

## NOTES ON THE HERPETOFAUNA OF THE CĂLIMANI NATIONAL PARK (ROMANIA)

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**Key words:** Călimani National Park, mountains, Romania, amphibians, reptiles, distribution, conservation

### INTRODUCTION

Călimani National Park is a protected area of national interest that corresponds to the IUCN second category (National Park, Special Conservation Area) located in the central-northern part of Romania and overlapping in the northern part with the Natura 2000 Site of Community Interest ROSCI0019 Călimani-Gurghiu.

The Natura 2000 network is a European system of protected natural areas (Natura 2000 sites) comprising a representative sample of wild species and natural habitats of community interest. It was established not only for the protection of nature, but also for the preservation of these long-term natural resources, to provide the necessary resources for socio-economic development. It aims to protect biodiversity and ensure sustainable development in the European area by protecting the key elements of both natural habitats and plant and animal species. The protection of Natura 2000 species and habitats is also a good reason for preserving other species (often in need of protection) coexisting with those declared protected. Its efficacy is the subject of many studies: ecological (e.g. Klaučo et al. 2013, Votsi et al. 2012), socio-economical (e.g. Cruz et al. 2011), integrated management (e.g. Walentowski et al. 2013), etc., highlighting the importance of this network, but also the problems it faces.

While the Romanian Natura 2000 network is quite effective in covering the protected species as compared to the European general situation (Trochet & Schmeller 2013), mapping the distribution of protected species within and around sites remains of paramount importance in assessing them and increasing the effectiveness of the sites' protective function (see, e.g., Hartel & von Wehrden 2013). This paper refers to the distribution of amphibians and reptiles inside and outside the limits (but nearby) of Călimani National Park, as an integral part of the Natura 2000 site Călimani-Gurghiu.

### MATERIAL AND METHODS

#### Area description

Located in the Calimani Mountains and including the largest volcanic crater in Romania with a diameter of about 10 km (currently quenched), Călimani National Park has a total area of 24,566 ha. The natural area extends to the north-eastern part of Mureș County (on the administrative territories of Lunca Bradului, Rostolita and Stânceni communes); the south-western part of Suceava County (on the communes Dorna Căndrenilor, Panaci, Poiana Stampei and Șaru Dornei and the town of Vatra Dornei); the north-western part of Harghita County (on the territory of Bilbor and Toplița); and the south-eastern part of Bistrița-Năsăud County, on the administrative territory of Bistrița Bărgăului commune. The first proposal for the establishment of Călimani National Park took place in 1975, and would be declared a protected area by *Law no. 5* of March 6th, 2000 (regarding the approval of the *National Territory Planning Plan - Section III - Protected Areas*). In 2003, by *Government Decision no. 230* of 4th March (on the delimitation of biosphere reserves, national parks and natural parks and the constitution of their administrations), the boundaries and the area of the Călimani National Park is going to be reestablish.

The park is a mountainous area with various relief forms: peaks (Pietrosul Călimanului - 2100 m, Gurghiu - 1776 m, Harghita - 1800 m, Lucaciu - 1778 m, 12 Apostoli - 1760 m, Ciomatu - 1.301 m), rocky cliffs, gorges, valleys, sinkholes, hillocks, clints, slopes, meadows, with natural areas covered with forests, pastures and lawns (Fig. 1). The natural area has several types of habitats (Alpine and Boreal heaths, Bushes with *Pinus mugo* and *Rhododendron myrtifolium*, Siliceous alpine and boreal grasslands, Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas, Transition mires and quaking bogs, Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels, Acidophilous *Picea* forests of the montane to alpine levels (*Vaccinio-*

