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Terrestrial Isopods (Isopoda: Oniscoidea) from Jiului Gorge National Park, Romania

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Abstract. The terrestrial isopod from Jiului Gorge National Park was investigated in 2010. Hand sampling was performed in 8 habitat types: a common spruce forest, two pine tree plantations, 10 beech forests, 9 mixed deciduous forests, two clearcut surfaces, 6 meadowlands and the surrounding of 6 constructions, from which 5 were abandoned, being left in ruins. We identified the following species: *Ligidium hypnorum*, *L. germanicum*, *Hyloniscus transsylvanicus*, *H. riparius*, *Cylisticus convexus*, *Protracheoniscus politus*, *Trachelipus bujori*, *T. arcuatus*, *T. rathkii*, *T. difficilis*, *Porcellio scaber*, *P. spinicornis*, *Armadillidium vulgare*, *A. versicolor*. A high number of species was identified in the abandoned construction area, respectively 9 species, from which 5 presented synanthropic tendencies (*C. convexus*, *P. scaber*, *P. spinicornis*, *A. vulgare*, *A. versicolor*). A high number of species was also identified in the beech and mixed deciduous forests, namely 8 in each forest type. Only one species was identified in the common spruce forests and two species in the pine plantations and beech with common spruce forests. The species' distribution in the 8 habitat types is different. *T. rathkii* has populations in 6 habitat types, *H. transsylvanicus* and *T. arcuatus* in 5 habitat types each, *P. scaber* and *P. spinicornis* in one habitat type each. The distribution in relation with the altitude is also different. *H. riparius*, *T. bujori*, *P. scaber*, *P. spinicornis* and *A. versicolor* live in habitats from 300 to 500 m altitude. The following species have a wide distribution, in habitats situated at different altitudes: *H. transsylvanicus* (300-1300 m), *P. politus* (300-1357 m), *T. difficilis* (400-1357 m), *T. arcuatus* (300-1000 m), *T. rathkii* (300-900 m). The high diversity of terrestrial isopods from the natural habitats of Jiului Gorge National Park denotes their particular conservative importance.

Key words: terrestrial isopods, Oniscoidea, habitat, altitude, Jiului Gorge National Park.

Introduction

The studies concerning terrestrial isopods from Romania have generally focused on aspects about their ecology and biology (e.g. Radu & Tomescu 1972, 1976, 1980-1981, Hotea et al. 2003, Tomescu et al. 1995, 2002a, 2005, Giurginca & Ilie 2003, Giurginca & Nae 2006). Most investigations were carried out using Barber traps (e.g. Tomescu et al. 1995, 2002a, 2008, Hotea et al. 2003), a method that allows quantitative estimates but which does not reveal all species of isopods potentially present in an area (Stoyenoff, 2001, Tomescu et al. 2008). Thus, older studies have enabled only a partial estimate of the true diversity of isopods from Romania, being limited only to lists of species and ecological and habitat related links, but did not unveil for example the isopod fauna assemblage of some regions of the country, the altitudinal limits of their distribution or synthetic zoogeographic interpretations. Also, previous studies have covered only certain regions of Romania, several researches being made for example in Apuseni Mountains (Muresan et al. 2003, Tomescu et al. 1995, 2000, 2001, 2002a, 2008), Dobruja (Giurginca & Ćurćič 2003) or on the cavernicolous fauna (Boitan & Negrea 2001). A region of the country where there were conducted few studies on isopods compared to the previous ones is Oltenia, this despite the region's location in south-western Romania, at the sub-Mediterranean influences' limit (Mândruţ 2006), where according to the fauna of Romania volumes on isopods there are many species which are missing from other regions of the country (Radu 1983, 1985). In spite of the importance of the region, the terrestrial isopods from Oltenia area have been poorly studied. There are scattered data from Danube Gorge (Radu & Tomescu 1975), Mehedinţi Plateau (Ilie et al. 2002, Giurginca et al. 2010) or from neighbouring areas such as Caraş Severin County (Giurgimca & Ilie 2003) or Retezat Mountains (Giurginca et al. 2007).

Thus, this study provides preliminary data on the isopods of an area from northern Oltenia, namely Jiului Gorge. This has recently acquired the status of National Park, having a special biodiversity given by a great variety of habitats. Our data are a contribution to the knowledge of the biodiversity of this region of Romania, thus helping to its proper conservation.

