DATA ON THE DISTRIBUTION AND ECOLOGY
OF DREPANOSURUS HANKOI (CRUSTACEA: ANOSTRACA)
IN ROMANIA

LÁSZLÓ DEMETER

In this paper I present the distribution of the rare fairy shrimp Drepanosurus hankoi in Romania. This species is restricted to two tectonic mountain basins of the South-Eastern Carpathians, known from only 15 habitats. Detection probability of this species is lowered by early frost or drying out of the habitat, which kill larval populations usually in February and March, after which the eggs from the egg bank do not hatch in that year. Frequently, habitats are dry because of low precipitation in early spring. Also, if the habitat is wet in the previous year, the eggs will not hatch. The unpredictability of the habitat and high specialization of the species, combined with slow dispersal, makes D. hankoi extremely vulnerable. Protection of its habitats is very much needed.

Key words: Drepanosurus hankoi, distribution, rarity, vernal pools, Eastern Carpathians.

INTRODUCTION

Drepanosurus hankoi (Dudich, 1927) is a rare fairy shrimp (Crustacea: Anostraca), known from Hungary (Dudich, 1933), Slovakia (Dudich, 1927; Brtek, 1976), Czech Republic (Brtek & Thiéry, 1995), Belorussia (Nagorskaya et al., 1998) and Romania (Demeter & Stoicescu, 2008). In Romania, it was found first by Demeter (2004, 2005) in the Ciuc Basin (Eastern Carpathians), and later also in the Brașov Basin (Demeter & Hartel, 2007). It was not detected in any other part of Romania (Botnariuc & Orghidan, 1953; Demeter & Stoicescu, 2008). While it is a relatively large and spectacular species, very few information are available on its ecology. The aims of this paper are to summarize the distribution of this species in Romania and to discuss the causes of its rarity.

MATERIAL AND METHODS

I surveyed temporary ponds for the presence of large branchiopods from February to May between 2003 and 2008 in the Ciuc, Gheorgheni and Brașov basins, parts of North-Western Romania, Banat, Southern Romania and the Transylvanian Basin (Demeter & Hartel, 2007; Demeter & Stoicescu, 2008). The largest sampling effort was done in the three large tectonic mountain basins of the South-Eastern Carpathians, where approximately 500 habitats were surveyed. Habitats where D. hankoi was found were checked in 3 to 6 years and they were visited one to ten times per year, totaling 57 pond years (Table 1).
RESULTS

*D. hankoi* is known from 15 habitats located in five sites in two mountain basins of the South-Eastern Carpathians: the Ciuc Basin and the Braşov Basin (Fig. 1). Adult populations were recorded in 42.1% of the 57 pond years. In 26.3% of the cases the habitats were dry in spring and in 7% of the cases they did not dry out in the previous year. In 5.3% of the cases a larval population has been observed early in the season (February or early March) but did not reach adulthood because of freezing or early drought. For individual habitats, the chance of an adult population varies between 20-75% for habitats observed at least in two years. One habitat has been destroyed because of building and filling up. In two habitats eutrophication was observed with the excessive growth of *Spirogyra* sp. (Table 1).

![Fig. 1. Distribution of Drepanosurus hankoi in Romania and neighbouring countries. The map shows localities and habitats where the species was not recorded (personal data and data from the literature).](image-url)
Table 1
List and short characterization of habitats and the presence of Drepanosurus hankoi populations

