

Notes on the herpetofauna of the Leaota Mountains, a “wildlife corridor” area

Alexandru IFTIME^{1,*} and Oana IFTIME²

1. “Grigore Antipa” National Museum of Natural History, Bd. Kiseleff No. 1, sector 1, Bucharest, Romania.

2. Department of Genetics, Faculty of Biology, University of Bucharest, Aleea Portocalelor 1-3 060101 sector 6, Bucharest, Romania.

* Corresponding author, A. Iftime, E-mail: alexandru_iftime@yahoo.com

Received: 16. August 2013 / Accepted: 26. April 2014 / Available online: 05. October 2014 / Printed: December 2014

Abstract. The results of studies on the amphibians and reptiles of the Leaota mountains (Dâmbovița, Argeș and Brașov counties, Romania), a meeting-point of three Natura 2000 sites (Piatra Craiului, Leaota and Bucegi) forming a wildlife corridor, are presented. Twelve amphibian and 4 reptile species were identified in the field. Their distribution within and around the site is discussed, together with some data on the status of the local population. We remark the relative paucity of reptile species.

Key words: Natura 2000 sites, Leaota mountains, corridor, conservation, amphibians, reptiles, records, distribution.

Introduction

The issue of connectivity versus fragmentation is increasingly important in the conservation of all mobile species, especially from the perspective of climate change and projected increase of human pressure (see, e.g., Mazaris et al. 2013), leading to the development of various strategies to restore or maintain the connectivity between populations of threatened species, mostly by means of what have been called “wildlife corridors” (McEuen 1993). The scale of devices fulfilling this role can be very variable, from some as small as road culverts, ditches or hedgerows (Forman & Baudry 1984), to (proposed) wildlife corridors of continental scale (Rabinowitz 2010). Basically, a wildlife corridor connects “core” areas (of prime importance for the conservation of target elements) through “corridor” areas (which can be optimal or suboptimal habitats for target elements, but allow their connectivity).

In the Southern Carpathians of Romania, the Leaota massif lies between the Bucegi and Piatra Craiului massifs. This area constitutes a wildlife corridor between the core areas of the Bucegi and Piatra Craiului National Parks - and the corresponding Natura 2000 sites, whose boundaries do not match exactly those of the national parks, having been enlarged especially for the purpose of connectivity. To complete this corridor, the Leaota Natura 2000 site was declared, joining the easternmost part of the Piatra Craiului site to the westernmost part of Bucegi (see Fig. 1). While this corridor was devised first and foremost for the use of large carnivores (bear, wolf and lynx), numer-

ous other species of conservation interest - including amphibians and reptiles - are either protected themselves within the sites (*Bombina variegata* is protected in all three sites, *Lissotriton montandoni* in Piatra Craiului and Bucegi, and *Triturus cristatus* in Piatra Craiului), or benefit from the protection granted to the vast areas needed for such “umbrella species” as the large carnivores (Rozyłowicz et al. 2010). We studied amphibians and reptiles, which are excellent indicators for ecological change (Cogălniceanu et al. 2008), in this wildlife corridor area, in order to establish their distribution, and to some extent the condition of their populations (cf. Covaciu-Marcov et al. 2009), with implications for the status of ecosystems, both inside and nearby the protected areas, and for the conservative management of the area and sites. The status of habitats immediately next to the protected areas is important in the conservation of those areas - (see, e.g., DeFries et al. 2007).

Materials and methods

Area description.

The Leaota massif is separated from the Piatra Craiului Mountains to the west by the Rucăr-Bran corridor, and is connected to the Bucegi Mountains to the east by a ridge passing between the headwaters of the Brătei and Turcul creeks. It reaches 2133 m a.s.l. in the central Leaota peak. Geologically, its structure is diverse, comprising both crystalline shales (with occasional granitic intrusions) and sedimentary rocks such as limestones and conglomerates. The Leaota massif is drained by creeks and rivulets that belong to three riverine basins: the Dâmbovița to the west (receiving waters such as Cheia, Ghimbavul, Valea Bădenilor, Râul Alb), the Ialomița to the east (receiving the