Material and methods

Jiului Gorge National Park (JGNP) is situated in the western part of the Middle Carpathians, between Vâlcan Mountains to the west and Parâng Mountains to the east. It has a surface of 11127 ha. The relief is characterised by steep slopes on both sides of Jiu River and depressions situated alongside its tributaries. There are terrain surfaces in the park area that vary in altitude from 295 m to 1621 m (Pop 2000). The national road D.N. 66 (E 79) and a railroad cross the park area from south to north, between the localities situated outside of the park, Bumbeşti and Livezeni. Several abandoned buildings are found alongside the railroad. There are no human localities in the park. The vegetation is mainly formed of natural common spruce, beech, combinations of beech with common spruce, and mixed deciduous forests (*Fagus sylvatica*, *Carpinus betulus*, *Quercus sp.*, *Acer pseudoplatanus*, *Fraxinus excelsior*, *Populus nigra*, *Betula pendula*, *Tilia cordata*, *T. tomentosa*, *Salix caprea* etc.).

The terrestrial isopod samples were collected from 38 sites that are grouped in 7 natural habitat types plus the surroundings of a chalet and the debris of the abandoned buildings near the railroad (Table 1). The habitats are found at altitudes between 312 and 1357 m. We collected isopods from a common spruce forest, two pine plantations, two beech with common spruce forests, 10 beech forests, 9 mixed deciduous forests, two clearcut surfaces, 6 meadows surrounding a chalet and five abandoned constructions. The isopods from the abandoned constructions were collected from under rocks, debris, brick and board fragments. Species with synanthropic tendencies were collected from such places, situated at low altitudes, between 312 and 453 m. Most of the samples were collected from forests situated between 347 and 1228 m altitude. Only one sample was collected from the limit of the forest with the alpine meadows, at an altitude of 1357 m (Table 1).

Field surveys were conducted in spring 2010 (April, May). The terrestrial isopods were collected using manual sampling. The collected specimens were put in 70% ethylic alcohol, being separated according to the studied habitat and sample. We identified the species using the scientific literature (Radu 1983, 1985; Schmöltzer 1965; Schmidt 1997), according to the presently accepted nomenclature (Schmalfuss 2003).

Results and discussions

In the research made on the field we manually collected a number of 634 terrestrial isopod specimens from 8 habitat types from J.G.N.P. In the collected material we identified 14 species that are taxonomically grouped in 7 families and 7 genera (Table 2). Trachelipus genus is represented by 4 species, Ligidium, Hyloniscus, Porcellio and Armadillidium genus are each represented by two species, while Protracheoniscus and Cylisticus genus are represented by one species. Trachelipus is the genus with the highest number of species in Romania (Radu 1983, 1985).

One of the species identified in JGNP, namely *T. bujori*, is currently not considered a valid species, being synonymized with *T. ratzeburgi* (Schmidt 1997, Schmalfuss 2003). However, we consider that between the two species there are enough differentiation characters, so we believe that this species should benefit from a separate taxonomic status. *T. difficilis* and *T. wächtleri* are also synonyms (Schmidt 1997).

Geographic distribution

The analysis of the geographic distribution of the species from J.G.N.P. indicates that 6 species are distributed only in Europe (*L. germanicum*, *H. transsylvanicus*, *P. politus*, *T. arcuatus*, *T. difficilis, A. versicolor*), 7 species are distributed both in Europe and on other continents (*L. hypnorum*, *H. riparius*,

Table 1. The studied habitats from Jiului Gorge National Park.

No	Habitat type	Number of analysed habitats	Altitude (m)
1	Common spruce forests	1	1228
2	Pine plantations	2	411-570
3	Beech with common spruce forests	2	768-946
4	Beech forests	10	347-1003
5	Mixed deciduous forests	9	352-576
6	Clearcut surfaces (forest at the limit with the alpine meadow)	2	719-1357
7	Meadows (5 meadows close to forests, one meadow with bushes)	6	395-813
8	Constructions (one chalet and 5 abandoned buildings, in ruins)	6	312-453

C. convexus, *T. rathkii*, *P. scaber*, *P. spinicornis*, *A. vulgare*) and one species is endemic in Romania (*T. bujori*) (Table 2).

