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Note on eight new thermal habitats with winter-active amphibians in Western Romania

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Abstract. In the winter of 2011 we found active amphibians in eight new thermal habitats from western Romania. The identification of some populations in Arad County fills the gaps in the distribution of the phenomenon. Most of the habitats are artificial, represented by channels originating from thermal wells.

Key words: amphibians, thermal waters, Western Romania, habitats.

Older records from Romania, on winter-active amphibians in thermal waters were related to the north-western part of the country (Covaciu-Marcov et al. 2003, 2004, 2006, 2010, 2011a, Sas et al. 2007). Only recently, several localities have also been identified in the southwest of the country, in Banat (Covaciu-Marcov et al. 2010, Bogdan et al. 2011). Nevertheless, most of the habitats are in north-western Romania at present as well, and in Arad County, located between this area and Banat, a single population has been identified so far (Covaciu-Marcov et al. 2011a). This seems to be rather a result of the absence of detailed studies, than of the absence of thermal habitats because, at least in the neighbouring areas of Hungary, thermal waters seem to be more abundant in south-west than in north-west of the country (Kulcsár 2012). The abundance of thermal waters in the Western Pannonian Basin, exploitable for various purposes (e.g. Antal et al. 2009, Petrescu-Mag et al. 2009, Balog et al. 2011, Kulcsár 2012), indirectly shows that winter-active amphibians are more widely distributed in western Romania, including Arad County, where they have rarely been reported previously. Thus, we intended to fill the gap in the distribution of winter-active amphibians by surveying thermal habitats in previously insufficiently analyzed areas from western Romania.

The study was conducted in the winter of 2011 and January of 2012. We have investigated 21 localities in western Romania, from which we had information about the existence of some thermal water sources. As in previous studies (e.g. Covaciu-Marcov et al. 2006, 2011a), we used the direct observation method. Amphibians from thermal waters were counted and their habitats were photographed.

We have identified winter-active amphibians in eight of the 21 investigated habitats (Table 1), most of the checked thermal water sources being represented by closed wells or by pools inoperative during winter. Thus, the number of thermal habitats with winter-active amphibians has reached 41 in western Romania, 33 being described previously (see the discussion in: Bogdan et al. 2011). Four of the eight new habitats are in Arad County (Fig. 1). The identification of those four non-hibernating amphibian populations from Arad County attest that the phenomenon is general in all western Romania, where, as it was previously reported, there are thermal waters which combine the conditions of its generation (e.g. Covaciu-Marcov et al. 2006). There are still thermal habitats in western Romania, whose biodiversity has not been investigated, the conducted studies being commonly limited to faunistical data on amphibians.

Most of the new thermal habitats are represented by channels originating from thermal wells (Fig. 2), used only by locals for household activities, as in other cases (e.g. Covaciu-Marcov et al. 2010). At Bobalna the habitat is represented by two basins belonging to an abandoned thermal pool, partially used only by locals. At Curtici, the thermal water which supplies a channel comes from the large greenhouses in the locality. Similar applications have the thermal waters from other regions as well (e.g. Stavreva-Veselinovska & Todorovska 2010, Balog et al. 2011). At Şandra (Fig. 2B), water is discharged from an industrial facility related to a refinery, being probably used in technological processes. On the contrary, at Moneasa there is a spring, probably natural, which was captured and used in the old thermal baths of the locality. These have been neglected for many years, but they are reconditioned at present, the habitat

Table 1. The new thermal habitats with winter-active amphibians in western Romania.

Locality	Altitude	Type of the habitat	Species and no. of individuals	
			R. dalmatina	*P. ridibundus*
Crasna [SJ] (A.)	291 m	Well	-	1
Roşiori / Tămăşeu [BH] (B.)	101 m	Well	-	45
Zerind[AR] (C.)	89 m	Well	-	13
Socodor [AR] (D.)	92 m	Well	-	11
Moneasa [AR] (E.)	325 m	Captured thermal spring	-	8
Curtici [AR] (F.]	102 m	Greenhouses	-	40
Bobalna [HD] (G.)	376 m	Abandoned pool	3	23
Şandra [TM] (H.)	86 m	Industrial facility	-	21

Legend: AR- Arad county, HD- Hunedoara county, BH- Bihor county, TM- Timis county, SJ- Salaj county; A. to H. - locality codes on Fig.1.