*Piceetea*)) which shelter a diverse range of flora and fauna specific to the Oriental Mountains. It consists of the following natural reserves: Twelve Apostles (with the 12th Apostles Thematic Route), Juniper Trees with *Pinus cembra* - Călimani and Lake Iezer and overlaps with the special avifaunistic area of the Călimani Mountains (SPA site) - Natura 2000. The herpetofauna in this area is incompletely known: Fuhn (1960) mentions *Salamandra salamandra* and *Lissotriton montandoni* in Răstolița, *Ichthyosaura alpestris* and *Rana temporaria* in Gurghiu Mountains, Mureș valley and Panaci, *Bombina variegata*, *Bufo bufo*, *Bufo viridis*, *Hyla arborea* and *Rana dalmatina* on the Mureș and Gurghiu valleys and Poiana Stampei; Fuhn & Vancea (1961) mentions *Lacerta agilis* in Stânceni and Gurghiu valley, *Zootoca vivipara* even in Călimani Mountains, Răstolița, Lunca Bradului and Gurghiu Mountains, *Zamenis longissimus* in Deda, *Coronella austriaca* at Răstolița and Lunca Bradului and *Vipera berus* in Călimani Mountains, Răstolița, Lunca Bradului and Gurghiu Mountains; Ghira et al. (2002) mentions the species *Salamandra salamandra*, *Lissotriton vulgaris*, *Triturus cristatus*, *Ichthyosaura alpestris*, *Bombina bombina*, *Bombina variegata*, *Bufo bufo*, *Bufo viridis*, *Hyla arborea*, *Pelophylax ridibundus*, *Rana temporaria*, *Rana dalmatina*, *Lacerta viridis*, *Lacerta agilis*, *Zootoca vivipara*, *Anguis colchica*, *Natrix natrix*, *Coronella austriaca* and *Vipera berus* for a number of localities near Călimani National Park; Strugariu et al. (2006) mentions the following reptile species: *Anguis colchica*, *Lacerta agilis*, *Zootoca vivipara* and *Vipera berus* at Gura Haitii and Vatra Dornei; Gherghel et al. (2008) mentions the species *Ichthyosaura alpestris*, *Lissotriton montandoni*, *Bombina variegata* and *Rana temporaria* at Gura Haitii, Neagra Șarului and Plaiu Șarului and *Vipera berus* in Gura Haitii; Cogălniceanu et al. (2013a) indicates with new points for the studied area, without mentioning the associated localities, the species: *Ichthyosaura alpestris*, *Lissotriton montandoni*, *Bombina variegata*, *Bufo bufo*, *Rana temporaria*; Cogălniceanu et al. (2013b) mentions the species: *Anguis colchica*, *Lacerta agilis*, *Zootoca vivipara* and *Vipera berus* with new points in the area but without association with localities. In addition to the two mentions by Fuhn & Vancea (1961) for *Zootoca vivipara* and *Vipera berus* in the Călimani Mountains, all other mentions are outside the boundaries of Călimani National Park.

#### Methodology

Our investigations regarding herpetofauna of Călimani National Park were made between years 2011-2013. Our studies were carried out based on transects method (Cogălniceanu 1997). Most of the specimens were captured by hand and newts were

collected during the reproduction period using landing net. All the captured specimens were released after identification. A number of 16 stations were investigated (Table 1), out of which 7 (Gura Haitii to Quarry, Pietrosu area, Quarry to Weather Station, Călimani Izvor area, 12 Apostoli area, Weather Station, Călimanul Cerbului area) were inside the limits of the park and the rest of 9 (Mijlociu Stream, Quarry, Tămău area, Dorna Stream, Tihuleț and Rusca Streams, Iezer Lake, Bistricior area, Măieriş area, Ilișoara Stream) were both within and outside Călimani National Park. The length of the transects ranged from approx. 3 km to approx. 19 km. The total number of points recorded along all routes amounted 193. Amphibians were searched for both in aquatic basins and terrestrial habitats. Photographs were taken whenever possible.

### **RESULTS AND DISCUSSIONS**

In Călimani National Park we identified 6 species of amphibians: *Salamandra salamandra* (Fig. 2), *Ichthyosaura alpestris*, *Lissotriton montandoni* (Fig. 3), *Bombina variegata* (Fig. 4), *Bufo bufo*, *Rana temporaria* (Fig. 5) and 4 reptile species: *Lacerta agilis*, *Zootoca vivipara* (Fig. 6), *Anguis colchica* and *Vipera berus* (Fig. 7). We have noted the distribution in the investigation sites of all identified species (Table 2).

The occurrence of amphibian and reptile species in different habitat types in the study area is given in Table 3.

Also we noted the occurrence of reproducing amphibians in different types of water bodies in the limits of Călimani National Park (Table 4).

The results are comparable to those obtained by other researchers in other areas of similar size and also located within the Carpathian Mountains, of course with the differences that occur due to the specificity of each area (e.g. Bogdan et al. 2011, Cogălniceanu et al. 2008, Covaciu-Marcov et al. 2007, Gherghel et al. 2008, Ghiurcă et al. 2005, Ghiurcă & Roșu 2016, Iftime & Iftime 2014 a, b, Sos 2007, Strugariu et al. 2006, etc.). All the identified species are characteristic of montane and submontane areas in central and eastern Europe.