The distribution of the 14 species on the territory of Romania differs. There are species that populate habitats (mostly forests) only in the mountainous areas (*L. germanicum*), in mountainous and hilly areas (*L. hypnorum*, *H. transsylvanicus*, *T. difficilis*), in all of the country, from plains to mountains, including in the Danube Delta (*H. riparius*, *C. convexus*, *T. arcuatus*, *T. rathkii*, *P. scaber*, *A. vulgare*), in all of the country except the Danube Delta (*P. politus*). *A. versicolor* is distributed in Transylvania and Banat (Table 2) (Radu 1983, 1985).

The presence and distribution of the 14 species of terrestrial isopods in JGNP is, generally, predictable and expectable in relation to the known situation in Romania (Radu 1983, 1985). The notable difference is represented by the identification of *T. bujori* in JGNP. This species has been recorded so far only from a very restricted area situated north of Poiana Ruscă Mountains (Radu 1985). The populations from JGNP are located with over 100 km to the south-east, which is, for the following acceptance of its validity, a considerable enlargement of the distribution area. Certainly, not the species has expanded its distribution range, but its identification in JGNP is due to the absence of studies on isopods in the past. *T. bujori* inhabits the lowlands neighbouring the Jiu River, upstream being identified to the Chitul Valley. It is found in forested areas with beech, but also in the open areas surrounding them, being collected from under rocks, logs or bark of fallen trunks.

The wide distribution in JGNP of some species such as *Protracheoniscus politus* is a consequence of the great extent of forests in the region, this species being typical for forested areas (Radu & Tomescu 1972). The species from Ligidium and Hyloniscus genera are favoured by the several wetlands from the region. At the southern boundary of the park and in the lowlands bordering the Jiu River, but only to the centre of the gorge there are species related to warmer and anthropogenically affected areas, such as *Porcellio scaber* or *Armadillium vulgare*. The distribution of isopods in JGNP is rather comparable with that of the herpetofauna, with southern, thermophilic species occurring in the same sectors of JGNP, while in the higher areas species related to forests are present (Covaciu-Marcov et al 2009).

The species' distribution in habitats

The manual collecting of isopods allowed us to evaluate the species' distribution from the 8 types of studied habitats (Table 3). Some species have populations in several habitat types, for example *T. rathkii* is present in 3 forest types, in clearcut surfaces, meadows and the surroundings of the abandoned buildings, *H. transsylvanicus* inhabits four types of forests and meadows neighbouring them; *T. arcuatus* is present in four types of forests and meadows; *P. politus* is found in mixed forests, meadows close to the forests and clearcut surfaces. Other species have been found in only one type of habitat, for example *H. riparius*, *P. scaber*, *P. spinicornis* are present only in the area of the abandoned buildings, the last two species also presenting a pronounced distribution behaviour in the anthropogenic habitats (Radu 1985). The species' distribution in different habitat types depends on their tolerance for the environmental factors' variation.

Analysing the richness in species of each habitat studied from JGNP, it can be stated that a large number of species live in some habitats, while the number is smaller in others (Table 3). The number of species is in relation with the ecological diversity of the habitats, namely with the number of microhabitats. Except for the species that have a wide distribution on the soil surface, most of the terrestrial epigeic isopod species occupy certain microhabitats in which the ecological conditions are optimum, respectively small surfaces with high and constant humidity, under fallen trunks, rocks etc.

From the 8 studied habitat types, most of the isopod species are found in the surrounding of the abandoned buildings, in the mountain meadows surrounded by forests and in the mixed deciduous forests. In the surrounding of the abandoned buildings, from the 9 identified species, 5 species are partially synanthropic (*C. convexus*, *P. scaber*, *P. spinicornis*, *A. vulgare*, *A. versicolor*). A low number of species is found in the common spruce forest, pine plantations, mixed beech with common spruce forests and in the clearcut surfaces. In the previous research taken in other mountainous areas, we recorded that more terrestrial species also live in the common spruce forests (Tomescu et al. 2000, 2001, 2002a). Analysing the isopod fauna from several common spruce forests, we have recorded differences regarding the number of isopod species, determined by the steepness and exposition of the slopes, the density and age of the

trees, the grassy strata, the soil humidity etc (Tomescu et al. 2002a). Plantations hold a low number of isopod species. The negative effect of pine and acacia plantations from the southern boundary of JGNP was also observed in the case of herpetofauna (Covaciu-Marcov et al 2009). The effect of plantations is even more evident on isopods which are detritivores (Radu 1983), in such habitats including the growth of isopods being affected (Sousa et al. 1998). The low diversity of isopod fauna from acacia plantations was previously reported in north-western Romania as well (Tomescu et al 2008).

