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TERRESTRIAL ISOPODS FROM SALONTA TOWN, WESTERN ROMANIA

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ABSTRACT. *In the spring of the year 2015 we found in Salonta town from western Romania 11 terrestrial isopod species, less than in other localities, including western Romania. Most of them were synanthropic and generalist species, being also present an introduced species, Protracheoniscus major. The most common isopod from the locality was Trachelipus nodulosus. The uniformity of the assemblage and the low species richness are probably the consequence of the town's localization in a plain area, surrounded with agricultural fields, without forests. Most of the species populate a humid zone from the southern outskirts of the town.*

KEY WORDS: *relief, anthropization, uniformity, humid zone, comparison.*

INTRODUCTION

Studies on terrestrial isopod assemblages from urban areas of Romania are, even now, at an early stage. Thus, in the country, to our knowledge, only two studies were realized, one in Bucharest (Giurgincă, 2006) and the other in Beiuş, a small town from western Romania (Bodin et al. 2013). Unlike, in the foreign literature there are more information on isopods in localities (e.g. Korsós et al. 2002, Riedel et al. 2009, Vilisics & Hornung 2009, Vilisics et al. 2012). These data are important in the context of many recent studies, which show that urbanization modifies the aspect of native assemblages of different groups (e.g. Magura et al. 2010, Tóthmérész et al.

2011, Bogyó et al. 2015). Also, for example, public parks proved to be important for different groups (e.g. Nielsen et al. 2014). Thus, in the light of importance of the data on urban fauna and the scarcity of such data in Romania, we proposed to analyze the composition of the terrestrial isopod fauna from Salonta town, western Romania. Differences between the terrestrial isopod fauna from a city and a town were observed before (Bodin et al. 2013). Thus, we aimed to verify these conclusions in another small town, situated in another relief unit.

MATERIAL AND METHODS

The study was realized in the year 2015, the field activity being performed in 19 March. Totally we collected 22 samples, coming from 19 locations (Table 1) situated at the entire surface of Salonta town. The 19 locations belonged to 11 habitat types (Table 2). The sampling was made with the direct method, the isopods being collected directly with hand, or tweezers, as well as in other studies upon urban isopods (e.g. Vilisics & Hornung 2009, Bodin et al. 2013). In every location we spent approximately 20 minutes. The isopods, conserved in tubes with alcohol, were determined in laboratory using identification keys (e.g. Radu 1983, 1985, Farkas & Vilisics 2013). We calculated the percentage abundance and frequency of occurrence in the town of each species, both by the investigated locations and habitat types. The diversity of the terrestrial isopod assemblages from Salonta was calculated using the Shannon – Wiever index (Shannon & Wiever 1949). The similarity between species and isopod assemblages by habitats was established using the Past.3x software (Hammer et al. 2001). The Salonta town is situated in the southern part of Bihor County, neighboring the Hungarian border, in Cri urilor Plain (Tufescu 1986). Being localized in a low plain (Mândruț 2006), the altitude of the town is reduced, under 100 m, the plain's aspect being plat and uniform. The locality is surrounded with agricultural fields, forests in the vicinity being absent. In the southern part of the town there is a small wetland that was recently arranged partially as a public park.

RESULTS

In Salonta town we have collected 187 individuals of terrestrial isopods,

which belonged to 11 species: *Hyloniscus riparius*, *Haplophthalmus danicus*, *Cylisticus convexus*, *Platyarthrus hoffmannseggii*, *Protracheoniscus major*, *Porcellium collicola*, *Trachelipus rathkii*, *T. nodulosus*, *Porcellionides pruinosus*, *Porcellio scaber* and *Armadillidium vulgare*. The highest number of species (6 species) was encountered in wetland in the southern part of the town. In the most of the sampling points the species richness was extremely low. Thus, in 7 of the 19 analyzed locations were registered only two terrestrial isopod species, but in two locations we found only one species. *T. nodulosus* have registered the highest percentage abundance and frequency of occurrence (Tabel 1). The diversity of the terrestrial isopod assemblages from Salonta was H=1.82.

