

## SOME DATA UPON THE TERRESTRIAL ISOPOD ASSEMBLAGE FROM A NORTH-WESTERN ROMANIAN WETLAND

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**Abstract.** In 2009, we identified nine terrestrial isopod species in a wetland near Valea lui Mihai locality (Bihar County, Romania): *Hyloniscus riparius*, *H. transsilvanicus*, *Haplophthalmus danicus*, *Cylisticus convexus*, *Porcellium collicola*, *Trachelipus arcuatus*, *T. rathkii*, *T. nodulosus*, *Armadillidium vulgare*. Considering certain ecologic and zoogeographic characteristics of the nine species, we divided them in three groups: 1. species the presence of which is due to the actual features of the habitat (*H. riparius*, *T. rathkii*, *A. vulgare*, *P. collicola*, *C. convexus*, *T. nodulosus*); 2. species that probably represent survivors of a colder climate and the forest from the past (*H. transsilvanicus* and *T. arcuatus*); 3. species rarely found in traps (*H. danicus*). The surface activity is low in July, probably due to the high temperatures, which reduce the humidity of the habitat.

**Keywords:** wetland, Oniscidea, habitat, surface activity.

**Rezumat. Date asupra comunității de izopode terestre dintr-o zonă umedă din nord-vestul României.** Într-o mlaștină de lângă localitatea Valea lui Mihai (Bihar, România) am identificat în anul 2009, nouă specii de izopode terestre: *Hyloniscus riparius*, *H. transsilvanicus*, *Haplophthalmus danicus*, *Cylisticus convexus*, *Porcellium collicola*, *Trachelipus arcuatus*, *T. rathkii*, *T. nodulosus*, *Armadillidium vulgare*. Luând în considerare anumite caracteristici ecologice și zoogeografice ale acestora, am împărțit cele nouă specii în trei grupe: 1. specii ale căror prezență se datorează caracteristicilor actuale ale habitatului (*H. riparius*, *T. rathkii*, *A. vulgare*, *P. collicola*, *C. convexus*, *T. nodulosus*); 2. specii care probabil reprezintă urmele unui climat mai rece și a pădurilor din trecut (*H. transsilvanicus* și *T. arcuatus*); 3. specii rare în capcane (*H. danicus*). Activitatea de suprafață este redusă în iulie, probabil datorită temperaturilor ridicate, care diminuează umiditatea habitatului.

**Cuvinte cheie:** zonă umedă, Oniscidea, habitat, activitate de suprafață.

### INTRODUCTION

Wetlands from north-western Romania have a distinct importance both for the flora and fauna (e.g. KARACSONYI, 1987; FERENTI et al., 2012; COVACIU-MARCOV et al., 2009a, b; ARDELEAN & KARACSONYI, 2005). From this perspective, Carei Plain is an area with numerous wetlands, extremely important from a zoogeographic and conservative point of view (KARACSONYI, 1987; FERENTI et al., 2012; COVACIU-MARCOV et al., 2009a). Remains of the natural wetland fauna have been recently mentioned near some canals from north-western Romania following their regularisation (e.g. SAS et al., 2008; COVACIU-MARCOV et al., 2007, 2008a, b). Such results were obtained by collecting terrestrial isopods through pitfall traps (FERENTI & DIMANCEA, 2012). However, qualitative studies with direct method were previously made in the wet areas of Carei Plain (FERENTI et al., 2012), quantitative data being recorded in only one wetland (TOMESCU et al., 2008). Thus, our study started from the hypothesis that the terrestrial isopod fauna from a wetland from Valea lui Mihai is similar to the one from the wet areas from Carei Plain. Considering that the remains of this fauna are found in the artificial canals from north-western Romania (FERENTI & DIMANCEA, 2012), we wanted to establish the composition of the terrestrial isopod fauna from a relatively natural wetland, through quantitative collections, in order to compare what and how many of it survives in the anthropogenic canals from the region. Regarding the herpetofauna, the wetland from Valea lui Mihai shelters mountainous elements at low altitudes (COVACIU-MARCOV et al., 2009b). Assuming that the climatic conditions from the past have had the same influence upon the vertebrate and invertebrate fauna, it is possible that those conditions will also be felt by the terrestrial isopods.

