convallario-Quercetum* woodland	04 June 1994
No. 47	CT 56	Budapest	Vezér Street, student hostel	04 June 1994

Table 2. Summary of species records: number of localities where found and number of individuals (male, female, juvenile, total) collected. At some sites *Platyarthrus hoffmannseggii* was seen, but specimens were not collected

Species	No. of localities recorded	Rank by no. localities	Number of specimens collected				Relative abundance
			Males	Females	Juvenile	Total	
Ligidium germanicum	3	= 15	6	13	–	19	0.016
Ligidium hypnorum	1	= 22	5	10	–	15	0.013
Androniscus roseus	2	= 17	–	3	–	3	0.003
Haplophthalmus danicus	3	= 15	12	66	–	78	0.065
Haplophthalmus mengii	1	= 22	15	33	–	48	0.040
Haplophthalmus mengii agg.	2	= 17	–	2	–	2	–
Haplophthalmus montivagus	5	12	13	27	–	40	0.033
Hyloniscus riparius	7	= 9	16	46	–	62	0.052
Hyloniscus vividus	2	= 17	4	2	–	6	0.005
Trichoniscus pusillus agg.	6	11	–	16	–	16	0.013
Trichoniscus noricus	2	= 17	2	2	–	4	0.003
Trichoniscus provisorius	1	= 22	4	8	–	12	0.010
Trichoniscus steinboecki	4	= 14	4	12	–	16	0.013
Lepidoniscus minutus	7	= 9	3	6	–	9	0.008
Platyarthrus hoffmannseggii	12	= 4	1	21	–	22 #	0.018 #
Oniscus asellus	1	= 22	–	–	1	1	0.001
Porcellium collicola	11	6	3	35	2	40	0.033
Trachelipus nodulosus	12	= 4	27	70	3	100	0.083
Trachelipus rathkii	15	3	25	44	12	81	0.068
Trachelipus ratzeburgii	10	7	32	46	13	91	0.076
Cylisticus convexus	1	= 22	2	13	–	15	0.013
Protracheoniscus politus	16	2	9	60	43	112	0.093
Porcellio scaber	8	8	25	45	–	70	0.058
Porcellio spinicornis	1	= 22	2	1	1	4	0.003
Porcellionides pruinosus	4	= 14	4	6	–	10	0.010
Armadillidium nasatum	1	= 22	–	3	1	4	0.003
Armadillidium vulgare	26	1	94	152	58	304	0.253
Armadillidium zenckeri	2	= 17	5	6	1	12	0.010
Total number specimens:			313	752	135	1200	

TAXONOMIC LISTING OF WOODLICE (ISOPODA: ONISCIDEA) COLLECTED

Diplocheta: Ligiidae

Ligidium germanicum VERHOEFF, 1901 – 22 (2 males, 4 females), 30 (2 males, 6 females), 32 (2 males, 3 females) – Specimens were collected from three woodland sites in the Zselic Landscape Protection Area and the Mecsek Mountains. These were hand sorted from amongst wet leaf litter and dead wood beside streams, often associated with *Hyloniscus vividus* or *Haplophthalmus montivagus*. This is in keeping with habitat preferences described by FARKAS (2004*a*). *L. germanicum* is widely recorded in southern Transdanubia (FARKAS 2004*a*, 2004*b*, 2005, 2006). This central European species (SCHMALFUSS 2004) has a narrower ecological range than its more widespread congener, *L. hypnorum*, typically occurring in wetter and colder places (GRUNER 1966, TOMESCU *et al.* 2002).

One male specimen had three long setae on the 1 exopodite, a character considered diagnostic of *L. intermedium* RADU, 1950, a species recently reported in Hungary (KONTSCHÁN 2002). However, SCHMALFUSS (2004) suspects that *L. intermedium* may prove to be conspecific with *L. germanicum.* Certainly, in the case of *L. hypnorum* both TOMESCU (1973) and VANDEL (1960) state that the number and length of setae on the 1 exopodite is variable.

Ligidium hypnorum (CUVIER, 1792) – 15 (5 males, 10 females) – This species was collected at a single site at Hosszúvíz, county Somogy, where it was frequent amongst wet leaf litter and dead wood in wet *Alnus* woodland. Here it was associated with *Haplophthalmus mengii* (ZADDACH). *L. hypnorum* occupies a broader ecological range (including wet meadows) than *L. germanicum* (VANDEL 1960, GRUNER 1966, TOMESCU 2002) and it is the most widespread member of the genus in Hungary (FORRÓ & FARKAS 1998). However, it seems to be partially replaced by *L. germanicum* in the forested hills of southern Transdanubia. This is the commonest *Ligidium* in Europe, occurring from Britain through Europe to western Asia (SCHMALFUSS 2004).