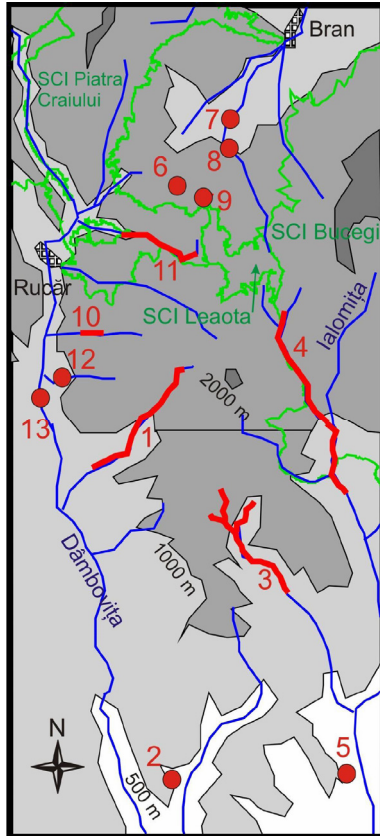


Figure 1. General map of the area. Transects are shown in red and numbered as in Table 1.

Ialomicioara, Titei, Raci and Brătei) and the Bârsa to the north (receiving the Turcul) (Fig. 1). The vegetation of this area consists of deciduous forests, dominated by beech (*Fagus sylvatica*) and hornbeam (*Carpinus betulus*) up to ca. 700 m, further up by beech stands, then above 1000 m by beech-fir-spruce forest, and further on by pure spruce forests and Alpine grasslands and bushes on the mountain tops. Secondary grasslands are found in all these zones, being created for the necessities of pasturing (Măciu et al. 1982; personal observations). The herpetofauna of this area is sparsely known, many of the older records being from its limits (Rucăr, Voinești) and not the massif itself – thus, Fuhn (1960) records *Lissotriton vulgaris* from Voinești, *Bombina variegata* and *Bufo viridis* from (probably) Rucăr; Fuhn and Vancea (1961) record *Lacerta agilis*, *Zootoca vivipara*, *Podarcis muralis* and *Coronella austriaca* from Rucăr; Pop et al. (2007) record *Bombina variegata* from the Podu Dâmboviței – Greater Dâmbovița Gorges area. Iftime & Iftime (2012) add a few records of *Lissotriton montandoni*, *Ichthyosaura alpestris*, *Bombina variegata* and *Rana temporaria* at Fundata and Moieciu de Sus, while Cogălniceanu et al. (2013) add one record of *Salamandra salamandra* in the same area (probably at Fundata).

Methodology.

This paper is based upon field work performed in June 2004, March 2010, May, June, July and September 2011, July 2012 and August 2013. The study was carried following the active transects method (after Heyer et al. 1994, and McDiarmid 1992, in Cogălniceanu 1997). 22 stations were checked, with transect length between 200 m and ca. 14 km (see Table 1; transect numbers correspond to Fig. 1). Amphibians were searched for in both terrestrial habitats and aquatic basins.

Photographs were taken whenever possible.

Results and discussions

Sixteen species (twelve of amphibians, four of reptiles) were recorded (see Table 2 for their occurrence in the checked transects).

The results above include all species previously recorded in the study area, with the exception of *Lissotriton montandoni*; this species was, however, also found by us in the area and published in a different context (Iftime & Iftime 2012). *T. montandoni* was found in the northern valleys of the Leaota massif, outside any sites (and is localized but common in those places). It appears to be absent from the southern and western valleys of the Leaota massif. Non-technical publications, such as the Bucegi natural park website (<http://www.bucegipark.ro/>) claim that *L. montandoni* is also found in the Răteii cave area, which is on the Brăteii valley, in the Leaota part of the Bucegi park (and Natura 2000 site) and in our study area. However, the same source illustrates *L. montandoni* with both *L. montandoni* and *Ichthyosaura alpestris* images, therefore there might be confusion due to that information in this report. The Răteii area had been searched by us several times (in 2010, 2011 and 2012) and only *I. alpestris* was found. Other Natura 2000 species that we found are *Bombina variegata* and *Triturus cristatus*. *Bombina variegata* is by far the most widely distributed species and also the most abundant (together with *Rana temporaria*); it was found in most transects, from 485 m a.s.l. to ca. 1300 m a.s.l., both within and outside the sites, and can be inferred to be present in most of the “corridor” area and in the greater part of the Leaota massif – although, within the smaller Leaota site, its population is probably indeed insignificant at the national level, as recorded in the site standard data form.