Isopod species' distribution according to the altitude

The altitude influences the terrestrial isopod species' distribution, mainly through the temperature values. Once with the drawing of the samples from Jiu Gorge, we also measured the altitude. *H. riparius*, *P. scaber* and *P. spinicornis* were collected from habitats situated between 300 and 400 m. *A. vulgare* and *A. versicolor* were collected between 300 and 600 m. Other species were collected from altitudes that vary to a great extent, between 300 and 1357 m, for example *P. politus* – 300-1357 m, *T. difficilis* – 400-1357 m, *H. transsylvanicus* – 300-1300

Table 2. The terrestrial isopod species identified in JGNP and information about their general distribution (from: Radu 1983, 1985, Schimdt 1997, Ilie et al 2002, Giurginca & Vanoaica 2006-2007, Tomescu et al. 1995, 2000, 2002a, 2005).

Taxa	No. specimens	Altitude (m) in JGNP	Geographic distribution	Distribution in Romania
Ligidium germanicum Verhoeff, 1901	7	600-1003	South-Eastern Germany, Northern Italy, Northern Greece, Southern Poland, Romania, Republic of Moldavia	mountainous areas and depressions, in forests in microhabitats with a high and constant humidity
Ligidium hypnorum Cuvier, 1792	11	416-758	Europe, except the cold Northern and Mediterranean area, Western Asia	mountain, hills, depressions and plateau areas, in habitats with a high and constant humidity
Hyloniscus transsylvanicus Verhoeff, 1901	153	352-1228	Slovakia, Hungary, Romania	mountain and hilly areas, depressions, in habitats with a high and constant humidity
Hyloniscus riparius C. L. Koch, 1834	7	365	Central and Eastern Europe, North America	in all of the country, from plains to mountainous areas, in very wet habitats
Cylisticus convexus De Geer, 1778	74	355-616	Europe, Asia, America, Northern Africa	in all of the country, eurytopic
Protracheoniscus politus C. L. Kock, 1841	15	371-1357	Eastern Germany, Poland, Czech Republic, Slovakia, Austria, Serbia, Montenegro, Hungary, Romania	in all of the country, except the Danube Delta, in forests, in mountainous areas in forests and hay-fields
Trachelipus bujori Radu, 1950	26	347-409	endemic in Romania	Buza hill, north to Poiana Ruscă Mountains, in forests
Trachelipus arcuatus Budde - Lund, 1885	61	355-946	Southern Switzerland, Italy, Austria, Slovakia, Croatia, Slovenia, Bosnia, Macedonia, Albania, North-Western Greece, Romania	in all of the country, in forests
Trachelipus rathkii Brandt, 1833	85	365-876	Europe (except Mediterranean region), North America	in all of the country, eurytopic
Trachelipus difficilis Radu, 1950	20	467-1357	Endemic in Carpathians	in mountainous and hilly areas, in forests
Porcellio scaber Latreille, 1804	2	365	Europe, distributed on all continents by man	in all of the country, eurytopic and synanthropic species
Porcellio spinicornis Say, 1818	3	312	Northern, Central and Eastern Europe, introduced in North America	in mountainous and hilly areas, in forests and shrubs
Armadillidium vulgare Latreille, 1804	167	312-532	Distributed across the entire globe by man, except the tropical regions	in all of the country, from plains to mountains, in opened habitats
Armadillidium versicolor Verhoeff, 1901	3	371	central and eastern Europe	in Transylvania and Banat, eurytopic

Table 3. The terrestrial isopod species' distribution in the studied habitats from JGNP.

