The isopod fauna of the Pilis Biosphere Reserve I. Basaharc loess mine

By

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Abstract. The terrestrial isopod fauna of Basaharc, an abandoned loess mine in the Pilis Biosphere Reserve was studied. Five species were found, among which *Armadillidium vulgare* was highly dominant. The abundance of isopods increases along a humidity gradient. The isopod fauna of Basaharc is poor, which is probably due to the dryness of the area.

Introduction

The flora and fauna of the Pilis Mountains have been studied for decades. So far only plant studies led to a comprehensive work (HORÁNSZKY, 1964), much less is known about the animals, especially the invertebrates there. In 1981 a large part of the area became a Biosphere Reserve resulting in a more coordinated research (BERCZIK, 1984), that includes not only faunistic surveys but ecological studies as well (e.g. TÖRÖK, 1987).

Research on the terrestrial isopod fauna of the area began in 1982. Although the isopod species ocurring in Hungary are relatively well known, very little data are available on the population characteristics of this arthropod group (but see HORNUNG, 1988). In this paper such data on the isopod fauna of Basaharc, an abandoned loess mine in the Pilis Mountains are given.

Materials and methods

The Basaharc area lies on the Pilis foothills, near the river Danube. The steep (50 – 60°) walls of the lately abandoned mine are covered with vegetation. The area of the old mine is cut by erosion. The whole study site is warm and dry. The following sites were used for collection: *1.* Astragalo-Festucetum sulcatae, NE slope of the mine; *2.* Astragalo-Festucetum sulcatae, N slope of the mine; *3.* *Calamagrostis epigeios* vegetation, on the top the loess wall; *4.* Festucetum valesiaceae, slight SE slope; *5.* Festucetum valesiaceae Diplachneval, a ravine; *6.* A gully

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with stagnant water; *7*. Festucetum valesiaceae, another ravine; *8*. Fragment of an *Acer tataricum-Quercus petraea* forest. For further details of the study site see LOKSA (1988).

Animals were collected by pitfall traps during the growing season of 1985. Five traps (modified Barber-traps) were placed at each site except sites 2 and 8 where ten traps were used (samples 2, 2a and 8, 8a). Traps were emptied three times: May 29, July 26 and October 1. Isopods were stored in 70% methanol. Each individual was identified, its sex, maturity (adult or juvenile) determined. In case of females the existence of full or empty marsupium was also recorded.

Results and discussion

Species composition and distribution

The 50 traps caught a total of 2365 individuals belonging to one of the following five species: *Hyloniscus riparius* C.L. KOCH, *Porcellium collicola* VERH., *Protracheoniscus amoenus* C. L. KOCH, *Trachelipus nodulosus* C. L. KOCH, *Armadillidium vulgare* LATR. (Table 1). Both spatially and seasonally *A. vulgare* is the dominant species. The two exceptions are site 2 and 8 where in certain periods of the year *A. vulgare* and *P. collicola* were about equally abundant.

Table 1. Occurrence of the five isopod species on the eight collecting sites. Spring, summer and autumn samples are pooled. (H. rip. = Hyloniscus riparius; P. coll. = Porcellium collicola; P. am. = Protracheoniscus amoenus; T. nod. = Trachelipus nodulosus; A. vulg. = Armadillidium vulgare)

Site	H. rip.	P. coll.	P. am.	T. nod.	A. vulg.	Total
1		8		14	196	218
2		178			402	580
3		19		2	127	148
4		22		3	69	94
5		1		3	177	181
6	14	12			275	301
7		9			131	140
8		303	1		399	703
Total ..	14	552	1	22	1776	2365
D (%) .	0.59	23.34	0.04	0.93	75.10	100%

Although direct measurements were not performed to determine the exact humidity of the different collecting sites, a rough ranking was possible based upon their geographical and topographical characteristics, vegetation and our field observations. Fig. 1 shows the changes in the abundance of isopods along this humidity gradient. Both the total number of isopods and the abundance of *A. vulgare* increase with humidity, which indicates that even for this relatively drought tolerant species humidity may be a limiting factor.