### MATERIAL AND METHODS

The study was realised in 2009, in a wetland near Valea lui Mihai locality, from north-western Romania. The habitat is a typical wetland from north-western Romania, having permanent humidity, being formed on the sides of a low flowing stream. The natural vegetation generally consists of grassy vegetation, pewter, reed and willow in certain places. The wetland is mainly affected by the nearby anthropogenic areas (households and fields), representing a natural island between them. The samples were prevailed with pitfall traps, once a month, from April to September. We set four traps / month in a representative area, at 5 m distance from each other. However, this number of traps was not the one that we collected, because many were destroyed by animals or humans due to the close proximity of the town. Therefore, we collected only 16 traps, respectively about 2-3 traps/month. The aim of the study was not to observe the differences between the microhabitats within the wetland, but to make an inventory of the species from it and to establish certain quantitative parameters. The isopods were preserved in alcohol, and afterwards determined in the laboratory using the scientific literature (e.g. RADU, 1983, 1985). The following parameters were analysed: numeric abundance, relative abundance, species frequency of appearance, species richness and diversity (Shannon-Wiever index, SHANNON & WIEVER, 1949).

## RESULTS

In the wetland from Valea lui Mihai we identified 9 terrestrial isopod species: *Hyloniscus riparius* (C. KOCH 1838), *H. transsilvanicus* (VERHOEFF 1901), *Haplophthalmus danicus* (BUDDE-LUND 1880), *Cylisticus convexus* (DE GEER 1778), *Porcellium collicola* (VERHOEFF 1907), *Trachelipus arcuatus* (BUDDE-LUND 1885), *T. rathkii* (BRANDT 1833), *T. nodulosus* (C. KOCH 1838) and *Armadillidium vulgare* (LATREILLE 1804). From a whole of 674 individuals, 273 were males and 401 females. The males only belonged to seven species, while the females were identified from each of the nine species. *H. riparius*, *T. arcuatus* and *A. vulgare* dominated the isopod assemblage. The same species also had high frequency (Table 1).

The largest number of individuals was registered in April. From the first months of the study a gradual decrease regarding the species richness can be observed, reaching the minimum value in August, and recovering in September. Concerning the diversity, the maximum value was reached in July, while the minimum in August (Table 1).

The structure of the terrestrial isopod assemblages was different from one month to another. Although, *H. riparius* had the highest abundance during the whole study, it only held a majority in the first two months, period in which *T. arcuatus* and *A. vulgare* were also greatly active. *T. rathkii* dominated the next month, while *T. nodulosus* held a majority in July. The total number of individuals was very low in August, *H. riparius*, *T. rathkii* and *A. vulgare* being the dominant ones. The *T. arcuatus* population presented a more intense surface activity in the last month.

Table 1. Relative abundance of the individuals of each species, numeric abundance, species richness and Shannon-Wiever (H) diversity in each study month; numeric (A) and relative (A%) abundance and frequency of appearance (F) of the individuals of each species, and assemblage diversity (H) throughout the whole study period; (IV – April, V – May, VI – June, VII – July, VIII – August, IX – September).

	IV	V	VI	VII	VIII	IX	Total		
	A / month						A	A%	F
<i>H. riparius</i>	46.45	54.42	37.08	12.58	10.52	8.47	233	34.57	87.50
<i>H. transsilvanicus</i>	-	0.68	-	-	-	-	1	0.14	6.25
<i>H. danicus</i>	1.29	1.36	1.98	1.39	-	1.69	10	1.48	37.50
<i>C. convexus</i>	0.64	0.68	-	-	5.26	3.38	5	0.74	31.25
<i>P. collicola</i>	1.93	2.04	1.32	-	-	1.69	9	1.33	31.25
<i>T. arcuatus</i>	15.48	19.72	10.59	32.86	-	49.15	145	21.51	75.00
<i>T. rathkii</i>	-	2.04	43.70	-	57.89	-	80	11.86	18.75
<i>T. nodulosus</i>	-	-	-	34.26	-	5.08	52	7.71	12.50
<i>A. vulgare</i>	34.19	19.04	5.29	18.88	26.31	30.50	139	20.62	100
No. of individuals	155	147	151	143	19	59	674		
No. of species	6	8	6	5	4	7	9		
H	1.17	1.25	1.25	1.36	1.06	1.32	1.64		

## DISCUSSIONS

Considering certain ecologic and zoogeographic characteristics of the nine identified terrestrial isopod species, these can be divided in three groups: 1. species the presence of which is determined by the actual features of the habitat; 2. species the presence of which can be due to the past of the area; 3. rare species in traps. The presence of the dominating species throughout the study was determined by two characteristics of the habitat: humidity and anthropogenic impact. Humidity determined the dominance of *H. riparius* and *T. rathkii*, these species being characteristic or frequent in the wet areas (e.g. RADU, 1983, 1985; WIJNHOFEN, 2000, see in: JASS & KLAUSMEIER, 2003). The high abundance of the synanthropic species *A. vulgare* (RADU, 1985) is a result of the presence of affected areas surrounding the wetland, some individuals probably migrating in the natural areas, situated at the limit of the anthropogenic areas.