Taxa	Habitat and microhabitat type																Total no. of habitats
	1	2	3	4		5				6		7		8			
				a	b	a	b	c	d	a	b	a	b	a	b		
Ligidium germanicum				+		+											2
Ligidium hypnorum					+							+					2
Hyloniscus transsylvanicus	+		+	+	+	+	+	+				+					5
Hyloniscus riparius															+		1
Cylisticus convexus				+								+	+	+	+		3
Protracheoniscus politus							+			+		+					3
Trachelipus bujori					+							+		+			3
Trachelipus arcuatus		+	+		+	+			+			+	+				5
Trachelipus rathkii		+		+	+		+			+		+			+		6
Trachelipus difficilis				+			+				+						3
Porcellio scaber															+		1
Porcellio spinicornis															+		1
Armadillidium vulgare						+		+							+		3
Armadillidium versicolor									+			+					2
Total no. of habitats	1	2	2	8		8				3		8		9			/

Abbreviations: 1 – common spruce forest; 2 – pine plantations; 3 – beech and common spruce forests; 4 – beech forests: a – margin of a forest road, b – shores of streams; 5 – mixed deciduous forests: a – inside the forest, b – margin of a forest road; c – shores of streams, d – rocks and detritus; 6 – clearcut surfaces: a – inside the forests, b – the limit of the alpine steppe; 7 – meadows: a – near the forests, b – meadows with bushes; 8 – constructions: a – around the chalet, b – the ruins of the abandoned railroad constructions.

m, *L. germanicum* – 600-1100 m (Table 4). Some of these species are tolerant towards the low temperature values (Tomescu & Radu 1971).

The highest number of species is found in the low areas of JGNP, their number decreasing with increasing altitude. At over 1300 m only two species are present (Table 4) and these also have small populations. The situation seems to be general; the decrease of species richness with altitude being previously reported (Sfenthourakis 1992). The fact is a consequence of worsening environmental conditions and of reducing diversity of habitats with elevation. Nevertheless, there are also cases when species diversity does not decline with increasing altitude (Sfenthourakis et al 2005).

Ecologic characterisation of the species

The ecological preferendum of the isopod species identified in J.G.N.P is generally described in the scientific publications (Radu 1983, 1985). The information is mostly based on collecting made during the day. The epigeic isopod species are nocturnal, moving at night on the soil surface for the biological activities, mainly for feeding, while dur-

Table 4. The terrestrial isopod species' altitudinal distribution from Jiu Gorge National Park.

Taxa	Altitudinal range (m)										
	300 - 400	401 - 500	501 - 600	601 - 700	701 - 800	801 - 900	901 - 1000	1001 - 1100	1101 - 1200	1201 - 1300	1301 - 1357
Ligidium germanicum				+					+		
Ligidium hypnorum		+	+		+						
Hyloniscus transsylvanicus	+	+	+		+		+		+	+	
Hyloniscus riparius	+										
Cylisticus convexus	+	+		+							
Protracheoniscus politus	+	+									+
Trachelipus bujori	+	+									
Trachelipus arcuatus	+	+	+		+		+				
Trachelipus rathkii	+	+	+		+	+					
Trachelipus difficilis		+	+					+			+
Porcellio scaber	+										
Porcellio spinicornis	+										
Armadillidium vulgare	+	+	+								
Armadillidium versicolor	+	+									

ing the day they stay hidden under different objects (rocks, fallen tree trunks and under their bark, leaves and soil cracks, etc.). This hiding behaviour during the day helps the individuals to defend themselves against certain harmful ecologic factors, such as the body desiccation due the high thermal values during the day, values that surpass the optimal levels of the species, low values of the air humidity, etc. Meanwhile, they are less exposed to predators. Hassal and Tuck (2007) published data regarding the behaviour of several isopod species found in search of shelters during the day. They have concluded that this behaviour is more or less pronounced in the relation with the type of habitat in which the species' populations live. We consider that the species that permanently live under the forest litter, such as *P. politus, Porcellium conspersum, P. collicola*, etc. do not manifest this searching behaviour for a place to hide during the daylight, due to the fact that the forest litter protect them throughout the entire circadian period. It is possible that these species do not present a circadian periodicity of the biological activities and also feed during the daytime. The information regarding the species' ecology is complete if different methods are used. In our previous research (Tomescu 1992, Tomescu et al. 2008) we captured them both directly by daylight, as well as by night, using pitfall traps. Thus, we could obtain complete information regarding the species' ecology.

