NEW DATA ON THE DISTRIBUTION OF LARGE BRANCHIOPODS (BRANCHIOPODA: ANOSTRACA, NOTOSTRACA, SPINICAUDATA) IN BIHOR COUNTY, NORTH-WESTERN ROMANIA

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Abstract. In the year 2017 we identified in the northern and central regions of Bihor County from western Romania large Branchiopods in 19 habitats from 17 localities. They were represented by four species: *Branchipus schaefferi*, *Lepidurus apus*, *Triops cancriformis* and *Leptestheria dahalacensis*. *B. schaefferi* was the only common species, the others being encountered in just one, two or three localities. *L. dahalacensis* was mentioned for the first time in the region. According to the literature, this is the second record of *L. dahalacensis* in western Romania.

Keywords: temporal waters, crustaceans, distribution, agricultural areas.

Rezumat. Noi date asupra distribuției branhiopodelor mari (Branchiopoda: Anostraca, Notostraca, Spinicaudata) în județul Bihor, nord-vestul României. În anul 2017 am identificat în regiunile centrale şi nordice ale judeţului Bihor din vestul României, Branchiopode mari în 19 habitate din 17 localităţi. Acestea au fost reprezentate de patru specii: *Branchipus schaefferi*, *Lepidurus apus*, *Triops cancriformis* şi *Leptestheria dahalacensis*. *B. schaefferi* a fost singura specie comună, celelalte fiind întâlnite în doar una, două sau trei localităţi. *L. dahalacensis* a fost menţionată pentru prima dată în regiune. Conform literaturii, acesta este a doua semnalare a speciei *L. dahalacensis* în vestul României.

Cuvinte cheie: ape temporare, crustacee, distribuție, zone agricole.

INTRODUCTION

Although temporary waters were common in Europe in the past, they were eliminated from large areas because of human interventions (WILLIAMS et al., 2001). In these habitats, large Branchiopods are considered helpful in testing the habitat's quality and functions (see in: BRENDOCK et al., 2008). They are threatened by agricultural activities, which directly eliminated their habitats, and also by hydrological changes (EDER & HÖDL, 2002). The protection of this important group implies maintaining high habitat diversity (BOVEN et al., 2008). Romania is a country with a high number of large Branchiopod species (26 species) compared to other European countries (DEMETER & STOICESCU, 2008). This great diversity of the large Branchiopod fauna indicated the importance of Romania for the protection of this group (DEMETER & STOICESCU, 2008). Nevertheless, with all the high species richness, there are very few recent data on this group in Romania, regions without any recorded species still existing in the country (DEMETER & STOICESCU, 2008). Bihor county in western Romania is not one of those zones, but the number of known species is still low (DEMETER & STOICESCU, 2008). In the region there are some old fauna notes on large Branchiopods (COVACIU-MARCOV & POP, 1999; CUPŞA & COVACIU-MARCOV, 2001, 2002) and some new data in a review article from 2008 (DEMETER & STOICESCU, 2008). However, in Bihor county there is no more recent information on this group, and the number of known distribution localities is low (DEMETER & STOICESCU, 2008). Thus, in the year 2017 we investigated some localities from the northern and central regions of Bihor County in order to contribute with new data to the knowledge on the distribution of large Branchiopods in this region.

MATERIAL AND METHODS

The field study was made in the year 2017. We have investigated 26 localities; large Branchiopods were present in 17 localities. Bihor County is situated in western Romania (TUFESCU, 1986). The investigated region was represented by the northern and central sectors of the county, containing parts from the Romanian Western Plain and Western Hills (MÂNDRUŢ, 2006). The region is covered almost completely by agricultural areas. Large Branchiopods were collected over many field trips, made especially in spring and autumn, when the rainfalls caused the accumulation of water in their habitats. On the field we investigated different localities from Bihor county looking for habitats suitable for large Branchiopods. The individuals were collected with a round net with an opening of 10 cm², mounted on a handle of approximately 1 m length. The collected individuals were conserved in test tubes and determined in the laboratory at a stereomicroscope. The species were determined with the help of the literature (BOTNARIUC & ORGHIDAN, 1953; ŠRAMEK-HUŠEK et al., 1962).

