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NOTE ON THE PRESENCE OF *Rana temporaria* (AMPHIBIA) IN UNDERGROUND HABITATS FROM APUSENI MOUNTAINS, ROMANIA

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ABSTRACT. *Individuals of Rana temporaria were identified in seven underground habitats from Apuseni Mountains. In one cave a juvenile was found near the entrance, in one only adults and in the other both adults and juveniles. Common frogs can get accidentally deep inside the caves, but sometimes they seek on purpose this type of habitat.*

KEYWORDS: *Rana temporaria, caves, mines, Apuseni Mountains.*

Caves are unique ecosystems that can harbor a great diversity of organisms (Culver & Pipan 2009). In the American continent is a well known fact that Ranids may inhabit caves (Resettarits & Aldridge 1988, Niemiller et al. 2009, Engbrech et al. 2011), but in Europe only during the last decade amphibian species started to be recorded in underground habitats. Among these species the fire salamander is the most studied and many cases of breeding in underground habitats were reported in Italy and Slovakia (Razzetti et al. 2001, Manenti et al. 2009, Manenti et al. 2010, Manenti & Ficetola 2013, Rosa & Penado 2013, Balogova & Uhrin 2014). In contrast studies on presence of *Rana temporaria* in underground habitats of Europe are fewer (Zagorodniuk & Petrushenko 2003) and to our best knowledge only once a breeding case was observed in Slovenia (Bressi & Dolce 1999). Even if Romania is inhabited by nineteen amphibian species, whose distribution was recently reviewed in the country (Cogălniceanu et al. 2013), to our best knowledge only one species, *Salamandra salamandra*

was recorded in underground habitats (Ianc et al. 2012). In this context we aimed to find out if other amphibians are present in underground sites of Apuseni Mountains.

The study was conducted in 2011-2013. A total of 19 caves and abandoned mines from Apuseni Mountains were surveyed. Captured animals were photographed and then released while those found deep inside the caves were brought up to the surface.

We have observed common frogs in six caves from Pădurea Craiului Mountains: Stracoş Cave, Ferigi Cave, Sohodol Cave, Gălăşeni Cave, Peşteruța Cave, Osoi Cave and in an abandoned mine from Ormindei Gorge in Metaliferi Mountains. In three of them (Gălăşeni Cave, Stracoş Cave and Ferigi Cave) were identified only juveniles while in the Sohodol Cave, Peşteruța Cave, Osoi Cave and in the mine were observed both juveniles and adults (Table 1).

Table 1. The investigated underground habitats characteristics.

Name	Entrance area	Season	Altitude	Water	Frogs` number
Gălăşeni Cave	Shrubs	autumn	370 m	permanent	1
Stracoş Cave	Shrubs	spring	268 m	permanent	1
Sohodol Cave	forest edge	autumn	545 m	temporary	2
Ferigi Cave	forest	autumn	600m	temporary	1
Peşteruța Cave	open area	summer	700m	temporary	5
Osoi Cave	forest edge	spring	410 m	permanent	2
Abandoned mine	Shrubs	summer	312 m	temporary	2

In Sohodol Cave (Figure 1) were identified frogs at 300m/– 50m, in Gălăşeni Cave at 20m/-10 m and in Ferigi Cave at 3500m/-100 m (Figure 2) deep on the shore of a lake was found one juvenile. In all three cases the frogs were very thin, near starvation, this means that the individuals had been sitting there from a long time and in each case the return out was impossible due to the number of vertical passages. We assume that frogs

sitting outside, around the cave entrance are caught by the flood and can be taken hundreds of meters or even kilometers far from the cave entrance. The entrances of these caves are located in or at forest edge and most probably, frogs were dragged in with leaves and branches deep inside during heavy rains in autumn season, similar to other reported cases when amphibians got accidentally in caves (Niemiller & Miller 2007).

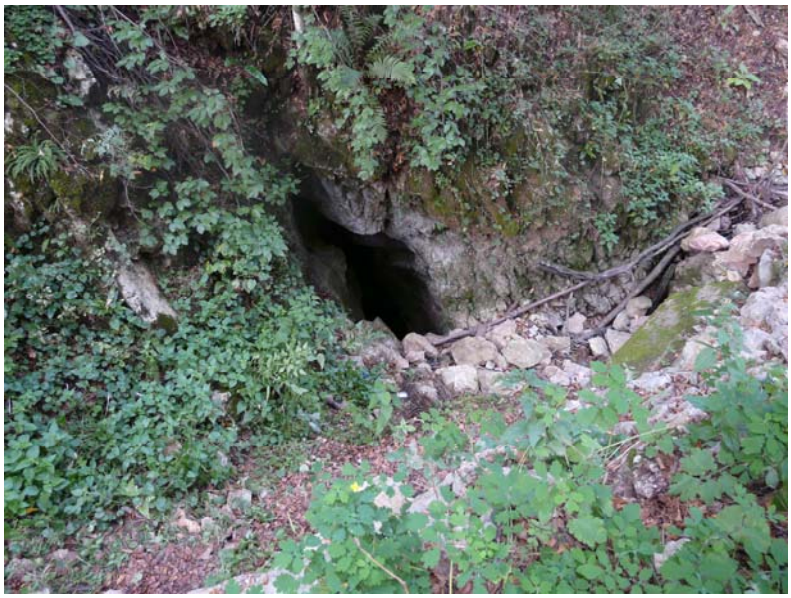

Figure 1. The entrance in the Sohodol Cave.

Figure 2. *Rana temporaria* individuals at Sohodol (left) and Ferigi cave (right).

Figure 1. *Rana temporaria* individuals at Osoi cave.

In contrast, the waters from Damiş Karstic Area disappear in underground through sinkholes, making it a dry area without permanent rivers (Rusu, 1988; Orăşeanu & Iurkiewicz 2010). As a consequence during summer amphibians need to find an alternative to these conditions. This may explain the number of five individuals from Peşteruța Cave. Firstly the cave represented a hiding place, providing a moist and cold refuge in summer, but then, during rain, individuals were washed in deeper, remaining there, which confirms that sometimes caves act as natural traps for amphibians (Uhrin & Lesinsky 1997).

On the other hand, the caves from Pădurea Craiului Mountains are known to have a great invertebrate diversity (Moldovan et al. 2007), as well as vertebrates, namely bats (Bucs et al. 2012) that are an important element in cave ecosystem with their guano as the principal provider of organic matter (Ferreira & Martins 1999). Therefore, in other situations

caves may be used not only as temporary refuge from the heat but also as foraging habitats (Resetarits 1986, Resetarits & Aldriger 1988). This is the case of Stracoş Cave, where, during the spring season, when the water level was low, a juvenile entered 10 m inside and Osoi Cave (Figure 3), where, even the water level was higher, one adult and one juvenile entered about 8 m inside.

The same explanation is valid also for the frogs found 50 meter deep inside in the abandoned mine, where we found one juvenile and one adult. The adult was checked directly by hand and it has recently eaten which means that this underground habitat does not provide only a cool and moist place to hide, but also provides food. Taking into account these facts, most probably common frogs are attracted by different underground sites for their stable conditions, for foraging and sometimes are just dragged in by water. Sometimes, *Rana temporaria* gets accidentally deep inside caves, without the possibility to get out, but in other cases, seems to choose on purpose this type of habitats and further studies needs to be conducted in order to see if it also breeds in underground habitats on Romanian territory.

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