Of all the amphibians and reptiles species identified in Călimani National Park, special attention was paid to the priority species of Annex 3 of the OUG 57/2007 included in the standard form of the Natura 2000 site Călimani-Gurghiu, that include the Călimani National Park. This species are: *Triturus cristatus*, *Lissotriton montandoni* and *Bombina variegata*.

The species *Triturus cristatus* was not identified by us within the limits of the Călimani National Park. We believe that this species could be found in the Park, because it was found near the Park's limits in Lunca

Bradului and Toplița localities at approx. 10 km and respectively approx. 20 km (Ghira et al. 2002), but is also found in Dorna Arini, Neagra Broșteni and Crucea at 20-30 km from the protected area (Gherghel et al. 2008). However, we think that the populations of *Triturus cristatus* are quite small, probably because of the lack of favorable habitats to this species. These populations are threatened with extinction in the absence of adequate conservation measures. For the evaluation of this species in the studied area, new investigations are needed.

For the *Lissotriton montandoni* species, the overall tendency for conservation status is rather less favorable. We specify this because the existing populations within the limits of Calimani National Park are small compared to other areas in the Carpathian Mountains (Ghiurca et al., 2005), even if the species is relatively well distributed in our transects (we found this species at an altitude between 800 and 1770 m). The breeding habitats for the *Lissotriton montandoni* species were mostly found on the edge of the forest roads in the studied area, with relatively small dimensions (approx. 3-15 m<sup>2</sup>). Threats for this species are related to: the deterioration or disappearance of reproductive habitats (living area), pasturage in the area of breeding and living habitats, the impact related to forestry (cuttings), tourism, adjustment works to regularize the course of some streams, greening of the quarry area.

The species *Bombina variegata* is present in most of the transects investigated by us and seems to be rather abundant (from ca. 743 m a.s.l. to ca. 1763 m a.s.l.), with large enough areas for favorable habitats to this species. It seems that there are no major threats to *Bombina variegata*, but some negative impact can be related to the deterioration or disappearance of reproductive habitats (living area), the impact related to forestry (cuttings) and greening of the quarry area.

Other species of amphibians are the beneficiaries of the same type of habitat as the one in which we found the species declared as priority in this area: *Salamandra salamandra*, *Ichthyosaura alpestris*, *Bufo bufo* and *Rana temporaria* (Table 3). Of these, *Rana temporaria* is the most common one, being found at the highest altitude in Călimani National Park (about 2000 m, in the area of the Weather Station). The species, *Salamandra salamandra* was found from ca. 800 m a.s.l. to ca. 1500 m a.s.l. Our surveys found very few reptile species: three lizards (*Lacerta agilis*, *Zootoca vivipara* and *Anguis colchica*) and one snake (*Vipera berus*).

The reptiles we found, all occur within the protected area or upon its limits, except for *Anguis colchica* which is recorded at Lunca Bradului and Neagra - but we consider it not unlikely for it to also live within the site, for the condition appear favourable,

at least at the bottom of the area limits. The species *Zootoca vivipara* is widely distributed and locally abundant, while *Lacerta agilis* is not well represented in terms of number of the specimens. *Lacerta agilis* is present in the area, from ca. 819 m a.s.l. to ca. 1744 m a.s.l. *Vipera berus* was relatively widespread, but we found few specimens. The species *Zootoca vivipara* and *Vipera berus* are found at the highest altitude in Călimani National Park (about 2000 m, in the area of the Pietrosul Călimanului Peak).

## CONCLUSIONS

We conclude that the Călimani National Park is quite poor in both amphibian and reptile species and is inhabited by montane, cold-tolerant species. In the literature, few similar works have been found to study herpetofauna at high altitudes.

A series of points indicated by us are close to the maximum altitude where the identified species have been found according to the literature (Fuhn 1960, Fuhn & Vancea 1961, Cogălniceanu et al. 2000, Ghira 2006).

For the species *Lacerta agilis* and *Zootoca vivipara* the maximum altitude at which they were found exceeded the data from the literature (Fuhn & Vancea 1961, Ghira 2006), and for *Salamandra salamandra*, *Lissotriton montandoni*, *Bombina variegata*, *Rana temporaria* and *Vipera berus*, the points identified by us are close to the maximum altitude given in the literature (Fuhn 1960, Fuhn & Vancea 1961, Cogălniceanu et al. 2000, Ghira 2006).