RESULTS

In the central and northern areas of Bihor County we have encountered large Branchiopods in 17 localities (Fig. 1). From those localities we collected 19 samples in which we determined four species: *Branchipus schaefferi* Fisher, 1884, *Lepidurus apus* Linnaeus, 1758, *Triops cancriformis* Bosc, 1801 and *Leptestheria dahalacensis* Rüppel, 1837 (Table 1.). Two species, *L. apus* and *T. cancriformis* belonged to Notostraceae, one species *B. schaefferi* belonged

to Anostraceae, and one species *L. dahalacensis* to Spinicaudatae. Totally we collected 235 large Branchiopod individuals, from which 222 belonged to the species *B. schaefferi*. The other three species were represented by a much lower number of individuals. Thus, *L. apus* was represented by six individuals, *T. cancriformis* was represented by four individuals and *L. dahalacensis* was represented only by three individuals. The percentage abundance of large Branchiopods in Bihor County was the following: *B. schaefferi* 94.46%, *L. apus* 2.55%, *T. cancriformis* 1.70% and *L. dahalacensis* 1.27%. Like in the case of the percentage abundance, *B. schaefferi* held the first place also in terms of frequency of occurrence. This species was present in each locality with large Branchiopods, having a frequency of 100%. *L. apus* registered a frequency of 10.52%, *T. cancriformis* registered a frequency of 20.05% and *L. dahalacensis* a frequency of only 5.26%.

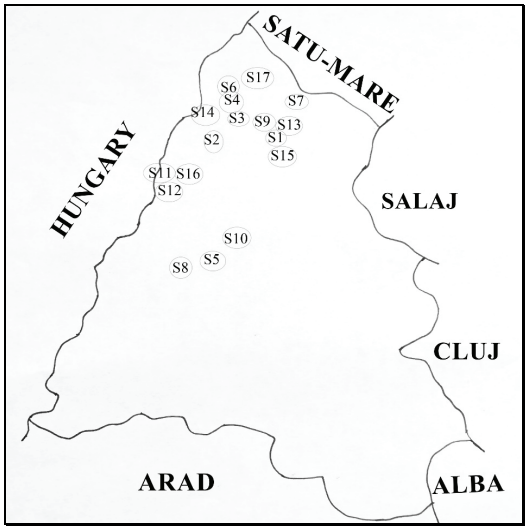

Figure 1. Large Branchiopods habitats in Bihor County (S1 – Abrămuț; S2 – Cadea; S3 – Cherechiu; S4 – Cherechiu / Cheşereu; S5 – Cheriu; S6 – Cheşereu; S7 – Cheț; S8 – Cihei; S9 – Crestur; S10 – Ineu de Criş; S11 – Niuved; S12 – Parhida; S13 – Petreu; S14 – Săcuieni border; S15 – Sânlazăr; S16 – Tămăşeu / Parhida; S17 – Tarcea).

Table 1. Distribution of large Branchiopods in Bihor County, Romania.

Locality	***B. schaefferi***	***L. apus***	***T. cancriformis***	***L. dahalacensis***
Abrămuț	X	X	X	-
Cadea	X	-	-	-
Cherechiu 1	X	-	-	-
Cherechiu 2	X	-	-	-
Cherechiu / Cheşereu 1	X	-	-	-
Cherechiu / Cheşereu 2	X	-	-	-
Cheriu	X	-	-	X
Cheşereu	X	-	-	-
Cheț	X	-	-	-
Cihei	X	-	X	-
Crestur	X	-	-	-
Ineu de Criş	X	-	-	-
Niuved	X	-	-	-
Parhida	X	-	-	-
Petreu	X	-	-	-
Săcuieni border	X	-	-	-
Sânlazăr	X	X	X	-
Tămăşeu / Parhida	X	-	-	-
Tarcea	X	-	-	-

In the northern and central areas of Bihor County, large Branchiopods were recorded in three habitat types: wheel tracks in agricultural areas produced by the passing of agricultural machineries, temporary waters situated near more natural zones (forest or pasture) and near some unpaved country roads, covered with stones. Most individuals were collected from wheel tracks in agricultural areas (119). Fewer individuals were collected from more natural areas (38). *B. schafferi* was encountered in all three habitat types, but he majority of individuals were present in agricultural

areas. *L. apus* was encountered both in agricultural areas and in more natural ones. *T. cancriformis* was recorded in all three habitat types. Unlike the previous species, *L. dahalacensis* was collected only in more natural habitats.

