

## Contributions to the knowledge regarding the herpetofauna from the Maramureş county areas of "Măgura Codrului", Romania

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**Abstract.** In the studied region we identified 11 species of amphibians: *Salamandra salamandra*, *Triturus alpestris*, *Triturus cristatus*, *Triturus vulgaris*, *Bombina bombina*, *bombina variegata*, *Bufo bufo*, *Hyla arborea*, *Rana ridiunda*, *Rana dalmatina*, *Rana temporaria*, 6 reptile species: *Lacerta agilis*, *Lacerta viridis*, *Anguis fragilis*, *Elaphe longissima*, *Coronella austriaca* and *Natrix natrix*, as well as hybrids between *Bombina bombina* and *Bombina variegata*. Populations of *Triturus alpestris* are present in the area at 250 m altitude. *Bombina bombina* is a premiere not just for the studied area, but for the entire Maramureş district.

**Key words:** herpetofauna, geographical distribution, *Triturus alpestris*, *Bombina bombina*

### Introduction

Măgura Codrului is one of the less studied area in the Maramureş county regarding the herpetofauna. Thus, for example, none of the writing about Transylvania's herpetofauna (Ghira et al 2002), or the red list of the vertebrates from Romania (Iftimie 2005) do not mention here one amphibian specie, wich is very common in the forested areas of Romania, namely *Rana dalmatina*. Also, the specie is absent in the earlier publications about this area, too (Fuhn 1960, Fuhn & Vancea 1961, Cogălniceanu et al 2000). The deficiency of the knowledge regarding the herpetofauna of this region sets of in comparison with other areas from north-western Romania, where recently numerous studies regarding the composition and the geographical distribution of the herpetofauna were achieved (Covaciu-Marcov et al 2000, 2002, 2003 b,c,d, 2004, 2005 a, b, 2006 a, b). In this context, the present study represents a contribution to the knowledge enlargement about the herpetofauna of Măgura Codrului area from Maramureş county.

### Materials and Methods

The study was made in 2007, between the march and september. We analysed herpetofauna from 31 localities in the investigated area, 25 of them being studied for the first time. The inspected area is situated in Maramureş county,

south-west from Someş river. The area borders upon Satu-Mare district in west and Sălaj district in south. The herpetofauna of the Măgura Codrului's west slope, situated in Satu-Mare district, was previously analysed (Covaciu-Marcov et al 2005 b), this data being used as a comparison for the results of the present study. Beside Măgura Codrului the investigated area includes some sectors of Codrului Hills and Baia Mare Depression (Posea & Badea 1984).



Figure no.1 The studied region in Maramureş County, Romania

We used the transects method (Cogălniceanu 1997), making numerous surveys, in each investigated locality. The animals were determined mostly directly, without the necessity of capturing them. When the capture of some specimens was compulsory, it was usually made by hand. Amphibians in their aquatic period were captured with the help of rectangle drags or using round nets mounted on long metallic poles. After determining the captured species,

they were set free in their habitats of origin. An important role in the charting of the herpetofauna of the investigated region was played by the dead animals that we found, killed either by local people or by cars. The hybrids were

determined after their morphological and chromatic characteristics, the determination being made after main features indicated in the speciality literature (Ghira & Mara 2000, Stugren 1980, Szymura 1993).