Triturus cristatus was found in one place only, on the Brăteii valley and within the Bucegi site, at ca. 800 m a.s.l., a small population but nevertheless an addition to the Natura 2000 species list of the

Table 1. Transects with coordinates and description.

Station no.	Location	Coordinates	Altitude (m a.s.l.)	Observations
1	Valea Bădenilor	From N45 16.122 E25 12.169 to N45 19.027 E25 16.164	665 - 1018	Mixed deciduous forest, then beech and spruce forest.
2	Pietrari	N45 05.205 E25 16.805	436	Small lake surrounded by gardens and orchards
3	Runcu-Ialomicioara	From N45 11.718 E25 22.081 to N45 15.513228 E25 18.300	585 - 1050	Beech and spruce forest
4	Valea Brătei	From N45 14.819 E25 24.991 to N45 20.948 E25 21.641	635 - 1300	Beech and spruce forest
5	Pucioasa	N45 04.740 E25 24.853	485	Mixed deciduous forest and secondary grassland; waterbodies in old quarry site
6	Rucăr-Bran	N45 26.033 E25 16.107	1272	Spruce forest and grassland
7	Cheia BV	N45 28.488 E25 18.560	874	Spruce forest and grassland
8	Moeci de Sus	N45 27.158 E25 17.126	1150	Spruce forest and grassland
9	Fundata	N45 25.463 E25 16.751	1152	Spruce forest and grassland
10	Valea Caselor	From N45 20.927 E25 12.313 to N45 20.908 E25 13.027	772 - 915	Mixed deciduous forest, then beech and spruce forest.
11	Valea Cheii	From N45 24.396 E25 12.385 to N45 24.206 E25 16.318	800 - 1100	Mixed deciduous forest, then beech and spruce forest.
12	Valea Hotarului	N45 18.585 E25 10.803	719	Mixed deciduous forest
13	Valea Dâmboviței	N45 18.241 E25 10.003	610	Riverbank alder thicket

Table 2. Distribution of recorded species in transects.

Species	Distribution in investigated sites	Observations
<i>Salamandra salamandra</i>	3	Relatively rare
<i>Lissotriton vulgaris</i> (Fig. 2)	3, 4,	Relatively rare
<i>Ichthyosaura alpestris</i> (Fig. 2)	3, 4, 7	Locally common
<i>Triturus cristatus</i> * (Fig. 2)	4	Relatively rare
<i>Bombina variegata</i>	1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13	Most widespread and frequent
<i>Bufo bufo</i> *	1, 2, 3, 4	Locally common
<i>Bufo viridis</i> (Figs. 2 and 3)	4	Relatively rare
<i>Rana temporaria</i>	1, 3, 4, 7, 8	Widespread, frequent
<i>Rana dalmatina</i> *	2	Relatively rare
<i>Pelophylax ridibundus</i> *	2, 5, 13	Locally common
<i>Pelophylax kl. esculentus</i> *	2	Relatively rare
<i>Lacerta agilis</i> (Fig. 4)	1, 3, 4, 10, 11, 13	Widespread, frequent
<i>Podarcis muralis</i>	1, 4, 10, 12	Locally common
<i>Zootoca vivipara</i> (Fig. 5)	1, 3, 4, 9	Locally common
<i>Natrix natrix</i> *	13	Relatively rare

* - species firstly recorded within the study area.

Bucegi site.

Numerous other amphibians benefit from the same habitat as these three Natura 2000 species within the area are *Salamandra salamandra*, *Ichthyosaura alpestris*, *Lissotriton vulgaris*, *Bufo bufo*, *Bufo viridis*, *Rana temporaria* and *Pelophylax ridibundus*. They are found together with one or more of the Natura 2000 species (see Fig. 2). Therefore, the Piatra Craiului-Leaota-Bucegi wildlife corridor, although primarily designed to ensure connectivity for large carnivores, is at present also effective in providing adequate habitats for amphibian species – both Natura 2000 species and others benefiting

from the same conditions. Of the other amphibian species found in the area, *Rana temporaria* is most frequently found; *Salamandra salamandra* is uncharacteristically restricted to one location, while *Rana dalmatina*, *Pelophylax ridibundus* and *P. kl. esculentus* are restricted to lower altitude locations on the outskirts of the massif, as expected, outside the sites and the “corridor” area.