Overall, we can say that adequate protection of the species (*Lissotriton montandoni* and *Bombina variegata*) for which the protected area has been declared may be beneficial for many other amphibian and reptile species.

## ABSTRACT

Our investigations regarding herpetofauna of Călimani National Park were made between years 2011-2013. In the studied region we identified 6 species of amphibians: *Salamandra salamandra*, *Ichthyosaura alpestris*, *Lissotriton montandoni*, *Bombina variegata*, *Bufo bufo*, *Rana temporaria* and 4 reptile species: *Lacerta agilis*, *Zootoca vivipara*, *Anguis colchica* and *Vipera berus*. Of these species, the best represented in terms of geographical distribution are: *Bombina variegata*, *Rana temporaria* and *Zootoca vivipara*.

Their distribution within an around the Călimani National Park is discussed, together with ecological data, correlating these with the local climate influences and endangering factors of the species.

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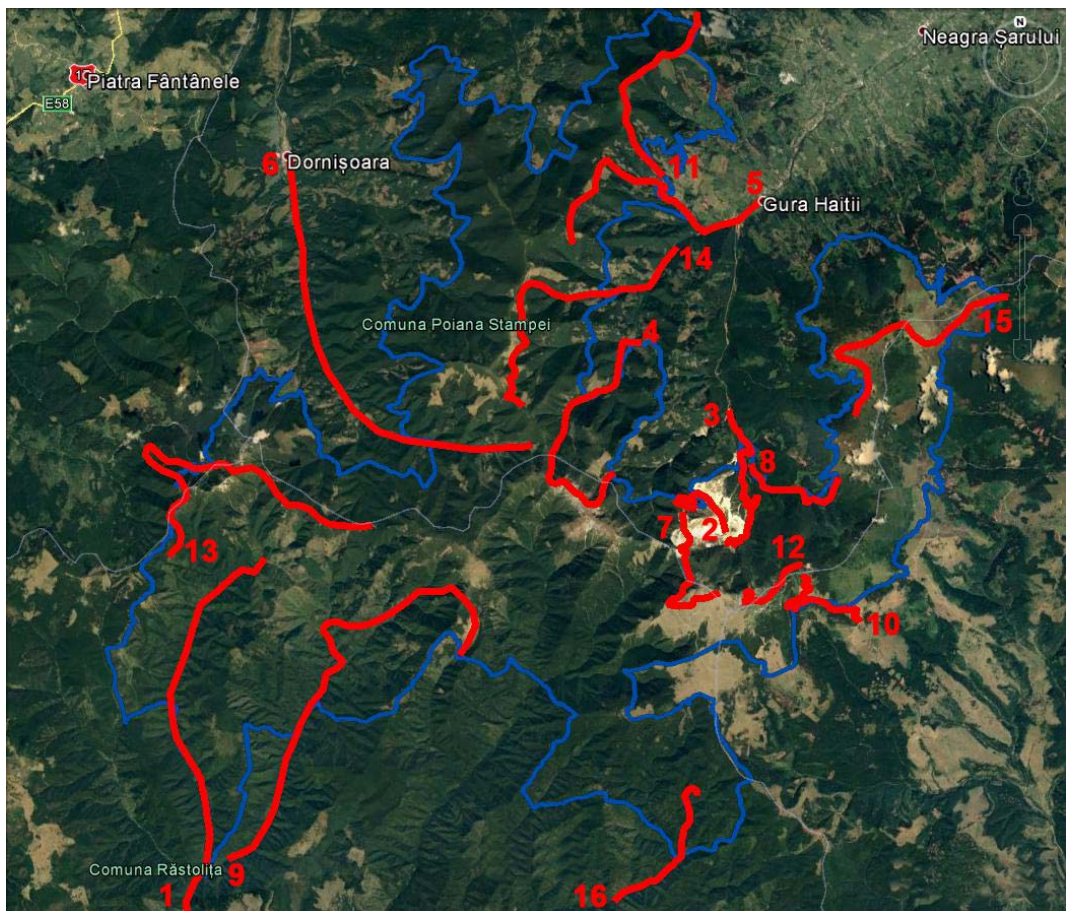


Figure 1. General map of the Călimani National Park. Transects are shown in red and numbered as in Table 1.