The highest (416) and lowest (94) abundances were found in collecting sites 8a and 4, respectively. This is partly due to the humidity of the area. Isopods do occur in dry areas but there they seek for humid microhabitats or have other behavioural mechanisms to avoid desiccation. On the relatively dry areas (sites 3, 4, 5) only the more tolerant species *(A. vulgare, P. collicola, T. nodulosus)* occur. It is very interesting, however, that between the two ravines where stagnant water is found, the traps cought *H. riparius*, this extremely hygrophyl species throughout the whole collecting period. On site *8 P. amoenus* was found. This species probably used to be much more abundant, when the *Acer tataricum-Quercus petraea* forest was bigger. Now only patches of this forest remained on the area.

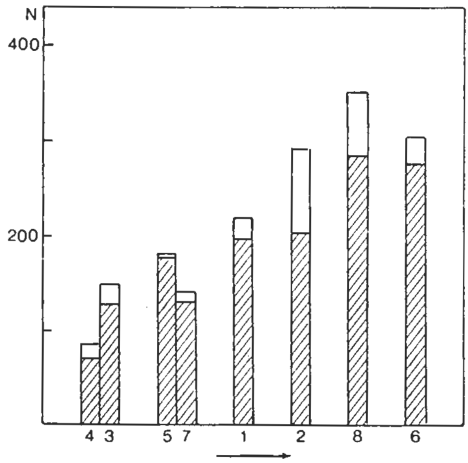

Fig. 1. Change in the total number of isopods along a humidity gradient. (Hatched columns: *A. vulgare* only. Sites 3 and 4 as well as sites 5 and 7 belong to the same category. Columns 2 and 8 represent the average of samples 2 – 2a and 8 – 8a, respectively)

Population characteristics

Only *A. vulgare* and *P. collicola* had high enough abundances to obtain population data. Since collecting with pitfall traps is a relative method, it cannot provide density data. It is appropriate, however, for comparison among the collecting sites. The results are shown on Fig. 1 and Tables 2 and 3.

Percentage of females with full or empty marsupium was highest in summer for both *A. vulgare* and *P. collicola* (44% and 95%, respectively) indicating a breeding period this time of the year. In case of *A. vulgare* high number of juveniles in periods II. and III. confirms this. Among these juveniles there were many very young, recently released ones. In case of *P. collicola* the low number of juveniles is due to their very small size. These tiny animals do not fall into the traps. Even the very few individuals noted as juveniles were rather subadults. They are fairly difficult to distinguish from young adults, especially in case of females. In autumn the percentage of *P. collicola* females with brood pouch was still relatively high (39%) showing a breeding period at this time of the year as well.

Table 2. Distribution of Armadillidium vulgare by sex and maturity on the eight collecting sites. The material of five traps is pooled in one sample. (I = March 27 – May 29; II = May 30 – July 26; III = July 29 – September 1. M = males; Fbp = females with brood pouch; Fnbp = females without brood pouch; Juv = juveniles)

Site		Armadillidium vulgare			Total
		I.	II.	III.	
1	M	11	14	28	
	Fbp	1	7	1	
	Fnbp	7	2	21	196
	Juv	15	54	35	
	M	16	25	19	
	Fbp	0	8	4	
2	Fnbp	11	14	18	203
	Juv	17	47	24	
	M	13	28	16	
	Fbp	0	3	3	
2a	Fnbp	6	5	20	199
	Juv	12	48	45	
	M	8	26	3	
	Fbp	0	7	0	
3	Fnbp	6	8	2	127
	Juv	14	40	13	
	M	11	2	0	
	Fbp	0	2	0	
4	Fnbp	10	0	1	69
	Juv	34	7	2	
	M	12	11	8	
	Fbp	1	3	0	
5	Fnbp	10	3	12	177
	Juv.	23	56	38	
	M	21	21	5	
	Fbp	0	11	0	
6	Fnbp	19	1	10	275
	Juv	17	82	88	
	M	12	16	8	
	Fbp	0	5	1	
7	Fnbp	6	3	8	131
	Juv	24	30	18	
	M	21	26	15	
	Fbp	0	3	3	
8	Fnbp	21	19	16	168
	Juv	4	14	26	
	M	41	26	24	
	Fbp	0	5	0	
8a	Fnbp	14	13	7	231
	Juv	17	56	28	
Total		455	751	570	1776

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3	Fnbp	6	8	2	127
	Juv	14	40	13	
	M	11	2	0	
	Fbp	0	2	0	
4	Fnbp	10	0	1	69
	Juv	34	7	2	
	M	12	11	8	
	Fbp	1	3	0	
5	Fnbp	10	3	12	177
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6	Fnbp	19	1	10	275
	Juv	17	82	88	
	M	12	16	8	
	Fbp	0	5	1	
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	Juv	24	30	18	
	M	21	26	15	
	Fbp	0	3	3	
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	Juv	4	14	26	
	M	41	26	24	
	Fbp	0	5	0	
8a	Fnbp	14	13	7	231
	Juv	17	56	28	
Total		455	751	570	1776