**Tabelul no.1** Geographical distribution of the amphibian and reptiles species in the investigated region

Localitatea	Ss	Ta	Tc	Tv	Bb	Bv	BX	Bu f	Ha	Rr	Rd	Rt	La	Lv	Af	Ca	El	N n
Ariniș	-	-	X	X	-	-	-	X	X	X	X	-	X	-	-	-	-	X
Ardusat	-	-	S	S	-	S	X	X	O	S	X	X	X	-	-	-	-	S
Arduzel	-	-	-	-	-	-	-	S	-	-	X	-	X	-	-	-	-	-
Asuaju de Jos	-	-	-	X	-	-	-	X	X	X	X	-	X	-	-	-	-	-
Asuaju de Sus	X	X	X	X	-	X	-	X	X	-	X	X	X	X	X	X	X	X
Băița de sub Codru	X	X	X	X	-	X	-	X	-	X	X	X	X	X	-	-	-	X
Băsești	X	-	X	X	-	X	-	X	X	X	X	X	X	X	-	-	-	X
Bicaz	X	-	X	X	-	X	-	X	-	X	X	X	X	X	-	-	-	X
Buzești	-	-	X	-	-	S	-	X	O	S	X	-	X	-	-	-	-	-
Ciuta	-	-	-	-	-	X	-	-	-	X	X	-	X	-	-	-	-	-
Corni	-	-	-	-	-	X	-	-	-	X	X	-	-	-	-	-	-	-
Fărcașa	-	-	X	X	-	X	-	X	X	X	X	-	X	X	X	-	-	X
Gherdani	-	-	-	-	-	S	-	-	X	-	-	-	X	-	-	-	-	-
Mânău	-	-	X	-	-	-	-	X	-	X	X	-	X	-	-	-	-	X
Oarța de Jos	-	-	-	X	-	-	-	X	-	X	X	-	X	-	-	-	-	X
Oarța de Sus	X	-	-	-	-	X	-	X	-	-	X	X	-	X	-	-	-	X
Orțița	-	-	-	-	-	X	-	X	-	-	X	-	-	-	-	-	-	-
Odești	X	-	X	X	-	X	-	X	X	X	X	X	X	X	-	-	-	X
Rodina	-	-	X	-	-	-	-	X	X	X	X	-	X	-	-	-	-	X
Sălsig	-	-	-	-	-	-	-	-	X	X	-	-	X	-	-	-	-	-
Sârbi	-	-	-	-	-	-	X	-	-	X	-	-	X	-	-	-	-	-
Săliște	X	-	X	X	-	X	-	-	-	X	X	X	-	-	-	-	-	-
Stremț	X	-	X	X	-	X	-	X	X	X	X	X	X	X	X	X	-	X
Someș Uileac	-	-	-	-	-	X	-	-	-	-	X	-	X	-	-	-	-	-
Tămaia	-	-	-	-	-	X	X	-	X	X	-	-	X	-	-	-	-	-
Tămășești	-	-	-	X	-	-	-	X	X	X	X	-	X	X	-	-	-	-
Tohat	-	-	X	-	-	-	-	-	O	X	-	-	-	-	-	-	-	-
Țicău	-	-	-	-	-	X	-	X	-	-	X	-	-	-	-	-	-	-
Ulmeni	-	-	X	-	X	O	X	X	O	X	-	-	S	-	-	-	-	-
Urmeniș	-	-	X	X	-	-	-	X	-	X	-	-	-	X	-	-	-	-
Vicea	-	-	-	-	-	X	-	-	-	-	X	-	X	-	-	-	-	-
Σ X	8	2	15	13	1	16	4	20	12	21	24	9	23	10	3	2	1	12
Σ S	-	-	1	1	-	3	-	1	-	2	-	-	1	-	-	-	-	1
Σ O	-	-	-	-	-	1	-	-	4	-	-	-	-	-	-	-	-	-

Legend:

Ss=*Salamandra salamandra*, Ta=*Triturus alpestris*, Tc=*Triturus cristatus*, Tv=*Triturus vulgaris*, Bb=*Bombina bombina*, Bv=*Bombina variegata*, BX= *Bombina bombina*X*Bombina variegata*, Buf=*Bufo bufo*, Ha=*Hyla arborea*, Rr=*Rana ridibunda*, Rd=*Rana dalmatina*, Rt=*Rana temporaria*, La=*Lacerta agilis*, Lv=*Lacerta viridis*, Af=*Anguis fragilis*, El=*Elaphe longissima*, Ca=*Coronella austriaca*, Nn=*Natrix natrix*.