H. riparius was encountered in the most types of habitats (in 9 of 11). Four species were present only in one type of habitats (Table 2). The percentage abundance ad frequency of occurrence was different between habitat types. *H. riparius* and *H. danicus* had the highest percentage abundance in the wetland, but *T. nodulosus* near buildings. The shelters used by terrestrial isopods in Salonta were represented by debris, or, in the case of wetlands, by vegetation and soil near the water. In the case of similarity between habitat types, the most similar, in terms of terrestrial isopods, were public parks and abandoned buildings (Fig. 1a). Referring to similarity between species, very close were *P. hoffmannseggii, P. major* and *P. scaber* (Fig. 1b).

DISCUSSION

The first impression after the analysis of terrestrial isopod assemblages' composition from Salonta town is the species poverty. The 11 species are few than the ones encountered in other towns (Riedel et al. 2009, Vilisics & Hornung 2009), including a small town from western Romania, like Beiuş (Bodin et al. 2013). The species richness is even lower than the one previously registered in urban studies realized with pitfall traps (Giurgincă 2006). We consider that the low species richness is mainly due to the aspect of the zones neighboring Salonta town. Thus, the town is situated in

Table 1. The terrestrial isopod species collected from the analyzed locations, their percentage abundance and frequency of occurrence (Hr-*H. riparius*, Hd-*H. danicus*, Cc-*C. convexus*, Ph-*P. hoffmannseggii*, Pm-*P. major*, Pc-*P. collicola*, Trk-*T. rathkii*, Tn-*T. nodulosus*, Ppr-*P. pruinosus*, Psc-*P. scaber*, Avu-*A. vulgare*, No. sp. – species richness)

Sampling points	Hr	Hd	Cc	Ph	Pm	Pc	Trk	Tn	Ppr	Psc	Avu	No. sp.
Abandoned storage, railway station	x	-	-	-	-	-	-	x	-	-	x	3
Ruined building, south	-	-	-	-	-	-	x	-	-	-	x	2
Abandoned orchard, north	x	-	-	-	-	-	-	x	-	-	-	2
Flats, south	-	-	-	-	-	-	-	x	-	-	x	2
Green space, railway station street	-	-	-	-	-	-	x	x	-	-	-	2
Swamp, south	x	x	x	-	-	x	-	x	-	-	x	6
Flats, east	x	-	-	x	-	-	-	x	-	-	-	3
Poplars swamps, south	x	x	x	-	-	-	-	-	-	-	-	3
Canal, north	x	-	-	-	-	-	-	-	-	-	-	1
Streets flats, downtown	-	-	-	-	-	-	-	x	-	-	x	2
Park block of flats, downtown	-	-	-	-	-	-	-	x	-	-	x	2
Vacant land, flats, east	-	-	-	-	-	x	-	x	x	-	x	4
Streets flats, downtown	-	-	-	-	-	-	-	x	-	-	-	1
Stream farm, east	x	-	-	-	-	-	x	-	-	-	x	3
Public park, railway station	x	-	-	-	-	-	-	x	-	-	x	3
Flats, north	-	-	-	-	-	-	-	x	-	-	x	2
Wetland, east	x	-	x	-	-	-	-	x	-	-	x	4
Canal, downtown	x	-	-	-	-	-	-	x	-	-	x	3
Flats, downtown	-	-	-	-	x	-	-	x	-	x	x	4
Percentage abundance (%)	25.66	8.55	4.27	0.53	1.06	1.06	2.13	32.62	1.60	9.09	13.36	
Frequency of occurrence (%)	52.63	10.52	15.78	5.26	5.26	10.52	15.78	78.94	5.26	5.26	68.42	

Table 2. The percentage abundance (P%), frequency of occurrence (f%) and species richness (No. sp.) in different habitat types (Hr-*H. riparius*, Hd-*H. danicus*, Cc-*C. convexus*, Ph-*P. hoffmannseggii*, Pm-*P. major*, Pc-*P. collicola*, Trk-*T. rathkii*, Tn-*T. nodulosus*, Ppr-*P. pruinosus*, Psc-*P. scaber*, Avu-*A. vulgare*)