Synocheta: Trichoniscidae

Androniscus roseus (C. KOCH, 1838) – 19 (2 females), 20 (1 female) – This small orange species was recorded from two sites close to human habitation in county Somogy. This is in keeping with the synanthropic habitat preference noted by FARKAS (2006) in adjacent county Tolna. *A. roseus* is apparently rare in western Hungary (FARKAS 2004*a*, 2004*b*, 2005, 2006), but sampling has been biased to semi-natural habitats and it is possible that this species has been under-recorded. This is a central European species occurring from eastern France and southern Germany eastwards to Romania (SCHMALFUSS 2004).

Haplophthalmus danicus BUDDE-LUND, 1880 – 5 (9 males, 23 females), 25a (3 males, 37 females), 32 (6 females) – Found at three sites, this small species was found beneath or within dead wood or beneath stones in damp situations, where it was associated with other *Haplophthalmus* sp. and *Hyloniscus* sp. This is the commonest *Haplophthalmus* in Hungary widely distributed in damp habitats (FORRÓ & FARKAS 1998, FARKAS 2004*a*). It occurs throughout Europe and has been widely introduced to other parts of the world (SCHMALFUSS 2004).

Haplophthalmus mengii sensu lato – 5 (1 female), 22 (1 female) – In Hungary, the *H. mengii* species aggregate includes *H. mengii* (ZADDACH, 1844) and *H. montivagus* VERHOEFF, 1941. These species can only be separated by microscopic examination of male specimens and females, listed here, cannot be attributed to a species. On the basis of observations presented below, it is possible that the female specimen collected beside Lake Balaton (Locality 5) is *H. mengii* (ZADDACH, 1844) whilst that from the Zselic Landscape Protection Area (Locality 22) is *H. montivagus* VERHOEFF, 1941.

Haplophthalmus mengii (ZADDACH, 1844) – 15 (15 males, 33 females) – This species was collected, in large numbers, at a single site at Hosszúvíz. It was found amongst wet leaf litter and dead wood in wet *Alnus* woodland, associated with *Ligidium hypnorum*. This species is considered widely distributed in damp habitats in Hungary and is widely recorded from south Transdanubia (FORRÓ & FARKAS 1998; FARKAS 2004*a*; 2004*b*; 2005; 2006). However, in light of this survey work (see *H. montivagus* below) it is possible that some of the records may be based on misidentifications. A re-assessment of collected material, similar to that undertaken for *Trichoniscus* by VILISICS (FARKAS & VILISICS 2006; VILISICS 2007) would be useful. This is a widespread species found throughout Europe and North Africa (SCHMALFUSS 2004).

Haplophthalmus montivagus VERHOEFF, 1941 – 19 (1 male, 1 female), 20 (1 male), 25a (4 males, 11 females), 28 (5 males, 13 females), 32 (2 males, 2 females) – Found at five localities in the well-wooded limestone hills of counties Somogy and Baranya this species was labouriously hand sorted from beneath large stones and dead wood. It was mainly collected from semi-natural deciduous woodland, but also from one synanthropic location. The records listed here are the first for county Somogy. FORRÓ & FARKAS (1998) list two records for *H. montivagus* from north-eastern Hungary, made by STROUHAL in the 1960's. A recent record is given from the Mecsek Mountains (VILISICS 2007, FARKAS & VILISICS 2006), but this species is considered to be rare and probably under-recorded in Hungary. The taxonomy of the *H. mengii* species aggregate is complicated and has been much confused (HOPKIN & ROBERTS 1987). This would appear to be the case in Hungary and the records presented here suggest that *H. montivagus* has been previously overlooked on the Transdanubian limestone hills. Two characters of the male 7 pereopod readily separate the two species (Figs 1–2). Firstly, the position and size of the spine on the inner face of the carpus. Secondly, the shape of the spines on the propodus. Unfortunately, this latter character is over-looked by GRUNER (1966). Occurring from the British Isles to Poland and south to Italy, *H. montivagus* has a wide European distribution (SCHMALFUSS 2004).