Geographical localities: 31 (25 investigated the first time)

New localities (X): 196

Previously signaled localities in which we reconfirmed the presence of the species (S): 10

Sum of the identified localities (X+S): 206

Localities in which the presence of a certain species, previously signaled, was not been reconfirmed (O): 5

## Results and discussions

In Maramureş's Măgura Codrului region we identified a total of 17 herpetofauna species. Among this, 11 species belong to amphibians (*Salamandra salamandra*, *Triturus alpestris*, *Triturus cristatus*, *Triturus vulgaris*, *Bombina bombina*, *Bombina variegata*, *Bufo bufo*, *Hyla arborea*, *Rana ridiunda*, *Rana dalmatina*, *Rana temporaria*) and 6 to the reptiles (*Lacerta agilis*, *Lacerta viridis*, *Anguis fragilis*, *Elaphe longissima*, *Coronella austriaca* and *Natrix natrix*). Together with those 17 species we identified hybrids between *Bombina bombina* and *Bombina variegata*, in the investigated area.

We analysed the distribution of those 17 species and of the hybrids throughout the territory of the 31 localities from the studied area. We identified a total of 206 localities for the species found in those 31 studied localities (tab. 1). Among this, 196 represent new localities for the herpetofauna of Romania. Five species of amphibians (*Salamandra salamandra*, *Triturus alpestris*, *Bombina bombina*, *Rana dalmatina*, *Rana temporaria*), the hybrids between *Bombina bombina* and *Bombina variegata*, and 4 reptile species (*Lacerta viridis*, *Anguis fragilis*, *Elaphe longissima*, *Coronella austriaca*) were a premiere in the studied area. This data emphasizes the deficiency of the earlier knowledge regarding the herpetofauna of Măgura Codrului sector from Maramureş county.

*Salamandra salamandra* (Linnaeus, 1758) is a relatively common species in the studied region, being found for the first time in 8 localities. However, it is distributed exclusively on the highest regions from Măgura Codrului being absent from Baia Mare Depression and from Sălaj Hills. *Salamandra salamandra* is present just at altitudes, higher than 200 m, in forested areas, mainly along pebbly layered streams. This result completes the previous data obtained in the Măgura Codrului sector from Satu-Mare district (Covaciu-Marcov *et al* 2005 b), indicating a wide distribution of salamandra in the area, although its presence here wasn't recorded before the year 2005.

*Triturus alpestris* (Laurentus 1768) is a rare species for the investigated region, being identified in just 2 localities. In both of the localities the newt is present in forested areas with altitudes higher than 250 m. This populations are linked with those from Satu Mare segment of Măgura Codrului, proving that the species occupies the high altitude area of the hill. Măgura Codrului is a place where the presence of the specie was established only in

the last few years. This contributed to the changing of the traditional point of view according to *Triturus alpestris* being present just at higher altitudes than 500 m (Cogălniceanu *et al* 2000). This populations are being added up to the other low altitude populations from the west part of Romania (Micluță 1970, Covaciu-Marcov *et al* 2003 a, b, 2005 a, b, 2006 a, 2007), confirming the fact that in the west side of Apuseni Mountains *Triturus alpestris* descends much lower than in the rest of the country.

*Triturus cristatus* (Laurenti 1768) is a common species in the studied area, being identified in all its sectors. It is present both in the high forested areas from Măgura Codrului and in the artificial ditches nearby Someş river.

*Triturus vulgaris* (Linnaeus 1758), the same as the previous newt, is a common species for the investigated area. It is present both in low altitude regions adjacent to Someş and in the highest forested areas from Măgura Codrului, where is much better represented.

*Bombina bombina* (Linnaeus 1761) is a rare specie for the studied area, being identified in just one place, at Ulmeni. *Bombina bombina* is a premiere in the investigated area, being a first for the whole Maramureş district too. Though a premiere, the fact that it hasn't been found earlier in the region is not due to its absence but to the lack of proper former studies, *Bombina bombina* being found upstream along Someş river, deep inside the Transylvanian Basin (Fuhn 1960, Cogălniceanu *et al* 2000, Ghira *et al* 2002,2003, Iftime 2005). Therefore, the presence of this specie in the area adjacent to Someş from Maramureş county is perfectly logical and expectable. It's a certain thing that *Bombina bombina* entered Transilvanian Plateau along Someş river, therefore the existence of intermediate populations between Western Plain and Transylvanian Basin comes natural. Otherwise the specie is present in Satu Mare county on both shores of Someş river, in close vicinity to Maramureş county.