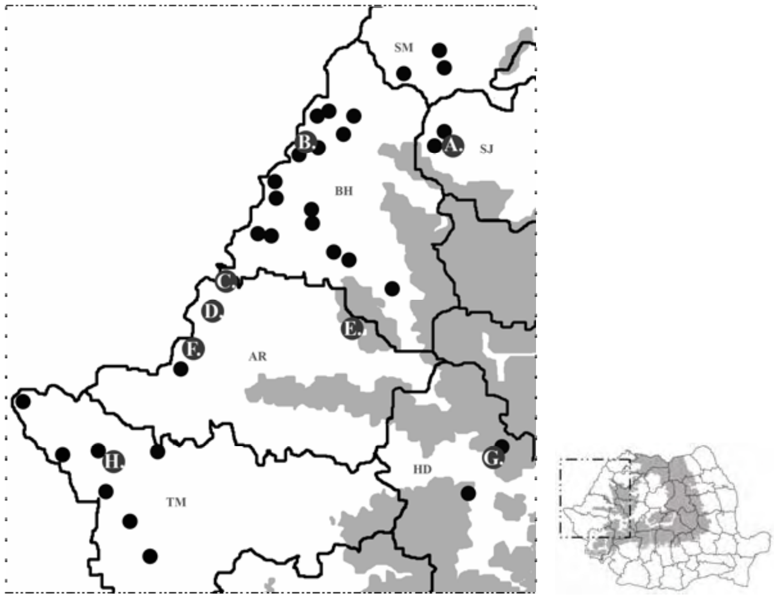

Figure 1. Distribution map of the thermal habitats from north-western Romania. Grey dots: represent the localities of the new thermal habitats with non-hibernating populations of *P. ridibundus* (A.- Crasna, B.- Roşiori/Tămăşeu, C.- Zerind, D.- Socodor, E.- Moneasa, F.- Curtici, G.- Bobalna, H.- Şandra; also see Table 1). Black dots represent the thermal habitats known from literature with non-hibernating populations of *P. ridibundus* (see in: Covaciu-Marcov et al. 2006, 2010, 2011, Sas et al. 2007, Bogdan et al. 2011). [AR- Arad county, BH- Bihor county, HD- Hunedoara county, SJ- Sălaj county, SM- Satu-Mare county, TM- Timiş county].

depending on these works. Currently, the thermal water flows into a non-thermal stream, heating it on several tens of meters due to its temperature and flow rate.

In all eight habitats, the effect of thermal waters on amphibians consists in the disappearence of hibernation, as in previous cases (e.g. Covaciu-Marcov et al. 2006, 2011a, Sas et al. 2007). *Pelophylax ridibundus*, the most common species from thermal waters (e.g. Covaciu-Marcov et al. 2006, Bogdan et al. 2011) has been identified in all new habitats, but the number of individuals varied among habitats (Table 1). Another species, *Rana dalmatina*, has been observed only at Bobalna. Here, the habitat is located in a wooded, natural area, being favourable for a forest species as *R. dalmatina* (Fuhn 1960). The other habitats are located in treeless areas, in or near localities, being thus generally populated only by *P. ridibundus*. The only exception is Moneasa, where *R. dalmatina* theoretically could be present. The disappearance of hibernation was the only common feature observed in all habitats. However, some habitats can also provide conditions for the appearance of modifications in reproduction: recently, in thermal waters originating from industrial facilities over-

A. B. C. D.

Figure 2. Aspects of some newly discovered thermal habitats in north-western Romania - the thermal water source also given. **A.** the habitats at Socodor; **B.** the habitat at Şandra; **C.** the habitat at Zerind; **D.** the habitat at Roşiori/Tămăşeu.

Figure 3. Frozen idnividuals of *P. ridibundus* in the thermal habitat at Şandra.

wintering larvae have been identified (Fominykh & Lyapkov 2011).

Discharges of thermal waters are considered unfavourable for the environment (see in: Wałkuska & Wilczek 2010). However, in the case of amphibians living in thermal waters from western Romania the negative influence does not seem to be obvious. Amphibians from these are common species (Cogalniceanu et al. 2000), a situation also valid for invertebrates from thermal waters in other regions (Boothroyd 2009). At the same time, most of the thermal habitats with winter-active amphibians are not natural and thus it is difficult to pose the question of their affectation. This is the case of the habitat from Zerind (Fig. 2C), represented by a narrow channel with concreted walls, originating in a fountain with thermal water located in the centre of the locality, being similar to the habitats from Tulca (Covaciu-Marcov et al. 2011a).

Simultaneously, it is confirmed that staying active during winter is not necessarily advantageous for amphibians from thermal waters (Covaciu-Marcov et al. 2011b). Thus, at Şandra it seems that the discharges of warm waters are variable, with moments of high flow rate, followed by stoppages. The effect of these variations can be deadly to frogs (Fig. 3), if the interruption of thermal water overlaps with a cold wave. This happened in January 2012 and led to the death of 10 marsh frogs which were located too far away from the thermal water source, being thus trapped under ice (Fig. 3). If these alternations that seem to be characteristic to habitats related to industrial facilities are not too sudden and are not associated with frost, the frogs can enter into hibernation (Covaciu-Marcov et al. 2006).

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