Table 3. Distrubution of Porcellium collicola by sex and maturity on the eight collecting sites. (For further explanation see Table 2)

Site		Porcellium collicola I.	Porcellium collicola II.	Porcellium collicola III.	Total
1	M	5	0	0	8
	Fbp	1	0	0	
	Fnbp	2	0	0	
	Juv	0	0	0	
2	M	19	6	11	93
	Fbp	0	4	7	
	Fnbp	28	1	14	
	Juv	0	0	3	
2a	M	16	2	14	85
	Fbp	3	8	1	
	Fnbp	12	2	21	
	Juv	5	0	1	
3	M	1	3	0	19
	Fbp	0	8	4	
	Fnbp	1	0	2	
	Juv	0	0	0	
4	M	18	0	0	22
	Fbp	1	0	0	
	Fnbp	3	0	0	
	Juv	0	0	0	
5	M	0	0	0	1
	Fbp	0	1	0	
	Fnbp	0	0	0	
	Juv	0	0	0	
6	M	3	0	2	12
	Fbp	0	1	0	
	Fnbp	2	1	3	
	Juv	0	0	0	
7	M	4	0	1	9
	Fbp	0	2	0	
	Fnbp	2	0	0	
	Juv	0	0	0	
8	M	15	0	16	118
	Fbp	5	11	12	
	Fnbp	8	0	51	
	Juv	0	0	0	
8a	M	30	10	8	185
	Fbp	2	45	48	
	Fnbp	21	0	21	
	Juv	0	0	0	
Total		207	105	240	552

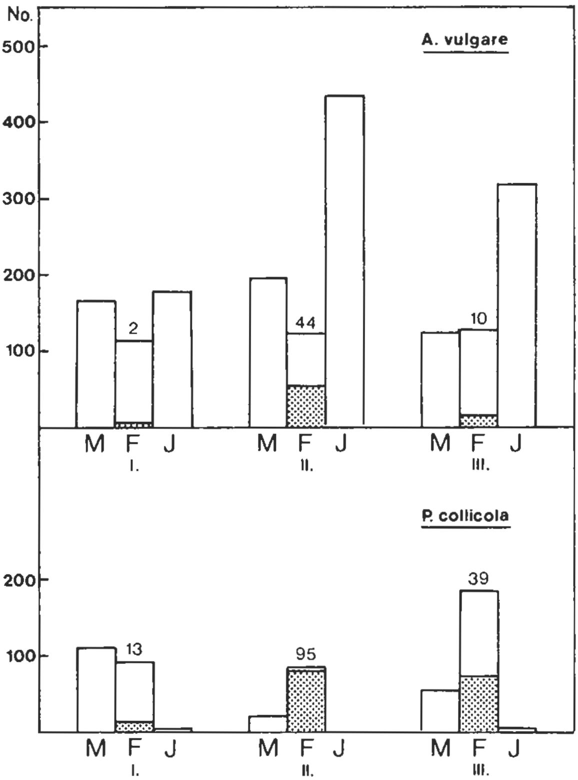

Fig. 2. Seasonal change in abundance of the two dominant isopod species in the Basaharc area. (Columns represent the sum of the individuals caught at the eight sites. M: males, F: females, J: juveniles. Shaded columns: females with brood pouch. Numbers above the columns: percentage of females with brood pouch)

Isopods are known to show reproductive cycles in the field. This is especially well represented for *A. vulgare* (eg. HOWARD, 1940; HATCHETT, 1947; PARIS and PITELKA, 1962) while to my knowledge no such data have been reported for *P. collicola*. For a more exact determination of the breeding period, more frequent (at least monthly) sampling would de necessary.

Neither male nor female *A. vulgare* showed large fluctuations in numbers (Fig. 2). For *P. collicola* the fluctuations are greater, here however the abundance was lower.

Summary

Comparing these data to those obtained from different areas of the Pilis Mountains (SZLÁVECZ unpubl.) it is fair to say that the isopod fauna of the Basaharc area is poor. Since the area is warm and dry, only the more drought tolerant species are widely distributed, but even their abundance is limited by these physical factors.

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