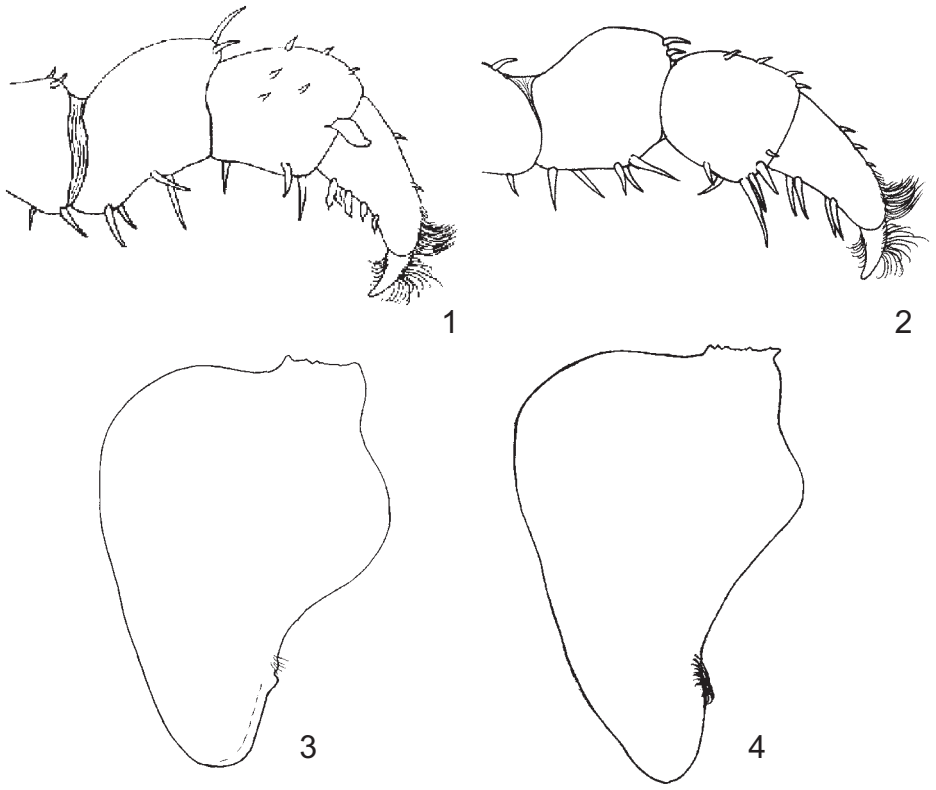
Hyloniscus riparius (C. KOCH, 1838) – 5 (8 males, 12 females), 15 (1 male, 2 females), 20 (2 males), 23 (4 females), 25a (1 male, 5 females), 26 (1 female), 36 (4 males, 22 females) – This species was recorded at seven localities. Interestingly, it was only the 7 most widely recorded species in this survey, whereas FARKAS (2004*a*, 2005, 2006) found it to be the first or second most commonly encountered species. This may be explained by differences in collecting methods (BMG mainly hand-searched, whereas FARKAS mainly pitfall trapped). *H. riparius* is considered widespread, if not common, in damp habitats throughout Hungary (FORRÓ & FARKAS 1998, FARKAS 2004*a*). This is a common species found throughout central and eastern Europe and introduced into North America (SCHMALFUSS 2004).

Hyloniscus vividus (C. KOCH, 1841) – 30 (2 males, 2 females), 32 (2 males) – Collected from two localities in the Mecsek Mountains this species was taken from waterlogged dead wood in forested ravines. This is a similar habitat to that described as typical by FARKAS (2004*a*). Despite its distinctive 'striped' appearance there has been much taxonomic confusion regarding this species. Consequently, it was not mapped by FORRÓ & FARKAS (1998), but has subsequently proved to be widespread in the Mecsek Mountains and adjacent county Somogy (FARKAS 2004*a*, 2005). However, *H. vividus* has a very restricted distribution elsewhere and, apart from south-western Hungary is only known from adjacent Slovenia and Herzegovina (SCHMALFUSS 2004).

Trichoniscus pusillus sensu lato – 12 (2 females), 15 (7 females), 17 (3 females), 19 (1 female), 21 (6 females), 25a (1 female) – Species within the *Trichoniscus pusillus* aggregate can only be reliably separated by microscopic examination of male specimens. Females, grouped together here, cannot be easily attributed to a species. In Hungary, this species aggregate is likely to include three species: *T. noricus* VERHOEFF, 1917; *T. provisorius* RACOVITZA, 1908; and the parthenogenetic *T. pusillus* BRANDT, 1833. Some of the specimens collected may refer to the genuine *T. pusillus* BRANDT, 1833 (for example those from locality 15: wet *Alnus* woodland at Hosszúvíz). However, since males of *T. pusillus* BRANDT, 1833 occur at about 1% of the population in Europe (GRUNER 1966), it is almost impossible to confirm the occurrence of this species from male specimens. At some localities, *e.g.* 17 and 21, more than one species seem to be present. *Trichoniscus pusillus* sensu lato is widely distributed in damp habitats throughout Hungary, but it is apparent from the large proportion of males in published lists (*e.g.* FARKAS 2004*a*, 2005, 2006) that other *Trichoniscus* species are present. This has been confirmed by VILISICS (2007) who has recently undertaken a review of these *Trichoniscus* specimens. The true *T. pusillus* BRANDT, 1833 has yet to be formally recorded from Hungary (VILISICS, personal communication), but is widely dispersed across Europe, especially in the west and north of the Alps and has been introduced into North America (SCHMALFUSS 2004).