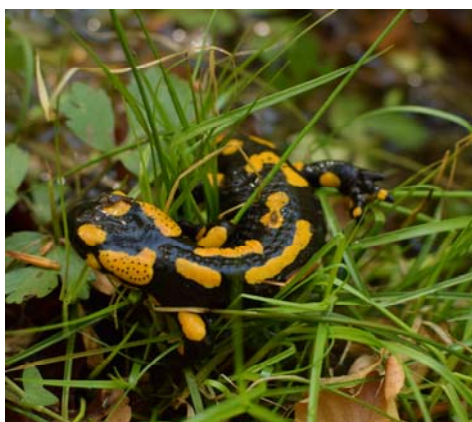


Figure 2. *Salamandra atra*, adult, Mijlociu Stream, photo Daniel Ghiurcă



Figure 3. *Bombina orientalis*, adult, Quarry, photo Daniel Ghiurcă





Figure 4. *Lissotriton montandoni*, adult, Mijlociu Stream, photo Daniel Ghiurcă



Figure 5. *Rana temporaria*, adult, Mijlociu Stream, photo Daniel Ghiurcă



Figure 6. *Zootoca vivipara*, adult, Quarry, photo Daniel Ghiurcă



Figure 7. *Vipera berus*, adult, Mijlociu Stream, photo Cosmin Mihai

Table 1. Transects with coordinates and description

Transect with numbers as in Fig. 1	Coordinates	Altitude	Description
1. Mijlociu Stream	From 46°58'26.24"N 24°59'37.85"E to 46°06'44.36"N 25°04'00.24"E	525 m - 1235 m	Spruce forest with small openings, juniper, alpine and boreal heaths
2. Quarry	From 47°06'45.24"N 25°14'26.24"E to 47°07'12.16"N 25°13'34.63"E	1544 m - 1689 m	Scrub with <i>Pinus mugo</i> (mountain pine) and <i>Rhododendron hirsutum</i> (hairy alpenrose), juniper, alpine and boreal heaths, species-rich <i>Nardus</i> grasslands, on siliceous substrates
3. Gura Haitii to Quarry	From 47°08'40.76"N 25°14'43.77"E to 47°06'35.43"N 25°14'27.17"E	1205 m - 1546 m	Spruce forest with small openings, acidophilous forests
4. Pietrosu area	From 47°10'17.92"N 25°12'53.79"E to 47°07'22.44"N 25°12'50.67"E	1211 m - 1457 m	Spruce forest with small openings, scrub with <i>Pinus mugo</i> (mountain pine) and <i>Rhododendron hirsutum</i> (hairy alpenrose), juniper, alpine and boreal heaths, highland rush
5. Tămău area	From 47°11'45.98"N 25°15'44.04"E to 47°11'16.48"N 25°11'23.75"E	1058 m - 1597 m	Juniper, alpine and boreal heaths, species-rich <i>Nardus</i> grasslands, on siliceous substrates, eutrophic tall herbs
6. Dorna stream	From 47°12'43.52"N 25°05'01.99"E to 47°08'15.46"N 25°10'03.24"E	1072 m - 1583 m	Spruce forest with small openings, juniper, alpine and boreal heaths
7. Quarry to Weather Station	From 47°07'04.49"N 25°13'28.28"E to 47°05'45.20"N 25°14'25.71"E	1735 m - 1960 m	Scrub with <i>Pinus mugo</i> (mountain pine) and <i>Rhododendron hirsutum</i> (hairy alpenrose), species-rich <i>Nardus</i> grasslands
8. Călimani Izvor area	From 47°07'44.36"N 25°15'09.16"E to 47°06'56.42"N 25°17'38.18"E	1289 m - 1768 m	Spruce forest with small openings, juniper, alpine and boreal heaths, siliceous alpine and boreal grass