However, the Ulmeni population appears to be singular and isolated. This fact can have two explanations. First, the populations are numerous in the area, but we failed to find them because of a very dry year. Secondly, it is possible that many populations adjacent to Someş river to disappear because of the habitat destruction. The plain area near by Someş river is highly affected by people, being transformed in agricultural terrain with many artificial ditches. At the same time, there are many localities in the area. We consider that this

explanation is valid for the majority of the situations, especially when at the limit between the flood plain and the hills exist hybrid populations with individuals close to *Bombina bombina*. This suggests that, in the past, in the vicinity of the Someș river, populations of *Bombina bombina* were also present, the habitat occupied by them disappearing completely due to human activities. Therefore, the present populations of *Bombina bombina*, from the Someș flood plain, are isolated one from another due to the human impact. The Ulmeni population is situated at approximately 145 m altitude, its altitudinal requirements being the same as that of the other populations from western Romania (Covaciu-Marcov et al 2002, 2003 a, b, 2005 a, b, 2006 a, b). The habitat from Ulmeni is made by artificial ditches from the grazing fields.

*Bombina variegata* (Linnaeus 1758) is a more common species than the previous. It is spread in the whole studied area, excepting low land areas next to the rivers where its congenera is present.

*Bombina bombina* X *Bombina variegata*. The hybrid populations between the two species are a premiere for the studied area and for the whole Maramureș district too. The hybrids are relatively frequent at the contact area between the Someș flood plain and the hills from the close vicinity. Hybrids are situated at altitudes of approximately 150 m, similar, to the altitudes occupied by the hybrids from other western parts of Romania (Covaciu-Marcov et al 2000, 2002, 2003, a, b, 2006 a, Sas et al 2005), but much lower than the altitudes where hybrids from other parts of the country are found (Strugariu et al 2006, Gherghel et al 2007). Most of the hybrid populations are present here in artificial habitats (ditches), occupying in the studied area, the sector most affected by humans activities.

*Bufo bufo* (Linnaeus 1758) is a widespread species for the studied area, being seen in a large number of localities. A great number of individuals were observed, although a great number of roadkill toads were found, both in the forest vicinity and close to Ariniș ponds.

*Hyla arborea* (Linnaeus 1758) is a species more rare than the previous in the studied area. However it can be found in a large area, both in the forested sectors of Măgura Codrului and in the lowlands near by Someș river. In the spring time numerous individuals have been found dead on the road close to Ariniș ponds, the place where a large number of amphibian species come for reproduction.

*Rana ridibunda* Pallas 1771 is one of the most widespread amphibian in the region. Most of the

populations are found in the canals from the areas near Someș river, or in the ponds made by Sălaj river, especially in the Ariniș region. But marsh frogs can be found up on Măgura Codrului too, advancing upstream along the brooks towards high altitude areas, where the water has a low level, a fast flow and a stony layer underneath.

*Rana dalmatina* Bonaparte 1839 is the most common species of amphibian in the studied region, being found in 24 of the 31 investigated localities. The biggest populations were found in the Măgura Codrului forested area, but the species is also present in the humid areas from the rivers flood plain.

*Rana temporaria* (Linnaeus 1758) is more rare than its congenera, being present in just 9 of the studied localities, all situated in the highest forested area of Măgura Codrului. Alongside *Salamandra salamandra* and *Triturus alpestris*, it belongs to a group of species generally attached to high altitude areas, recently identified in the Măgura Codrului region from Satu Mare county. The presence of this 3 species is closely related to the environment features, typical to a cold and humid area.