Trichoniscus noricus VERHOEFF, 1917 – 28 (1 male, 2 females), 30 (1 male) – Males of this species were collected at two woodland sites in the Mecsek Mountains. Specimens were sieved from woodland leaf-litter and in both samples *T. steinboecki* was also present. Although, FORRÓ & FARKAS (1998) list a few historical records in northern Hungary it has become apparent that *T. noricus* is both under recorded and has been subject to

misidentification in the past (VILISICS 2007). The male *T. noricus* specimens examined had the 1 exopodite having a somewhat more 'square' appearance (Fig. 3) and the tip wider and more obviously rounded than seen in *T. provisorius* (Fig. 4). The length to width ratio of 1.5 is comparable to that figured in GRUNER (1966). Currently, this is the only member of the *T. pusillus* species aggregate that has been formally recorded from Hungary (FORRÓ & FARKAS 1998). This species has a central European distribution (SCHMALFUSS 2004).



Figs 1–4. 1 = *Haplophthalmus mengii* sensu lato, male seventh pereopod, posterior view. Specimen from *Alnus* woodland, Hosszúvíz, county Somogy. Note prominent spine on inner face of carpus and blunt spines on propodus. 2 = *Haplophthalmus montivagus* VERHOEFF, 1941, male seventh pereopod, posterior view. Specimen from deciduous woodland, Sötét Valley, Mecsek Mountains, county Baranya. Note absence of prominent spine on inner face of carpus and pairs of long tapered spines on propodus. 3 = *Trichoniscus noricus* VERHOEFF, 1917, male first exopodite. Specimen from deciduous woodland, Sötét Valley, Mecsek Mountains, county Baranya. 4 = *Trichoniscus provisorius* RACOVITZA, 1908, male first exopodite. Specimen from shore of Lake Balaton, Balatonfenyves, county Somogy

Trichoniscus provisorius RACOVITZA, 1908 – 5 (4 males, 8 females) – This is the first record of *Trichoniscus provisorius* RACOVITZA, 1908 in Hungary. Specimens were collected from under stones at the edge of Lake Balaton. It is surprising that there are no previously published Hungarian records for this widespread European species. The male 1st exopodite of the examined specimens are noticeably more elongate and more tapered towards the tip (Fig. 4) than seen in *T. noricus* (Fig. 3). The length to width ratio of 1.66 conforms to figures in GRUNER (1966) and VANDEL (1960). Considering the close similarity to *T. noricus* it has almost certainly been overlooked elsewhere in Hungary. This is a very widespread species, occurring across Europe, North Africa, the Middle East and introduced elsewhere (SCHMALFUSS 2004).

Trichoniscus steinboecki VERHOEFF, 1931 – 22 (1 male, 3 females), 28 (1 male, 7 females), 30 (1 male), 32 (1 male, 2 females) – Males of this species were found at four sites; all deciduous forests in hilly areas. The majority of the specimens were sieved from woodland leaf-litter, often associated with *T. noricus* and *Lepidoniscus minutus*. Thus, it would appear to be associated with slightly drier microsites than *L. germanicum, Hyloniscus vividus* and *Haplophthalmus montivagus* that were recorded from saturated ground at many of the same localities. *T. steinboecki* has only recently been recorded from Hungary (FARKAS 2006, FARKAS & VILISICS 2006), but VILISICS (2007) believes this species is under recorded and will prove to be widespread in Transdanubia. The results presented here certainly support this view. The male 1st exopodite and 7th pereopod are figured by VILISICS (2005). Elsewhere, this species has only previously been recorded from Eastern Austria (SCHMALFUSS 2004).