L. germanicum is present in all of the Carpathian Mountains and Apuseni Mountains' area (Radu 1983). It is a hygrophilous species, living in wet places, very humid forests, under very moist leaves. In our previous research (Olariu & Tomescu 1997, Tomescu 2010, Hotea et al 2003), we have identified the species only in forests and riverside coppices from mountainous areas, being absent from the hilly areas, where *L. hypnorum* is found. It only populates the microhabitats with permanent humid soil (the margin of the streams, moist surfaces due to the close position of the ground-water layer to the soil surface). During the day, the specimens stay under the moist leafy roof or under rocks. Due to the fact that they were captured using pittfall traps, it can be deduced that the individuals move during the night on the soil surface for feeding. In the past we indentified the species in the forest from the Natural Park from Vatra Dornei (about 900 m altitude) Suhard Mountains (Olariu & Tomescu 1997), Giumalau and Rarau Mountains (Tomescu et al. 2002b), the mountains area of the upper basin of Somesul Cald (Tomescu et al. 2001), Gutai Mountains (Hotea et al. 2003) and in Calimani and Bargau Mountains (Tomescu 2010). In all of the previous studied area the capturing was made using Barber traps and directly. It has also been signalled in Anina Mountains (Giurginca & Ilie 2003) and in the karstic area of Varghis reservation (Giurginca & Vanoaica 2006-2007). In JGNP *L. germanicum* is present, as in other regions of the country, only in very humid areas, being found on the shore of some streams, fountains or springs, but only at altitudes over 600 m. In the region it is advantaged by the high humidity of some areas and by the high altitude, the observed populations being large.

L. hypnorum is distributed in Romania in the Carpathian regions and Apuseni and it is absent from Baragan and Dobrogea (Radu 1983). The species lives in very moist forests, in similar microhabitats to the ones in which *L. germanicum* lives. In our previous research, we have recorded that *L. hypnorum* lives in forests and mountainous riverside coppices, as well as in hilly and depression area. In mountains area we identified it in forests, riverside coppices and meadows from: Dorna Depression, Suhard Mountains (Olariu & Tomescu 1997), Zugreni Depression and the foothills of Pietrosul Bistritei Mountains (Tomescu et al. 2002b), the upper basin of Somesul Cald (Tomescu et al. 2001), the upper and middle basin of Aries (Tomescu et al. 2002a, Muresan et al. 2003) and in Calimani and Bargaului Mountains (Tomescu 2010). In Apuseni Mountains (the upper basin of Somesul Cald and Aries) we have recorded that *L. hypnorum* also has populations in hay-fields, on surfaces with constant and saturated humidity (Muresan et al. 2003). In those hayfields, opened ecosystems, only paludicolous and silvicolous isopod species live: *L. hypnorum, H. riparius, H. transsylvanicus,* etc. (see in: Murescu et al. 2003). The praticulous species are absent being encountered in the grassland from the hilly and plain areas (Tomescu et al. 2001, 2002a, Muresan et al. 2003). In mountainous areas from Romania this species has also been reported by Giurginca et al. (2006) in the Piatra Craiului National Park, Giurginca & Vanoaica (2006-2007) in Anina Mountains and Vilisics (2008) in Tibles Mountains. In the hilly areas *L. hypnorum* is present only in moist microhabitats from forests and riverside coppices but it don`t appear in meadows. It was identified from Feleac Hills (Radu & Tomescu 1976), Sibiu Depression (Tomescu et al. 1979a) an Turzii Gorge

(Tomescu et al. 1995). In JGNP this species is better represented than the previous one being also present at lower altitudes. As well as the previous one, it inhabits only very moist areas being abundant on the shores of small watercourses from inside of forests. It is also present on the edge of some puddles formed near abandoned forest roads. The collected specimens were generally hiding under trunks or under their old bark and more rarely under rocks.

H. transsylvanicus is well represented in Romania, being present in hilly and mountainous areas, in moist habitats (Radu 1983). It is a hygrophilous species, living only in natural habitats, having no synantrophic tendencies (Radu 1983). In our previous research (Tomescu et al. 2005), we have identified it in the same areas and habitats in which *L. hypnorum* is present. In the mountainous areas they live both in forests, as well as in hay-fields with humid parts. In the hilly areas it only lives in forests in which shadowy and humid microhabitats are found. It does not live in the forests with low tree density, where the insolation at the soil level is high and the humidity under the forest litter is low. In JGNP is an extremely well represented species, identified almost all over the park, being one of the most common species of isopod from the region and having a much wider altitudinal distribution than those of the species described above. As in other regions of the country, it is found with *L. hypnorum* where this species is present. It is the only species that has been identified in the coniferous forest of Candet Massif, at over 1200 m altitude, where it has been observed under large rocks on a slope. However, *H. transsylvanicus* is generally present close to water, under rocks or fallen trunks or under their bark, rather in forested areas and less at the edge of forests. The wide distribution in a protected area of this species with a limited geographical distribution has a great importance. There has been recently shown that conservation of isopods can be effective in good quality habitats (Vilisics et al. 2011). JGNP is a suitable nominee for protection and conservation of isopods, having several natural habitats inhabited by species with limited distribution range.