*Lacerta agilis* (Linnaeus 1758) is the most common reptile species from the surveyed area, similar situation being pointed out in the western parts of Romania too (Covaciu-Marcov et al 2000, 2002, 2004, 2005 a, b, 2007). Thus, the common lizard was observed in 23 localities, being uniform spread in the entire investigated area.

*Lacerta viridis* (Laurenti 1768) is much rare than the previous, being found exclusively on Măgura Codrului. It inhabits the obtrusive slopes covered in bushes, the forest outskirts or the vegetation from the road edge.

*Anguis fragilis* (Linnaeus 1758) can be found exclusively in the forested area of the studied region, being observed in the forest outskirts or in the vicinity of the forest roads.

*Coronella austriaca* Laurenti 1768 is rare in the surveyed area, being found in just 2 localities. This species is present in the high altitude forested areas of Măgura Codrului, where it have been observed in the forest outskirts.

*Elaphe longissima* (Laurenti 1768) is a very rare species, being found in just one localitie alone. Likewise the previous species it inhabits exclusively the high altitude forested areas of Măgura Codrului.

*Natrix natrix* (Linnaeus 1758) is a common species for the studied areas, being identified in 12 localities. The grass snake is spread all along the studied area being found both in the low lands

near the Somes river and in the high altitude habitats of Măgura Codrului. Occasionally we

encountered dead individuals killed by the road traffic.