Crinocheta: Philosciidae

Lepidoniscus minutus (C. KOCH, 1838) – 11 (1 female), 14 (1 female), 17 (2 males), 21 (2 females), 22 (1 female), 31 (1 male), 32 (1 female) – Although collected at seven localities, this attractively mottled species was only collected in small numbers. Specimens were typically sieved from woodland leaf-litter (often along with *T. steinboecki*) in well-forested hilly areas. In the Mecsek Mountains, it was one of two species found at 450m a.s.l. (the other being *Protracheoniscus politus*). VILISICS (2007) demonstrates a strong association of this species with land over 300 m a.s.l. In the Transdanubian hills *L. minutus* is widely recorded (FARKAS 2004*a*, 2004*b*, 2005), but VILISICS (2007) also demonstrates the occurrence of this species in forested mountains of northern Hungary. Although essentially a Central European species, the distribution of *L. minutus* extends as far south as northern Greece (SCHMALFUSS 2004).

Crinocheta: Platyarthridae

Platyarthrus hoffmannseggii BRANDT, 1833 – 4 (1 female), 5 (12 females), 9 (seen), 12 (2 females), 14 (seen), 15 (1 female), 19 (2 females), 20 (1 male, 1 female), 24 (seen), 25a

(2 females), 42 (seen), 47 (seen) – This species was readily found by searching for ant nests beneath stones in sunny locations. It was recorded at twelve localities. The relatively high occurrence of this species reported here (it is the 4 most common species) is probably due to the targeted hand searching methods employed. The majority of other published records (*e.g.* those of FARKAS & KONTSCHÁN) use pit-fall traps, which are not ideally suited to catch this species. Nonetheless, *P. hoffmannseggii* is known to have a wide distribution across Hungary (FORRÓ & FARKAS 1998, FARKAS 2004*a*). Elsewhere it occurs throughout Europe, North Africa, Asia Minor and has been introduced into North America (SCHMALFUSS 2004).

Crinocheta: Oniscidae

Oniscus asellus LINNAEUS, 1758 – 20 (1 juv.) – A single immature specimen was collected from Szenna, Museum Village in county Somogy. Other synanthropic woodlice, such as *A. roseus* and *Porcellio spinicornis,* were also recorded here suggesting a high degree of human disturbance. Although this Atlantic species is common as far eastwards as Bohemia (FLASAROVÁ 1995), *O. asellus* is near the eastern edge of its European range in Hungary. It is considered rare in Hungary (CSORDÁS *et al.* 2005) and FORRÓ & FARKAS (1998) list just three records. However, there are recent records from synanthropic sites in the Mecsek Mountains (FARKAS & VILISICS 2006, VILISICS 2007) and it is possible that the species may be found at other synanthropic sites. This species is common across much of northern and western Europe and has been widely introduced into the Americas (SCHMALFUSS 2004).

Crinocheta: Trachelipodidae

Porcellium collicola (VERHOEFF, 1907) – 6 (2 females), 7 (1 female), 15 (1 male, 5 females), 18 (1 female), 19 (3 females), 21 (1 female), 23 (1 male), 25a (1 female, 2 juv.), 32 (2 females), 36 (1 male, 10 females), 45 (9 females) – Discovered at eleven localities, this was the 6 most frequently encountered species. Other studies in southern Transdanubia (FARKAS 2004*a*, 2005, 2006) have also shown *P. collicola* to be one of the commonest species in this area. The records presented here suggest an affinity for damp habitats, as preference noticed by FARKAS (2005) and also FLASAROVÁ (1995) in Bohemia. This is a central European species found from southern Germany and Poland southwards to northern Greece (SCHMALFUSS 2004).

Trachelipus nodulosus (C. KOCH, 1838) – 1 (1 male, 1 female), 4 (4 males, 2 females, 2 juv.), 5 (1 male), 19 (2 males, 5 females, 1 juv.), 20 (7 males, 10 females), 23 (2 males), 25a (2 males, 7 females), 32 (8 females), 39 (3 males, 24 females), 40 (4 males, 6 females), 43 (6 females), 45 (1 male, 1 female) – This species, recorded at twelve localities, was the 4 most widely collected woodlouse. This is a relatively high occurrence, compared to other published records for southern Transdanubia (*e.g.* FARKAS 2004*a*, 2005, 2006). This species is

known to have a preference for drier sites than *T. rathkii* (SCHMIDT 1997), but the two species were often collected at the same locality, possibly occupying different micro-sites. Although widely recorded in Hungary (FORRÓ & FARKAS 1998) it is less frequent than its congener *T. rathkii*. *T. nodulosus* has a central European distribution from southern Germany and Poland southwards to Serbia and Bulgaria (SCHMALFUSS 2004).