Our surveys found very few reptile species; the three lizards (*Lacerta agilis* – which can be seen in Fig. 4 for its interesting color morph – , *Podarcis muralis* and *Zootoca vivipara*) are widely distributed and locally abundant, while the grass snake (*Na-*



Figure 2. *Triturus cristatus* adult male, *Ichthyosaura alpestris* adult male, *Lissotriton vulgaris* adult female and *Bufo viridis* egg string in a pond on Brătei valley. Photo Al. Iftime.

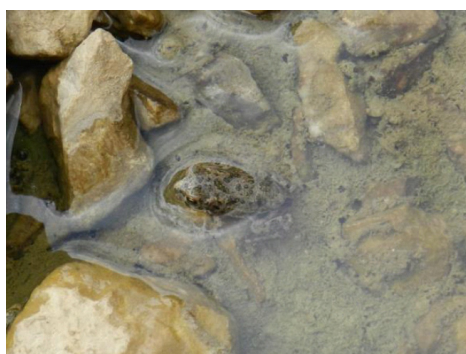


Figure 3. *Bufo viridis* metamorph, Brătei valley. Photo Al. Iftime.



Figure 4. *Lacerta agilis* adult, sparsely spotted morph, Ialomicioara valley. Photo Oana Iftime.

trix natrix), the only snake we found, was recorded in a single spot. This paucity of reptiles when compared to other montane areas of the southern Carpathians (e.g. Cogălniceanu et al. 2001, Iftime & Iftime 2010 a,b, 2013) or to other Carpathian areas important for ecological connectivity (e.g. Co-

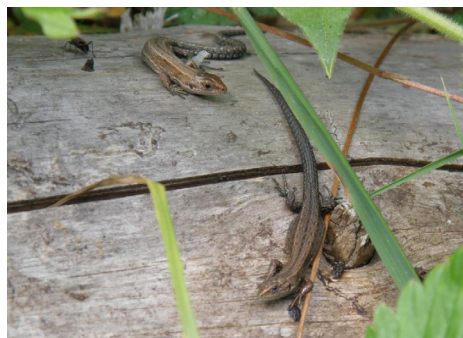


Figure 5. Two *Zootoca vivipara* juveniles on log, Bădenilor valley. Photo Oana Iftime.

vaci-Marcov et al. 2005, 2007) is peculiar and may result from insufficient sampling. This is true as some species, particularly at low densities, can avoid detection on the short term (see, e.g., the discussion in Iftime et al. 2008). However, as comparative (and often less intense) search efforts by us in other montane areas yielded far more reptile species and individuals (e.g. Iftime, 2003; Iftime & Iftime, 2010 a, b). Hence we conclude that the Leaota massif, while relatively rich in amphibians (including species of conservative interest), is quite poor in reptiles.

References

- Cogălniceanu, D., Ghira, I., Ardeleanu, A. (2001): Spatial distribution of herpetofauna in the Retezat Mountains National Park (Romania). *Biota* 2(1): 9-16.
- Cogălniceanu, D., Băncilă, R., Samoilă, C., Hartel, T. (2008): The current distribution of herpetofauna in the Maramureș county and the Maramureș Mountains Nature Park, (Maramureș, Romania). *Transylvanian Review of Systematic and Ecological Research* 5: 189-200.
- Cogălniceanu, D., Székely, P., Samoilă, C., Iosif, R., Tudor, M., Plăiașu, R., Stănescu, F., Rozyłowicz, L. (2013): Diversity and distribution of amphibians in Romania. *ZooKeys* 296: 35-57.
- Covaciu-Marcov S.D., Cicort-Lucaciu A.Ș., Sas I., Ile R.D. (2005): The herpetological fauna of "Culmea Codrului" (Satu - Mare county, Romania). *Analele Universitatii din Craiova, Fascicula Biologie, Horticultura, Tehnologia Prelucrării Produselor Agricole, Ingineria Mediului* 46: 163-168.
- Covaciu-Marcov, S.D., Cicort-Lucaciu, A.Ș., Sas, I., Groza, M.I., Bordaș, I. (2007): Contributions to the knowledge regarding the herpetofauna from the Maramureș county areas of "Măgura Codrului", Romania. *Bihorean Biologist* 1: 50-56.
- Covaciu-Marcov, S.D., Cicort-Lucaciu, A.Ș., Dobre, F., Ferentzi, S., Birceanu, M., Mihuț, R., Strugariu, A. (2009): The herpetofauna of the Jiului Gorge National Park, Romania. *North-Western Journal of Zoology* 5(1): S01-S78.
- DeFries, R., Hansen, A., Turner, B. L., Reid, R., Liu, J. (2007): Land use change around protected areas: management to balance human needs and ecological function. *Ecological Applications* 17(4): 1031-1038.