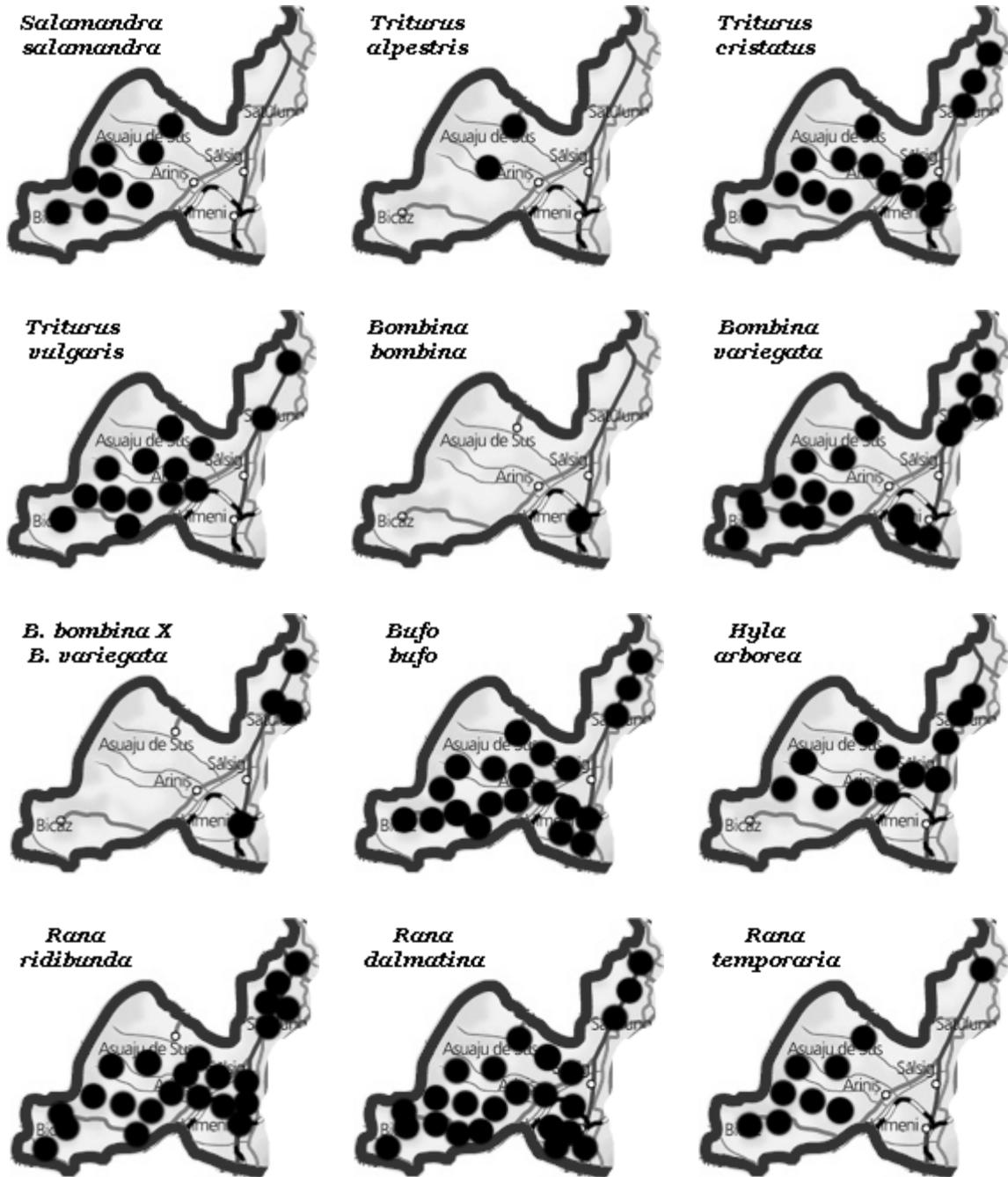


Figure no.2 The geographical distribution of the amphibian fauna in the investigated region

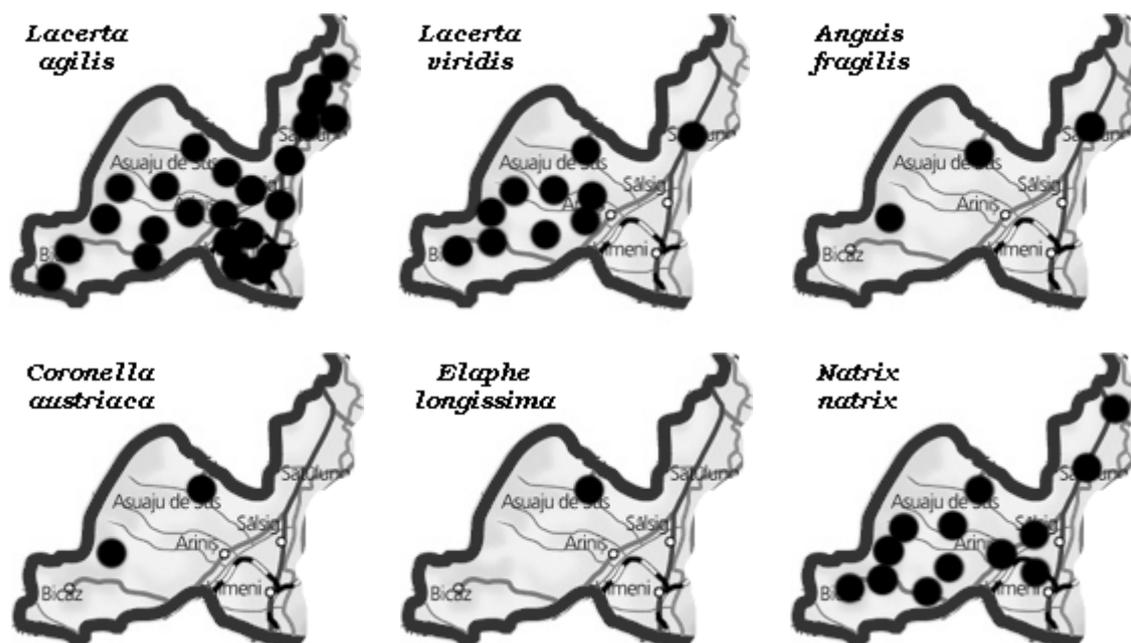


Figure no.3 The geographical distribution of the reptilian fauna in the investigated region