9. Tihuleț and Rusca Streams	From 47°02'06.18"N 25°02'4.16"E to 47°05'03.89"N 25°08'12.55"E	757 m - 1363 m	Spruce forest with small openings, juniper, alpine and boreal heaths
10. Iezer Lake	From 47°05'15.91"N 25°17'15.65"E to 47°06'03.36"N 25°16'00.81"E	1597 m - 1819 m	Scrub with <i>Pinus mugo</i> (mountain pine) and <i>Rhododendron hirsutum</i> (hairy alpenrose), transition mires and quaking bogs
11. 12 Apostoli area	From 47°12'19.37"N 25°13'03.84"E to 47°14'42.03"N 25°14'27.17"E	1304 m - 1616 m	Spruce forest with small openings, acidophilous forests, juniper, alpine and boreal heaths, species-rich <i>Nardus</i> grasslands
12. Weather Station	From 47°06'12.92"N 25°15'59.74"E to 47°05'47.44"N 25°14'37.64"E	1854 m - 1993 m	Scrub with <i>Pinus mugo</i> (mountain pine) and <i>Rhododendron hirsutum</i> (hairy alpenrose), siliceous alpine and boreal grass
13. Bistricior area	From 47°07'12.43"N 25°02'11.70"E to 47°07'14.66"N 25°06'39.50"E	1486 m - 1511 m	Spruce forest with small openings, juniper, alpine and boreal heaths
14. Măieriș area	From 47°11'17.21"N 25°13'54.77"E to 47°08'48.68"N 25°10'10.28"E	1129 m - 1802 m	Juniper, alpine and boreal heaths, species-rich <i>Nardus</i> grasslands, on siliceous substrates, eutrophic tall herbs
15. Călimanul Cerbului area	From 47°10'01.78"N 25°20'53.90"E to 47°08'05.56"N 25°17'08.27"E	1498 m - 1984 m	Spruce forest with small openings, juniper, alpine and boreal heaths, siliceous alpine and boreal grass
16. Ilișoara Stream	From 46°57'20.67"N 25°06'54.31"E to 47°02'52.76"N 25°13'27.03"E	582 m - 1277 m	Spruce forest with small openings, juniper, alpine and boreal heaths

Table 2. Distribution of recorded species in transects in Călimani National Park

Species	Distribution in investigated sites	Observations
<i>Salamandra salamandra</i>	1, 8	Relatively rare
<i>Ichthyosaura alpestris</i>	1	Relatively rare
<i>Lissotriton montandoni</i>	1, 2, 4, 5, 6, 7, 9, 10, 14, 15	Relatively widespread, few specimens
<i>Bombina variegata</i>	1, 2, 3, 5, 6, 7, 9, 13, 14, 15, 16	Widespread, frequent
<i>Bufo bufo</i>	5	Relatively rare
<i>Rana temporaria</i>	1, 2, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16	Widespread, frequent
<i>Lacerta agilis</i>	1, 2, 6, 8, 9, 10	Relatively rare
<i>Zootoca vivipara</i>	1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16	Most widespread and frequent
<i>Anguis colchica</i>	16	Relatively rare
<i>Vipera berus</i>	1, 3, 4, 5, 11, 13, 14	Relatively widespread, few specimens

Table 3. The occurrence of amphibian and reptile species in different habitat types in Călimani National Park

Species	Spruce forest	Alpine and boreal heaths 4060	Scrub with <i>Pinus mugo</i> (mountain pine) and <i>Rhododendron myrtifolium</i> (hairy alpenrose) 4070*	Siliceous alpine and boreal grass 6150	Species-rich <i>Nardus</i> grasslands 6230*	Eutrophic tall herbs 6430	Transition mires and quaking bogs 7140	Acidophilous forests 9410
<i>Salamandra salamandra</i>	+	+	-	+	-	-	-	-
<i>Ichthyosaura alpestris</i>	+	+	-	-	-	-	-	-
<i>Lissotriton montandoni</i>	+	+	+	+	+	+	+	-
<i>Bombina variegata</i>	+	+	+	+	+	+	+	+
<i>Bufo bufo</i>	-	+	-	-	+	+	-	-
<i>Rana temporaria</i>	+	+	+	+	+	+	+	-
<i>Lacerta agilis</i>	+	+	+	+	+	-	+	-
<i>Zootoca vivipara</i>	+	+	+	+	+	+	+	-
<i>Anguis colchica</i>	+	+	-	-	-	-	-	-
<i>Vipera berus</i>	+	+	+	-	+	+	-	+

Table 4. The occurrence of reproducing amphibians in different types of water bodies in Călimani National Park

Species	Slow-flowing brooks	Small, temporary ponds	Large, permanent ponds	Man-made ditches
<i>Salamandra salamandra</i>	+	+	-	-
<i>Ichthyosaura alpestris</i>	-	+	+	-
<i>Lissotriton montandoni</i>	-	+	+	+
<i>Bombina variegata</i>	+	+	+	+
<i>Bufo bufo</i>	-	+	-	+
<i>Rana temporaria</i>	+	+	+	+