*H. transsilvanicus* and *T. arcuatus* are present in the wetland due to its past. The first one is characteristic to the wet areas from higher altitudes (RADU, 1983; TOMESCU et al., 2011), while the second one is typical of the forested areas (RADU, 1985; TOMESCU et al., 2005). The wetlands from north-western Romania represent extremely important habitats for the preservation of the mountain species found in the plain (e.g. COVACIU-MARCOV et al., 2009a; FERENTI et al., 2012). The areas with cold and wet climate from the north-western part of Hungary also proved to be capable of sheltering *H. transsilvanicus* population in the Tisa flood plain (VILISICS & HORNUNG, 2010). *H. transsilvanicus* is also frequent in the wetlands from Carei Plain (FERENTI et al., 2012). Therefore, although the wetland from Valea lui Mihai is small and surrounded by anthropogenic areas, it still preserves a terrestrial isopod fauna similar to the one of other wetlands from the region, fact also observed for the herpetofauna (COVACIU-MARCOV et al., 2009b). The presence of these terrestrial isopod species probably denotes their ecologic plasticity during times.

Although *T. arcuatus* is considered a forest species (RADU, 1985), it has been exceptionally observed in opened areas, in favourable microhabitats (TOMESCU et al., 2000). However, although the previous situation was observed in a mountain area (TOMESCU et al., 2000), the phenomenon seems to be more common in north-western Romania (FERENTI & DIMANCEA, 2012). Thus, identifying *T. arcuatus* in the wetland from Valea lui Mihai can suggest that the presence of the species in the canal from Caraseu (FERENTI & DIMANCEA, 2012) does not necessarily represent

a consequence of the forest disappearing from the area, but of the disappearing of the wetland. However, it is possible that forests were found in the past in Valea lui Mihai exactly in, or near the wetland, forests that have disappeared following the anthropogenic pressure. An argument in this direction is the high number of species, in other cases the isopods being more numerous in forests than in opened areas (SPUNGIS, 2008). On the other hand, it seems that in the past forests were well represented in the area (ARDELEAN & KARACSONYI, 2005), being present in the neighbouring areas in Hungary, even in the last glacial maximum (WILLIS et al., 1995).

*H. danicus* is a rare presence in pitfall traps, because of its low mobility (TOMESCU et al., 2008). Previously, the species was identified in wet areas, both natural and artificial (RADU, 1983), thus the habitat from Valea lui Mihai being a favourable one. Although represented by low numbers, the permanent presence of the species, with the exception of the warmest month, suggests the fact that it is a characteristic element of this assemblage. *C. convexus* appears in low numbers, and its presence can be due to its synanthropic character (RADU, 1985).

One of the most important parameters that influences the surface activity of the terrestrial isopods is the temperature of the environment (see in: WARBURG et al., 1984; MA et al., 1991; KUZNETSOVA & GONGALSKY, 2012). This is also highlighted in the manner in which the number of individuals and species varies throughout the warm season. The more intense surface activity from spring – beginning of summer and beginning of autumn - is probably due to the moderate temperatures from these periods. It has been observed that in some cases the dynamics of the terrestrial isopod populations is affected especially by habitat changes and not by weather (DAVIS, 1984). Thus, the lowest species and individuals diversity from August can be a consequence of the decrease of the isopods surface activity because of the modifications produced in the habitat by excessive heat.

Despite the fact that the number of terrestrial isopod species collected using pitfall traps is small (e.g. RADU & TOMESCU, 1976; TOMESCU et al., 2000), the number of species collected from Valea lui Mihai is high, considering the low number of traps. This probably indicates the existence of a high biodiversity in the wetland. Although the wetland from Valea lui Mihai is surrounded by anthropogenically affected areas, it represents one of the few relatively natural islands from the region, fact that probably determined the concentration of the existing species on a limited surface.

The structure of the terrestrial isopod assemblages from the wetland from Valea lui Mihai is similar to the one from the wet natural areas from Carei Plain (FERENTI et al., 2012). This fact was expectable, because these wetlands were connected with each other in the past, even if they are presently separated following anthropogenic activities. However, in comparison to the isopod fauna from near the recently studied anthropogenic canal (FERENTI & DIMANCEA, 2012), in the wetland from Valea lui Mihai, the species assemblages is much more diversified, the number of species being greater. This underlines the fact that natural wetlands are more favourable for the terrestrial isopod fauna. Although the artificial canals can shelter a part of the original wetland fauna, they are limited to a small part of the terrestrial isopods. This fact proves the distinct importance of natural wetlands for the terrestrial isopod fauna from north-western Romania, and meanwhile represents a new argument for the preservation of these habitats.

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