## Conclusions

The herpetofauna of the studied region has a similar composition with the herpetofauna from north-west of Romania (Covaciu-Marcov et al 2000, 2002, 2003 b,c,d, 2004, 2005 a, b, 2006 a, b, 2007). Five species of amphibians and 4 species of reptiles have been found in premiere. Typical to Măgura Codrului is a group of species identified in premiere, both in the case of the present study and in the case of the study upon Satu Mare areas of Măgura Codrului: *Salamandra salamandra*, *Triturus alpestris* and *Rana temporaria*. Their presence is possible due to the similarities in the environment characteristics. This 3 species inhabit the beech forests, being representative for humid and colder areas, associated, in general, in Romania with high altitude regions. Among this 3 species, the finding of the alpine newt at 250 m altitude is the most surprising fact related to the traditional concepts from Romania, concerning the species altitude limit. However, the presence of the alpine newt at similar altitudes in the west part of the country cannot be considered a surprise, the populations from Măgura Codrului sector from Maramureș county just being a contribution to the knowledge regarding the distribution of the low altitude populations of this species in north-western

Romania. A premiere for the Maramureș county is the discovery of the *Bombina bombina* in the close vicinity to the border between Maramureș and Sălaj. The finding of this specie in the Someș flood plain, proves the areal continuity between the populations from Western Plain and the population from Transilvanian Plateau, indicating at the same time their entry path in the north of the Transilvanian Depression.

## References

- Cogălniceanu, D. 1997. Practicum de ecologie a *Amfibienilor* – metode și tehnici în studiul ecologiei *Amfibienilor*. Ed. Universității din București, 1-122.
- Cogălniceanu D., Aioanei F., Bogdan M. 2000. *Amfibienii* din România, Determinator. Ed. Ars Docendi, București, 1-99.
- Covaciu-Marcov S. D., Ghira I., Venczel M., 2000. Contribuții la studiul herpetofaunei din zona Oradea. *Nymphaea, Folia Naturae Bihariae, Oradea XXVIII*, 143-158.
- Covaciu-Marcov S. D., Telcean I., Cupșa D., Cadleț D., Zsurka R., 2002. Contribuții la studiul herpetofaunei din regiunea Marghita (jud. Bihor, România). *Analele Univ. din Oradea, Fasc. Biol., Tom IX*, 47-58.
- Covaciu-Marcov S. D., Sas I., Cupșa D., Meleg G., Bud B., 2003 a. Studii herpetologice în regiunea Munților Pădurea Craiului și Plopișului (Județul Bihor). *Analele Univ. din Oradea, Fasc. Biol., Tom X*, 81-95.
- Covaciu-Marcov S. D., Cupșa D., Telcean I., Sas I., A. Cicort, 2003 b. Contribuții la cunoașterea herpetofaunei din regiunea cursului mediu și inferior al Crișului Negru