Trachelipus rathkii (BRANDT, 1833) – 5 (1 male, 1 female), 8 (1 male, 1 female), 15 (2 males), 22 (2 males), 25a (2 females), 26 (2 females), 28 (2 males, 6 females, 2 juv.), 30 (1 female), 32 (1 male, 1 female), 33 (1 male), 34 (3 males), 36 (9 males, 23 females, 8 juv.), 42 (1 male, 2 females), 43 (1 male, 3 females), 44 (1 male, 2 females, 2 juv.) – This was the third most frequently recorded species found at fifteen localities. *T. rathkii* was collected from a wide variety of habitats, but typically grassland habitats and open woodland. It appeared to be partially replaced by *T. nodulosus* at drier sites and by *T. ratzeburgii* in dense woodland. This is a common and widely distributed species in Hungary (FORRÓ & FARKAS 1998) and one of the most frequently encountered species in southern Transdanubia (FARKAS 2004*a*, 2005, 2006). Although found in all types of habitats, disturbed or rural, throughout Hungary, it requires relatively humid conditions. This is the commonest *Trachelipus* occurring throughout Europe, except in the Mediterranean basin (SCHMALFUSS 2004).

Trachelipus ratzeburgii (BRANDT, 1833) – 11 (5 males, 5 females), 14 (1 male, 4 females), 15 (2 males, 11 females, 3 juv.), 18 (3 males, 4 females, 2 juv.), 19 (1 male, 2 juv.), 21 (3 males, 2 juv.), 22 (10 males, 14 females, 1 juv.), 30 (3 males, 3 females, 2 juv.), 32 (1 male, 2 females), 36 (3 males, 3 females, 1 juv.) – Collected in good numbers, this large species was recorded at ten localities. Typically it was found in densely wooded hills, including stands of *Quercus, Fagus, Carpinus* and *Pinus*. According to FORRÓ & FARKAS (1998) *T. ratzeburgii* appears to be restricted to the western Hungary (*i.e.* Transdanubia), and FARKAS (2004*a*) describes it as characteristic of south Transdanubian woodlands. However, recent records indicate a much broader distribution in Hungary. This includes the Northern Mountains (Mátra and Zempléni Mts) (KONTSCHÁN 2004, KONTSCHÁN *et al.* 2006) and, in the lowlands, climax *Quercus* forest in the Szigetköz, north-east Hungary (HORNUNG, unpublished data) and rural and suburban *Quercus* forests in Debrecen, eastern Hungary (HORNUNG *et al.* 2007). It is widely distributed throughout central and eastern Europe (SCHMALFUSS 2004) and characteristic of woodlands (GRUNER 1966).

Crinocheta: Cylisticidae

Cylisticus convexus (DE GEER, 1778) – 25 (2 males, 13 females) – Specimens were found at a single locality under stones on dry ground, near a lake in the Mecsek Mountains. Here it was associated with *T. nodulosus* and *Armadillidium vulgare*. *C. convexus* is widely distributed in synanthropic locations in Hungary (FORRÓ & FARKAS 1998) and has proved to be frequent in southern Transdanubia (FARKAS 2004*a*, 2004*b*, 2005, 2006). This widely

distributed species is found throughout Europe and Asia Minor and introduced to northern Africa and the Americas (SCHMALFUSS 2004).

Crinocheta: Agnaridae

Protracheoniscus politus (C. KOCH, 1841) – 6 (2 females, 1 juv.), 9 (4 females), 10 (1 male), 11 (9 females, 3 juv.), 12 (1 male, 3 females, 2 juv.), 14 (4 females, 2 juv.), 15 (10 females, 7 juv.), 17 (1 female, 4 juv.), 19 (1 female), 21 (2 males, 8 females, 13 juv.), 22 (3 females), 26 (3 females, 3 juv.), 28 (2 males, 8 females, 2 juv.), 30 (3 males, 1 female, 3 juv.), 31 (2 females, 3 juv.), 33 (1 female) – Found at sixteen localities, this was the second most commonly collected species. It was particularly associated with the well-wooded hills of the Mecsek and Keszthelyi Mountains, where it was found in all woodland types. It was one of two species found at 450 m a.s.l. in the Mecsek Mountains (the other being *L. minutus*). This species favours leaf litter in forests (GRUNER 1966) and several specimens were collected by sieving leaf-litter. FARKAS (2004*a*) considers *P. politus* to be characteristic of south Transdanubian woodlands. This is a central European species found from Germany and Poland southwards to Montenegro and Romania (SCHMALFUSS 2004).