H. riparius is distributed all over the country, from plains to mountains, inhabiting humid, natural and anthropogenic places (Radu 1983). In our previous research (Tomescu et al. 2005), we have identified the species in all habitat types. We also mention that we identified it in the Danube Delta in an old poplar forest from Caraorman sand bank and under fallen leaves from the shore of the Caraorman canal (Tomescu 1992). It is present in very moist and shadow microhabitat together with *Trachelipus arcuatus* and *Armadillidium vulgare*, being the only paludicolous species identified in Danube Delta (Tomescu 1992). Although *H. riparius* has a wider distribution in Romania than the previous species, in JGNP is much more poorly represented, being identified only in lower areas of the gorge. Both the occupied territory and the number of specimens were obviously lower. Probably the large surface occupied by natural habitats in the region is more favourable for *H. transsylvanicus*, which is more related to these areas than for *H. riparius* which is present in more diverse habitats including anthropic ones (Radu 1983).

P. politus is distributed all over the country, in forests, under forest litter, wood and rocks (Radu 1985). It is considered a species characteristic of the fauna found under forest litter (Radu & Tomescu 1972). In our previous research we have identified *P. politus* populations in different forest types (common spruce, deciduous) situated in all of the studied regions from the country, except the Danube Delta (Tomescu 1992). We identified this species in hay-fields from mountain areas, in samples captured with pitfall traps (Tomescu et al. 2005). In a research made in an oak forest from Dobrogea (May 1992), we have recorded that during the day *P. politus* specimens were sheltered between the soil and the basis of the tree trunks (Tomescu – unpublished data). Surrounding a tree trunk we identified between 7 and 15 individuals but under the forest litter the soil was dry and we did not find any *P. politus* speciemens (Tomescu – unpublished data). *P. politus*` preference for forested areas is obvious in JGNP as well, all studied specimens being found in forests or close to them and captured from under logs and their bark.

Conclusions

In JGNP we found 14 terrestrial isopod species, most of them being characteristic to the epigeic fauna from forests. Identification of *T. bujori* form is very important, this being an endemic isopod known so far from a very small territory. The presence of *T. bujori* in JGNP calls into question its real distribution in Romania.

The existence of constructions on the railroad

margin that crosses the gorge has made possible the appearance of certain synanthropic species (*C. convexus*, *P. scaber*, *P. spinicornis*).

The species distribution in the 8 studied habitat types differs from a species to another, in relation with the limits of the ecologic valence. There are species that live in 5-6 habitat types, such as: *H. transsylvanicus*, *T. arcuatus*, *T. rathkii*. Other species live in the analysed region in only one habitat type: *H. riparius*, *P. scaber*, *P. spinicornis*.

In the mixed deciduous forests, the mountainous meadows surrounded by forests and the vicinity of the abandoned buildings and that of the chalet live 8-9 terrestrial isopod species. In the researched common spruce forest, in the pine plantations and in the beech and common spruce forests live one or two isopod species. The number of the species reflects the degree of ecologic diversity from each studied habitat. It is obvious that plantations are unfavourable habitats for terrestrial isopods, indicating their negative effect on local biodiversity.

The altitude at which the habitats are present determines a different distribution of the isopod species from Jiu Gorge: *H. riparius*, *P. scaber*, *P. spinicornis* present populations in habitats situated at altitudes of only 300-400 m. *P. politus*, *T. difficilis*, *H. transsylvanicus* have populations in habitats situated between 300 and 1357 m.

The terrestrial isopod fauna of most of JGNP is characteristic of some natural, forested areas. Synanthropic species have entered only in the low areas of the park, following lines of communication. The high diversity of terrestrial isopods from the natural, forested areas pleads for the protection of these areas.

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