Habitat type	Hr	Hd	Cc	Ph	Pm	Pc	Trk	Tn	Ppr	Psc	Avu	P %	No sp
Abandoned buildings	6.25	-	-	-	-	-	-	8.19	-	-	4.00	4.81	3
Roadside	-	-	-	-	-	-	25.00	6.55	-	-	12.00	4.27	3
Orchard	8.33	-	-	-	-	-	-	16.39	-	-	-	7.48	2
Buildings	8.33	-	-	100	100	-	25.00	47.54	-	100	40.00	34.22	7
Swamp	37.50	75.00	62.50	-	-	50.00	-	1.63	-	-	4.00	20.32	6
Poplar plantation	2.08	25.00	25.00	-	-	-	-	-	-	-	-	3.74	3
Artificial canal	1.25	-	-	-	-	-	-	-	-	-	-	3.20	1
Wastes	-	-	-	-	-	50.00	-	4.91	100	-	4.00	4.27	4
Natural stream	6.25	-	-	-	-	-	50.00	1.63	-	-	20.00	5.88	4
Public park	8.33	-	-	-	-	-	-	8.19	-	-	4.00	5.34	3
Pond	10.41	-	12.50	-	-	-	-	4.91	-	-	12.00	6.41	4
f (%)	81.81	18.18	27.27	9.09	9.09	18.18	27.27	81.81	9.09	9.09	72.72		

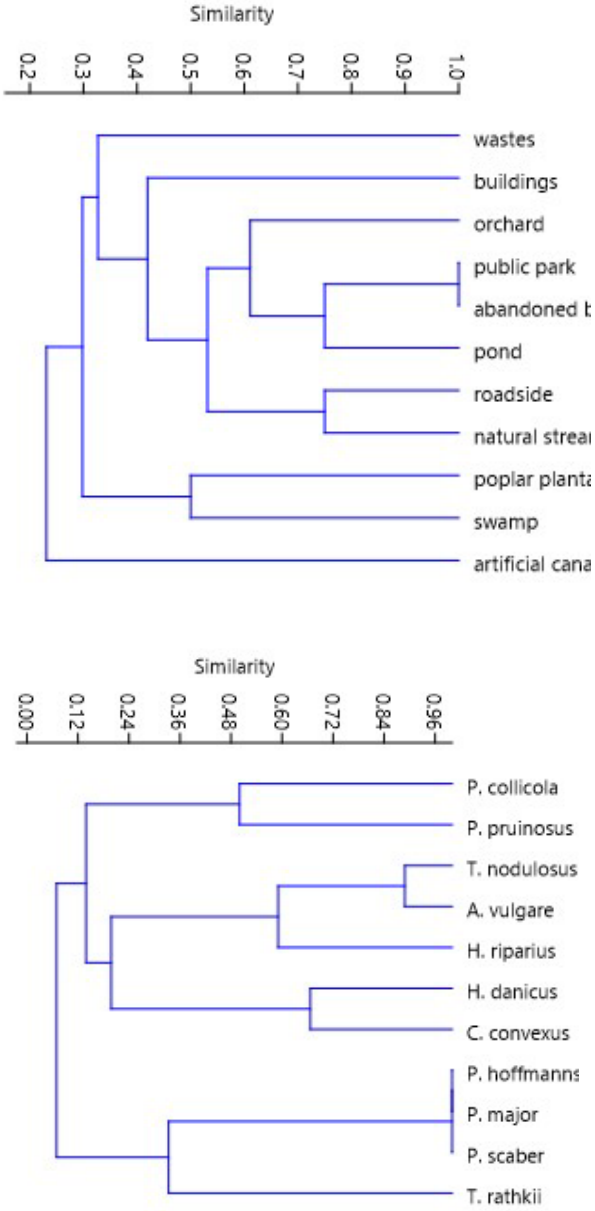

Figure 1. The similarity between habitat types (a) and species (b) after the Jaccard index

a flat plain, being surrounded with agricultural fields. Because the area is devoid of forests, terrestrial isopods linked to forests lack from the town, even if those species are present in other towns surrounded by forests (Bodin et al. 2013). The smooth relief of the area and the low altitude of Salonta town leads to the absence of species tied to high altitudes, species present in towns situated in depressions (Bodin et al. 2013). Thus, not only the reduced dimensions of a town advantage the native fauna (Bodin et al. 2013), but the naturalness of its surrounding areas, which guarantees the native species survive and allows their spreading in the town. Being surrounded with agricultural, anthropogenically affected fields, the Salonta town has a uniform and poor terrestrial isopod fauna.