Crinocheta: Porcellionidae

Porcellio scaber LATREILLE, 1804 – 5 (10 males, 13 females), 14 (2 females), 19 (1 male, 1 female), 20 (3 females), 24 (5 males, 10 females), 32 (1 male, 1 female), 40 (4 males, 6 females), 47 (4 males, 9 females) – This was one of the more frequently recorded woodlice, collected at eight localities. It was most numerous in synanthropic sites, but small numbers were occasionally encountered in apparently semi-natural forest. *P. scaber* is widespread in Hungary (FORRÓ & FARKAS 1998), but typically associated with synanthropic sites (*e.g.* FARKAS 2004*a*, 2006). Although commonest in the west, this species can be found throughout much Europe and has been introduced to many parts of the world (SCHMALFUSS 2004).

Porcellio spinicornis SAY, 1818 – 20 (2 males, 1 female, 1 juv.) – A few specimens were collected from beneath the bark of a live apple tree *Malus* sp. Although, normally associated with calcareous rocks, walls or ruins in dry exposed situations (TOMESCU *et al.* 1995, FLASAROVÁ 1995), the bark of *Malus* is calcareous. There a several, mainly historic, records for *P. spinicornis* in northern Hungary (FORRÓ & FARKAS 1998), but the species has not been found in recent surveys in south Transdanubia (FARKAS 2004*a*, 2004*b*, 2005, 2006). It is either rare or, because of its specialist habitat niche, *P. spinicornis* has been over-looked and under-recorded. This is a widely dispersed species occurring throughout northern and central Europe and introduced into North America (SCHMALFUSS 2004).

Porcellionides pruinosus (BRANDT, 1833) – 1 (1 male), 4 (2 females), 19 (3 males), 42 (4 females) – Collected at four localities, all with clear synanthropic influences, specimens

were found beneath stones and dead wood. It has been frequently recorded in south Transdanubia (FARKAS 2004*a*, 2004*b*, 2005, 2006) and considered synanthropic in its occurrence. Although originating in the Mediterranean area, *P. pruinosus* is a cosmopolitan synanthrope elsewhere (SCHMALFUSS 2004).

Crinocheta: Armadillidiidae

Armadillidium nasatum BUDDE-LUND, 1885 – 24 (3 females, 1 juv.) – Specimens were collected from beneath stones in a flowerbed in Fo Square, Pécs city centre. Here it was associated with the ubiquitous *A. vulgare* and the centipede *Scutigera coleoptrata*. This is the earliest recorded occurrence of *A. nasatum* in Hungary. The first formal record of *A. nasatum*, also from Pécs, was not made until 1998 when it was collected from glasshouses in the Botanic Gardens (FORRÓ & FARKAS 1998, FARKAS & VADKERTI 2002). Subsequently, KONTSCHÁN & HORNUNG (2001) report its occurrence in heated glasshouses in the cities of Szeged, Eger and Debrecen. Although KORSÓS *et al.* (2002) reports its preference for glasshouses, it is clearly able to survive outdoors, suggesting it may prove more widespread in other Hungarian cities. SCHMALFUSS (2004) considers *A. nasatum* to be native in western Europe, but has been widely introduced, and typically synanthropic, across northern and eastern Europe and North America.

Armadillidium vulgare (LATREILLE, 1804) – 1 (1 female), 3 (3 males, 5 females, 4 juv.), 4 (2 males, 1 female, 2 juv.), 5 (11 males, 11 females), 6 (2 females, 1 juv.), 7 (2 females), 15 (12 males, 11 females, 5 juv.), 17 (3 males, 1 juv.), 18 (1 male, 4 females, 1 juv.), 19 (2 males, 9 females, 9 juv.), 20 (1 male, 6 females, 9 juv.), 23 (6 males, 4 females), 24 (1 female), 25a (1 male, 4 females, 3 juv.), 26 (3 males, 3 females), 32 (2 males), 33 (1 juv.), 35 (1 male), 36 (5 males, 16 females, 6 juv.), 39 (9 males, 15 females, 5 juv.), 40 (8 males, 10 females, 4 juv.), 42 (2 males, 6 females), 43 (9 males, 6 females, 2 juv.), 44 (7 males, 15 females), 45 (4 males, 14 females, 2 juv.), 47 (2 males, 6 females, 3 juv.) – This was by far the most widely recorded species; some 304 specimens were collected from 26 localities (Table 2). It proved to be common in both semi-natural habitats, such as open forest and grassland, and synanthropic habitats, including human habitation. However, this species was less frequently collected from hilly localities and was scarce or absent in the Zselic Landscape Protection Area, the Keszthely Mountains and the Mecsek Mountains: an observation also suggested by FARKAS (2004*a*). Otherwise, *A. vulgare* is widely distributed and common in Hungary (FORRÓ & FARKAS 1998). Although native to the Mediterranean region, it has been introduced to all parts of the world (SCHMALFUSS 2004).