<table>
<thead>
<tr>
<th>Plot code and locality</th>
<th>Latitude (N)</th>
<th>Longitude (E)</th>
<th>Short description</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Frequency of breeding success of larval detection probability (number of years with population detected/number of years of observation)</th>
<th>Year of observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stanceni, Civic Basin</td>
<td>46°31'07&quot;</td>
<td>25°34'17&quot;</td>
<td>Mire meadow</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
</tr>
<tr>
<td>2. Stanceni, Civic Basin</td>
<td>46°31'11&quot;</td>
<td>25°33'11&quot;</td>
<td>Occasionally mire meadow/very low density</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
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</tr>
<tr>
<td>3. Citu, Civic Basin</td>
<td>46°49'25&quot;</td>
<td>25°38'31&quot;</td>
<td>Mire meadow</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>4. Citu, Civic Basin</td>
<td>46°49'17&quot;</td>
<td>25°37'01&quot;</td>
<td>Mire meadow/very low density</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>5. Gheac, Civic Basin</td>
<td>46°45'24&quot;</td>
<td>25°35'13&quot;</td>
<td>Ditch and filled pond</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>6. Dobau, Civic Basin</td>
<td>46°49'20&quot;</td>
<td>25°36'55&quot;</td>
<td>Tarns/dry pond</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>7. Dobau, Civic Basin</td>
<td>46°49'56&quot;</td>
<td>25°37'54&quot;</td>
<td>Tarns/dry pond/low density</td>
<td>1</td>
<td>1</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>8. Stanceni, Civic Basin</td>
<td>46°31'13&quot;</td>
<td>25°32'33&quot;</td>
<td>Mire field</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>9. Citu, Civic Basin</td>
<td>46°49'25&quot;</td>
<td>25°36'21&quot;</td>
<td>Mire field</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>10. Cinci, Civic Basin</td>
<td>46°49'17&quot;</td>
<td>25°39'21&quot;</td>
<td>Occasionally mire meadow</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<td>0</td>
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<td>0.33</td>
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</tr>
<tr>
<td>11. Cinci, Civic Basin</td>
<td>46°49'01&quot;</td>
<td>25°37'05&quot;</td>
<td>Occasionally mire meadow</td>
<td>1</td>
<td>1</td>
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<td>0</td>
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<td>0.33</td>
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</tr>
<tr>
<td>12. Cinci, Civic Basin</td>
<td>46°49'05&quot;</td>
<td>25°38'05&quot;</td>
<td>Occasionally mire meadow</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
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</tr>
<tr>
<td>13. Rem, Barja Basin</td>
<td>46°49'24&quot;</td>
<td>25°39'04&quot;</td>
<td>Pond with Glycerum obtusifolium</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>14. Rem, Barja Basin</td>
<td>46°49'33&quot;</td>
<td>25°39'33&quot;</td>
<td>Pond with Glycerum obtusifolium</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
<tr>
<td>15. Stanceni, Civic Basin</td>
<td>46°45'12&quot;</td>
<td>25°31'12&quot;</td>
<td>Pond with Glycerum obtusifolium</td>
<td>1</td>
<td>1</td>
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<td>0</td>
<td>0</td>
<td>0.33</td>
<td>0</td>
</tr>
</tbody>
</table>

Table abbreviations:
- 1 = larval or adult population observed,
- 0 = no specimen observed,
- x = no data,
- P = larval population present,
- F = larval population disappeared probably because of predation,
- D = pond dried before the end of observation,
- W = pond did not dry out in the previous year.

Note: frequency of breeding success is equal to frequency of detection probability in the season (April) — i.e., adults could be detected in only 10-50% of cases in the case of many habitats.
DISCUSSION

According to the literature (Botnariuc & Orghidan, 1953) and personal investigations (Demeter & Hartel, 2007; Demeter & Stoicescu, 2008), *D. hankoi* is restricted to two mountain basins in Romania, namely the Ciuc Basin and the Brașov Basin. This is an interesting geographic pattern, because these landscapes are special from a geomorphological (tectonic basins with a rich hydrographic network) and climatic (cold climate with thermal inversions and high humidity, but low precipitation) point of view. These areas are also rich in plant species considered glacial relics, so the question arises whether *D. hankoi* can be considered a relic species too?

Based on the available data the probability of the existence of more habitats in the Brașov Basin is high. I did not find any habitats in the Gheorgheni Basin, but the occurrence of this species is also probable.

*D. hankoi* habitats are temporary ponds of up to 300 m², 50-70 cm maximum depth and an average duration of less than three months. Most habitats are of natural origin, usually periglacial ponds (Demeter et al., 2012 b). The few artificial habitats (a drainage ditch and basins along a railway) are former natural habitats transformed by human activities. Habitats of this species are not conspicuous outside spring, being dry and the land is used for agricultural purposes (arable or mowing). Furthermore, many of these habitats are unpredictable on a short term for the human observer, because of unfavorable hydroperiod (drought, frost, excessive wetness in the previous year), habitat conditions (algal blooms), predation, or the combination of these. As a result, adult populations develop in every second year on average, but as rarely as one in five years. This is not an exceptional case for Anostraca, a group adapted to temporary wetland habitats, often semidesert or desert (Beladjal & Mertens, 2003).

The available data show that *D. hankoi* is a very rare species in the Romanian fauna (as well as in the European fauna), and as such, it deserves strict protection. Currently it is not listed in the national or European lists of protected species.

Although no experimental data are available, field observations suggest that for the activation of resting eggs (hatching) drying and freezing are necessary. No second hatching has been observed in cases when the ponds dried out and became rewetted during early spring, and nor when the ponds were not dry in the previous year. Excessive growth of *Spirogyra* algae and macrophytes has been suggested to be a factor responsible for the absence of *B. schaefferi*, probably because they obstruct the swimming of Anostraca (Hössler et al., 1995). We observed blooms of *Spirogyra* in two *D. hankoi* habitats, and in one of them we observed unusually small-sized individuals and low fertility (Demeter et al., 2012 a).

The rarity of *D. hankoi* is caused by several factors: first of all, detection probability is low because some populations appear only in some years (as low as...
once in four or five years), and larval populations can be killed by frost or early drying of the habitat. A single late sampling in April will not be able to detect such a population. The available population genetic data show large genetic distances between populations (Korn & Demeter, unpublished data), suggesting that slow dispersal may be a cause of rarity in this species. This explains why the species is missing from many apparently suitable habitats.

REFERENCES


DUDICH E., 1933, Faunistikai jegyzetek IV. Allattani Közlemények, 30: 120-129.