The uniformity and poverty of the terrestrial isopod fauna from Salonta becomes more obvious in comparison with other plain areas from north-western Romania, where the species richness is higher (Ferenți et al. 2012, 2013). Unlike the natural plains from northwestern Romania, in Salonta there are few species and most of them are synanthropic. In Salonta not only there are few species, but the previously reported particularities in northwestern Romania, namely the presence of some high altitude isopods at plain (Ferenți et al. 2012, 2013, Ferenți & Dimancea 2013), can not be observed. Thus, in the case of terrestrial isopods, the distribution of mountain species in plain seems to be limited only to the northern part of the Western Plain, as well as in the case of some reptiles (Covaciu-Marcov et al. 2008). On a larger scale, these differences were observed previously between the herpetofauna of northwestern and southwestern Romanian plains (see in: Bogdan et al. 2013).

The only advantage for the terrestrial isopods in Salonta is the presence of some small watercourses in the town and of the wetland south of this. The most important is the humid zone from the southern part of the town, which shelters the highest number of isopod species. *H. danicus* shows up only in this location, both at the edge of the wetland itself and in a poplar plantation from its vicinity. The species was also previously mentioned in northwestern Romania in wetlands (Ferenți et al. 2012, Ferenți & Dimancea 2013). Alongside, *P. collicola* is also present in the humid zone, even under the debris from wet areas, being frequent in wetlands from northwestern

Romania (Ferenți et al. 2012). Although, public parks are highly important both for isopods, sheltering many species (Giurgincă 2006, Vilisics & Hornung 2009) and for other groups (see in: Nielsen et al. 2014), in Salonta this fact is not proved, in public parks being present few species, the assemblages being closer to the ones from the buildings` vicinity. In Salonta, the parks are very small, situated in downtown. Being surrounded with buildings, the park has the same isopod fauna. Also, the public parks of Salonta, being extremely arranged, offer few shelters for terrestrial isopods.

Unlike Beiuş town from western Romania (Bodin et al. 2013), in Salonta not only many species lack, but a myrmecophilous species, *P. hoffmannseggii* (Radu 1985), and an introduced one, *P. major* (Cochard et al. 2010), shows up. The two towns are in the same class size (Mândruț 2006). *P. major* is considered a native species in Central Asia, which has invaded numerous European countries (Cochard et al. 2010). It was also encountered in Hungary (Csordás et al 2005, Farkas & Vilisics 2006), being introduced in Budapest, too (Vilisics & Hornung 2009). In western Romania it was, according the data published until now, encountered only in Oradea city, in the cellar of an old building (Radu 1985). Also in Salonta, *P. major* was identified only in a single location from the downtown, under the debris of a building ruined few years ago; building which probably had a cellar, too. This fact shows once again the relation of this species with localities and construction, and also its introduced character in the region. Thus, the isolation of a small town seems to limit the in-going of invasive species (Bodin et al. 2013), which could colonize a plain locality.

Most of the isopod species from Salonta town are synanthropic or introduced. Thus, although *H. riparius* is linked to wetlands, this is also present in humid disturbed zones (Radu 1983). The most frequent and abundant species from Salonta, *T. nodulosus* was also reported previously in localities (Vilisics & Hornung 2009, Bodin et al. 2013). Being a xerophilous species, typical for plain, it is common in Hungary (Farkas 2010), and also in the plain areas on northwestern Romania (Ferenți et al. 2012). Thus, its large distribution in Salonta is natural. In addition, *P. scaber* and *A. vulgare* were also encountered in other towns (Vilisics &

Hornung 2009, Bodin et al. 2013). The two species are frequent and abundant in different localities in Southern America (Preciado & Martinez 2014), being also encountered in urban forest fragments from New Zeeland (Parker & Minor 2015).

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