Armadillidium zenckeri BRANDT, 1833 – 8 (5 males, 3 females), 23 (3 females, 1 juv.) – This species, superficially similar to *A. vulgare*, was collected from two localities. At both sites it was found beneath dead wood in damp grassland. This is in keeping with preferences in Germany where *A. zenckeri* favours moist open habitats, such as marshy meadows and scrub (GRUNER 1996). Very few records are listed in FORRÓ & FARKAS (1998), but

recent surveys have proved it to be widespread in southern Transdanubia (*e.g.* FARKAS 2004*a*, 2005, 2006). Elsewhere, this species occurs across eastern central Europe (SCHMALFUSS 2004).

A RECORD OF CHILOPODA: SCUTIGEROMORPHA

Scutigera coleoptrata (LINNAEUS, 1789) – 24 (1 specimen) – This distinctive centipede was collected from beneath a stone, associated with *Armadillidium* spp., in a flowerbed in Fo Square, Pécs city centre. The record is reported here because it was inadvertently omitted from KORSÓS *et al.* (2006). *S. coleoptrata* is widespread in Hungary. This species is possibly indigenous to the Mediterranean basin, but has been widely introduced into much of Europe, Asia and North America (EASON 1964).

DISCUSSION

The five most frequently recorded species during this survey were *A. vulgare* (26 localities), *P. politus* (16 localities), *T. rathkii* (15 localities) *P. hoffmannseggii* and *T. nodulosus* (both 12 localities). These five species account for 48% of the woodlouse records made during the field trip (Table 2). In general species abundance, distribution and habitat preferences were similar to that observed by FARKAS (2004*a*, 2004*b*, 2005, 2006), during systematic surveys of counties Somogy, Baranya and Tolna. Some subtle differences are discussed below.

The two woodlice found most frequently by FARKAS , *i.e. H. riparius* and *P. collicola*, were ranked 10 and 6 respectively by this survey (Table 2). Clearly, FARKAS had a considerably larger data set collected in a more systematic way. However, his collection was biased to pit-fall trap samples, whereas the data presented here is derived primarily from hand searching. It is possible that these two species are surface-active, readily caught in pitfalls, but not easily collected by hand. Hand searching and sieving of leaf litter is more productive for sedentary species, such as the elusive trichoniscids *H. montivagus* and *T. steinboecki*, which are rarely caught in pitfall traps. It has been shown that hand searching, rather than pit-fall trapping, is more likely to provide accurate data on species diversity and abundance for millipedes (MESIBOV *et al.* 1995). The same is likely to be true of terrestrial isopods.

The most interesting areas in terms of species richness and species rarity proved to be the Mecsek Mountains (county Baranya) and the Zselic Landscape Protection Area (county Somogy). Certainly, the Mecsek are well known to hold an interesting woodlouse fauna (FARKAS 2005, FARKAS & VILISICS 2006). It was only in these areas that *L. germanicum, H. montivagus, H. vividus, T. noricus* and *T. steinboecki* were recorded. Hosszúvíz, where a number of interesting millipedes were collected (KORSÓS *et al* 2006), and the shores of Lake Balaton (both county Somogy) were also quite rich in Oniscidea species, but these were generally more widespread species such as *L. hypnorum, H. danicus* and *H. mengii*. A number of interesting millipedes were also found in the Keszthely Mountains (county Zala) (KORSÓS *et al.* 2006), but other than a few widespread Oniscidea species characteristic of forested hills, such as *P. politus* and *L. minutus*, no woodlice of note were recorded here.

Several apparently rare species were collected from synanthropic sites, in both urban and rural areas. Good examples are *A. roseus, P. spinicornis, O. asellus* and *A. nasatum*. This illustrates the value of synanthropic habitats for many species, otherwise near the edge of their natural ranges. VILISICS & HORNUNG (2009) report that 49% of the Hungarian Oniscidea fauna has been recorded from Budapest and its environs. In Britain, 83% of the Oxfordshire's native or naturalized woodlice (*i.e.* those that occur outdoors) have been collected from churchyards or gardens (GREGORY 2001). This equates to 65% of the British fauna, making this the most diverse habitat type in Oxfordshire. Synanthropic habitats are typically heterogeneous in structure and are afford protection from climatic extremes. Considering the ease with which many Oniscidea species are readily dispersed by human agency then it is probable that synanthropic species are under-recorded in both urban and rural areas.

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