- Forman, R.T.T., Baudry, J. (1984): Hedgerows and hedgerow networks in landscape ecology. *Environmental Management* (6): 495-510.
- Fuhn, I. (1960): Amphibia. In: Fauna R.P.R., Vol.14, fasc.1. Editura Academiei R.S.R., Bucharest. [in Romanian]
- Fuhn, I., Vancea, St. (1961): Reptilia. In: Fauna R.P.R., Vol.14, fasc.2. Editura Academiei Române. Bucharest. [in Romanian]
- Iftime A. (2003): Observations upon the fishes, amphibians and reptiles of the Piatra Craiului National Park and surrounding areas. *Research in Piatra Craiului National Park* 1: 267-272.
- Iftime, A., Iftime, O. (2010a): Contributions to the knowledge of the herpetofauna of the Eastern Jiu and Upper Lotru drainage basins (Southern Carpathians, Romania). *Travaux du Museum National d'Histoire Naturelle „Grigore Antipa”* 53: 273-286.
- Iftime, A., Iftime, O. (2010b): Herpetofauna masivului Ciucaș și starea sa de conservare. *Ocotirea Naturii, serie nouă* 46: 123-130. [in Romanian]
- Iftime, A., Iftime, O. (2012): New records of the Carpathian endemite, *Lissotriton montandoni* (Amphibia: Caudata: Salamandridae) at its southern distribution limit. *Travaux du Museum National d'Histoire Naturelle „Grigore Antipa”* 55(1): 175-179.
- Iftime, A., Iftime, O. (2013): Observations on herpetofauna of the Buila-Vânturarița massif (Southern Carpathians, Romania). *Travaux du Museum National d'Histoire Naturelle „Grigore Antipa”* 56(1): 93-101.
- Iftime, A., Gherghel, I., Ghiurcă, D. (2008): Contribution to the knowledge of the herpetofauna of Bacău county (Romania). *Travaux du Museum National d'Histoire Naturelle „Grigore Antipa”* 51: 243-253.
- Mazaris, A.D., Papanikolaou, A.D., Barbet-Massin, M., Kallimanis, A.S., Jiguet, F., Schmeller, D.S., Pantis, J.D. (2013): Evaluating the Connectivity of a Protected Areas' Network under the Prism of Global Change: The Efficiency of the European Natura 2000 Network for Four Birds of Prey. *PLoS ONE* 8(3): e59640.
- Măciu, M., Chioreanu, A., Văcaru, V. (eds.) (1982): *Enciclopedia geografică a României*. Editura Științifică și Enciclopedică, Bucharest, 847 pp. [in Romanian]
- McEuen, A. (1993): The wildlife corridor controversy: a review. *Endangered Species Update* 10(11-12): 1-6.
- Pop, O.G., Murariu, D., Danciu, M., Iftime, A., Vezeanu, M., Ionescu, D.T., Rakosy, L., Ștefănuț, S., Florescu, F., Pătrulescu, A. (2007): Piatra Craiului National Park – Natura 2000 site. Editura Universitatii. Transilvania, Brașov.
- Rabinowitz, A. (2010): A range-wide model of landscape connectivity and conservation for the jaguar, *Panthera onca*. *Biological Conservation* 143(4): 939-945.
- Rozyłowicz, L., Popescu, V. D., Pătroescu, M., Chișamera, G. (2011): The potential of large carnivores as conservation surrogates in the Romanian Carpathians. *Biodiversity and Conservation* 20: 561-579.