- (Județul Bihor, România). Oltenia, Studii și Comunicări, Științele Naturii, Vol. XIX, 189-194.
- Covaciu-Marcov S. D., I. Telcean, Sala G., Sas I., Cicort. A., 2003 c. Contribuții la cunoașterea herpetofaunei regiunii Beiuș, jud. Bihor, România. Nymphaea, Folia naturae Bihariae, XXX, 127-141.
- Covaciu-Marcov S. D., Ghira I., Sas I., 2004. Contribuții la studiul Herpetofaunei zonei Oașului (Județul SM, România). Mediul cercetare, protecție și gestiune, 2, Cluj - Napoca, 107-112.
- Covaciu-Marcov S. D., Cicort-Lucaciu A. Șt., Sas I., Bredet A. M., Bogdan H., 2005 a. Herpetofauna from the basin of Mureș river in Arad county, Romania. Mediul cercetare, protecție și gestiune, 5, Cluj - Napoca, 147-152.
- Covaciu-Marcov S. D., Cicort-Lucaciu A. Șt., Sas I., Ile R. D., 2005 b. The herpetological fauna of "Culmea Codrului" (Satu - Mare county, Romania). Analele Univ. din Craiova, Vol XLVI, 163-168.
- Covaciu-Marcov S. D., Sas I., Kiss A., Bogdan H., Cicort-Lucaciu A. Șt., 2006 a. The herpetofauna from the Teuz River hydrographic basin (Arad County, Romania). N. West. J. Zool., 2 (1): 27-38.
- Covaciu-Marcov S.-D., Sas I., Cicort-Lucaciu A.-Șt., Bogdan H., Ardelean R., 2006 b. The herpetofauna of the north-western region of Sălaj County. Studii și Cercetări, Biologie, 85-91, Bacău.
- Covaciu-Marcov S.-D., Cicort-Lucaciu A.-Șt., Ile R. D., Pașcondea A., Vatamaniuc R., 2007. Contributions to the study of the geographical distribution of the herpetofauna in the North-East area of Arad County, Romania. Herpetologica Romanica, Vol. 1, 62-69.
- Fuhn I., 1960. "Fauna R.P.R.", vol. XIV, fascicola I, Amphibia. Editura Academiei R.P.R., București, 1-288.
- Fuhn I., Vancea Șt., 1961. "Fauna R.P.R.", vol. XIV, Fascicola II, Reptilia. Editura Academiei R.P.R., București. 1-352.
- Gherghel I., Strugariu Al., Ghiurcă D., Roșu S., Hutuleac-Volosciuc M. V., 2007. The composition and distribution of the herpetofauna from the Valea Neagră river basin (Romania). Herpetologica Romanica, Vol. 1, 70-76.
- Ghira I., Mara G., 2000. Using the allelomorphic feature in identifying two species belonging to genus *Bombina* (Anura, Discoglossidae) from Transilvania. Studia Univ. Babeș - Bolyai, Cluj - Napoca, XLV, 85-95.
- Ghira I., Venczel M., Covaciu-Marcov S.-D., Mara Gy., Ghile P., Hartel T., Török Z., Farkas L., Rác T., Farkas Z., Brad T., 2002. Mapping of Transylvanian Herpetofauna. Nymphaea, Folia Naturae Bihariae, Oradea, XXIX, 145-203.
- Ghira I., Marinescu I. E., Domșa C. 2003. Habitat preferences of different hybrid categories between *Bombina bombina* (L.) and *Bombina variegata* (L.) in Transylvanian Plain. Studii și Cercetări Biologie, 8, 3 - 5, Universitatea din Bacău, 211-215.
- Iftime, Al., 2005. Amfibieni și Reptile. În: Cartea Roșie a Vertebratelor din România, editori: Botnariuc & Tatole. Ed. Acad. Române, 1-325.
- Micluță, H., 1970. Note faunistice herpetologice din Județul Maramureș. Bul. Științ. Inst. Pedag. Baia Mare, Ser. Biol., 2: 39-42
- Posea G., Badea L., 1984. România, Harta Unităților de relief (Regionarea geomorfologică). Ed. Științifică și Enciclopedică, București.
- Sas I., Covaciu-Marcov S.-D., Pop M., Ile R. D., Szeibel N., Duma C. 2005. About a closed hybrid population between *Bombina bombina* and *Bombina variegata* from Oradea (Bihor County, Romania). N. West. J. Zool., Vol. 1, 41-60.
- Strugariu Al., Gherghel I., Volosciuc-Hutuleac M.V., Săhlean T.C., Sas I., Pușcașu C.M., 2006. Preliminary data concerning the distribution of amphibian fauna in Suceava County (Romania). Analele univ. din Oradea, Fasc. Biol., 39-47.
- Stugren B., 1980. Geographical variation of the fire - bellied toad (*Bombina bombina* (L.)) in the USSR. (*Amphibia, Anura, Discoglossidae*). Zool. Abh. Mus. tierk. Dresden, 36 (5): 101-115.
- Szymura J. M., 1993. Analysis of hybrid zones with *Bombina*. In Hybrid zones and the evolutionary process (ed R. G. Harrison), pp 261-289. Oxford: Oxford University Press.