DISCUSSIONS

One of the four large Branchiopod species identified in the year 2017 (*L. dahalacensis*) was recorded for the first time in Bihor County according to the most recent data upon the distribution of this group in Romania (CUPŞA & COVACIU-MARCOV, 2001, 2002; DEMETER & STOICESCU, 2008). Moreover, for *L. dahalacensis* the locality from Bihor County seems to be the second record of this species in western Romania (DEMETER & STOICESCU, 2008). These results, despite the small investigated area, indicate how little is known about the distribution of this group in western Romania.

In Bihor County from western Romania the most common large Branchiopod species was *B. schaefferi*. Thus, from the four species identified in the region, *B. schaefferi* is the most capable to use all analyzed types of habitats, previously being indicated that it can survive both in temporal waters and in deeper ones (BELADJAL et al., 2003). In Romania the species seems to be common, being mentioned in numerous localities in the country, with the exception of eastern Romania (DEMETER & STOICESCU, 2008). The species proved to be common also in other regions from the Pannonian Plain, like the central areas of Hungary (BOVEN et al., 2008). Nevertheless, in other regions like Poland, even if the number of populations from some areas seems high, the species seems however in decline, surviving only in few regions (GOŁDYN et al., 2007, 2012), being threatened by the modifications of habitats (MIODUCHOWSKA et al., 2017). The species is considered rare in Portugal as well (MACHADO et al., 2017). Unlike these, *B. schaefferi* is very common in western Romania, being distributed uniformly in the entire studied area. The fact that most individuals were recorded in wheel tracks in agricultural areas is not surprising. This was also mentioned in other regions, where wheel tracks remained the only temporary aquatic habitats (VANSCHOENWINKEL et al., 2013). Probably this is the case in the northern and central areas of Bihor County too, where the investigated region was mostly represented by agricultural areas.

L. dahalacensis was identified only in a single locality, being the rarest species in the investigated region. The identification of *L. dahalacensis* in north-western Romania extends its previously known distribution range in the country (DEMETER & STOICESCU, 2008). However, its identification was expectable, taking into account the general distribution range of this species, which was recorded both eastwards and westwards from Romania (e.g. BRENDONCK et al., 1989; HÖDL & EDER, 1996; DOBRYNINA, 2010). Although in the studied region it was encountered only in relatively natural habitats, in other areas from the Pannonian Plain it was observed only in wheel tracks (BOVEN et al., 2008). Nevertheless, just like in the studied region, this species was rarely encountered in the central areas of Hungary (BOVEN et al., 2008).

T. cancriformis, although it was rare in the studied region, was mentioned in the past in different areas from Bihor County (COVACIU-MARCOV & POP, 1999; CUPŞA & COVACIU-MARCOV, 2001, 2002; DEMETER & STOICESCU, 2008), being a species with a large distribution range in Europe (EDER & HÖDL, 2002). Nevertheless, in the past, *T. cancriformis* was usually recorded near forests (COVACIU-MARCOV & POP, 1999; CUPŞA & COVACIU-MARCOV, 2001, 2002). This fact could explain the species rarity in the northern areas of Bihor County, where the forests are rare. Moreover all three localities, where it was identified in the studied region, are situated close to some forests. *L. apus* is even rarer than *T. cancriformis*, being recorded only in two localities. The relation of this species with transparent waters with vegetation (BOVEN et al., 2008) is also clear in the studied region. Thus, *L. apus* was encountered in deeper habitats (up to 50 cm) with reeds on the banks, in contrast to the ephemeral habitats from agricultural terrains with no aquatic vegetation. At least in the area with such habitats the species seems well represented. We have observed *L. apus* individuals even in concreted canals situated near asphalted roads, but which communicated with canals from agricultural terrains or pastures. Probably these habitats are remnants of some more natural areas, which were present in the region before the modernization of roads and the intensification of the agriculture.

Compared to the 26 large Branchiopod species in Romania (DEMETER & STOICESCU, 2008), the four species recorded in Bihor County are very few. Nevertheless, taking into account the fact one species was recorded for the first time in the region, the scarcity of knowledge on this group is obvious. The fact that only one species was well represented clearly shows the degree of the human impact upon this group in the region. Most habitats are artificial or heavily modified. Thus, the protection of these invertebrates, which can be realized by protecting their habitats (HODL & EDER, 1996), seems quite difficult.

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