

THE HERPETOFAUNA OF THE LOWER HYDROGRAPHICAL BASIN OF CRISUL ALB, THE DISTRICT OF ARAD (ROMANIA)

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Abstract. We have studied the geographical spread of the herpetofauna in 42 places from the lower hydrographical basin of the river Crisul Alb, in the district of Arad. In this region we have identified 14 species of amphibians: *Salamandra salamandra*, *Triturus alpestris*, *Triturus dobrogicus*, *Triturus cristatus*, *Triturus vulgaris*, *Bombina bombina*, *Bombina variegata*, *Pelobates fuscus*, *Bufo bufo*, *Bufo viridis*, *Hyla arborea*, *Rana ridibunda*, *Rana dalmatina*, *Rana temporaria*, as well as 9 reptile species: *Emys orbicularis*, *Lacerta agilis*, *Lacerta viridis*, *Podarcis muralis*, *Anguis fragilis*, *Elaphe longissima*, *Coronella austriaca*, *Natrix natrix*, *Natrix tessellata*, and hybrids between *Bombina bombina* and *Bombina variegata*. We have also identified populations of *Rana kl. esculenta*.

Key words: herpetofauna, lower basin of Crișul Alb

Rezumat. Herpetofauna bazinului inferior al Crișului Alb, județul Arad, România. Am studiat răspândirea geografică a herpetofaunei în 42 de localități din bazinul hidrografic inferior al râului Crișul Alb din județul Arad. În regiune am identificat 14 specii de amfibieni: *Salamandra salamandra*, *Triturus alpestris*, *Triturus dobrogicus*, *Triturus cristatus*, *Triturus vulgaris*, *Bombina bombina*, *Bombina variegata*, *Pelobates fuscus*, *Bufo bufo*, *Bufo viridis*, *Hyla arborea*, *Rana ridibunda*, *Rana dalmatina*, *Rana temporaria*, 9 specii de reptile: *Emys orbicularis*, *Lacerta agilis*, *Lacerta viridis*, *Podarcis muralis*, *Anguis fragilis*, *Elaphe longissima*, *Coronella austriaca*, *Natrix natrix*, *Natrix tessellata* și hibrizi între *Bombina bombina* și *Bombina variegata*, precum și populații de *Rana kl. esculenta*.

Cuvinte cheie: herpetofaună, bazinul inferior, Crișul Alb

INTRODUCTION

Sporadic data about the herpetofauna of the Arad district can be found in several books from *Fauna R.P.R.*, about amphibians and reptiles (FUHN, 1960, FUHN & VANCEA, 1961). In the last decade, two scientific books have been published. These refer either to amphibians or the herpetofauna as a whole, including also some regions from the district (COGALNICEANU et al., 2000, GHIRA et al., 2002, IFTIME, 2005).

Two articles referring explicitly to the herpetofauna of some regions from Arad district have been published recently (COVACIU-MARCOV et al., 2005 a, 2006 a). The importance of the study concerning the structure and the geographical spread of the herpetofauna is very important, as this is the starting point in protecting the amphibians and the reptiles (GHIRA et al., 2002). In Romania, the geographical spread of the herpetofauna continues to be unknown, as compared to the western Europe (GASC et al., 1997), despite the fact that in the latest years a series of studies over this issue have been carried out (ANDREI, 2002, COVACIU-MARCOV et al., 2000, 2002, 2003 a, b, c, 2004, 2005 a, b, 2006 a, b, GHIRA et al., 2002, GHIURCA et al., 2005, GHERGHEL & ÎLE, 2006, Lazar et al., 2005, STRUGARIU et al., 2006 a, b). In this way our objective has been to establish the structure and the geographical herpetofauna of the lower hydrographical basin Crisul Alb in the district of Arad.

MATERIAL AND METHODS

The region under question is located in the center-western of Arad district, overlapping the lower hydrographical basin of the river Crisul Alb, in the downstream area of Ineu. Most of the region is made of fields, belonging to the lower field of the river Cris, and in the south-eastern part there is a sector of the Zarandului Mountains. The maximum altitude in the area is 798 m, on the peak Highis (TUFESCU, 1986) The most important tributary of Crisul Alb here is the Cigher, which drains a large part of the northern slope of the Zarandului Mountains (FEY et al., 2001).

The study has been made between 2002 and 2006. We have observed the herpetofauna from 42 regions (table 1), and each of it supposing trips in different biotopes. The method consists in some visual crosswise lines (COGALNICEANU, 1997). The animals have been established directly most of the times, without catching them. We examined them directly (BROWN, 1997) and when it came to catching some types, our team used bare hands. In the aquatic period the amphibians have been caught with a square rake, or using a round net, on long metal sticks. After being established, the animals were released in their original biotopes.

The hybrids were established by the morphological or chromatical characters, using the main characters or surveys from the scientific literature (BERGER, 1966, 1973, COGALNICEANU et al., 2000, GHIRA & MARA, 2000, STUGREN, 1980, SZYMURA, 1993). An important role in establishing the geographical spread of the herpetofauna, was played by finding and observing a few dead animals, either killed by the local people or run over by cars.

RESULTS AND DISCUSSIONS

In the region in question we have identified a total of 23 species of the herpetofauna: 14 amphibians (*Salamandra salamandra*, *Triturus alpestris*, *Triturus dobrogicus*, *Triturus cristatus*, *Triturus vulgaris*, *Bombina bombina*, *Bombina variegata*, *Pelobates fuscus*, *Bufo bufo*, *Bufo viridis*, *Hyla arborea*, *Rana ridibunda*, *Rana dalmatina*, *Rana temporaria*) and 9 reptile species: (*Emys orbicularis*, *Lacerta agilis*, *Lacerta viridis*, *Podarcis muralis*, *Anguis fragilis*, *Elaphe longissima*, *Coronella austriaca*, *Natrix natrix*, *Natrix tessellata*). Along with the 22 species, we have also identified in the region 2 hybrid categories between certain amphibian species. In this way, a lot of hybrids between *Bombina bombina* and *Bombina variegata* are to be seen in the area, as well as groups of *Rana kl. esculenta* – hybrids between *Rana ridibunda* and *Rana lessonae*. Both of the hybrid categories, as well as *Lacerta viridis*, have been identified for the first time in the respective area.

We have analyzed the spread of the 23 species and 2 hybrid forms of the herpetofauna in the 42 places of the region in question. We have identified 290 places for the respective species we observed in the above 42 areas (table 1), and among these, 232 places are considered new for Romania's herpetofauna.

Salamandra salamandra (LINNAEUS, 1758) is a rare species in the region we have analyzed. We have noticed few types, originating in a small number of places. This is because there are few high wood areas here, which are specific to these types. The species is present in the wood areas, 200 m altitude and upper.

Triturus alpestris (LAURENTUS, 1786) is a rare species, being identified in only one place, Naidas. It lives mostly in the high area, at 400 m and even upper, although in other western areas in Romania it can be found at lower altitudes, even 150 m (COVACIU-MARCOV et al., 2006 a).

Triturus cristatus (LAURENTI, 1768) lives mostly in the hill and high areas in the south-eastern region. It lives in area higher than 150 m, and also on uneven relief, which is common to western Romania (COVACIU-MARCOV et al., 2003 a, b, 2005 a,b, 2006 a). Although it does not have a very large territory, the populations taken into account are formed of several types.

Triturus dobrogicus (KIRITZESCU, 1903), as opposed to the former species, lives in an area having several spreadings, namely in the field area of the lower hydrographical basin of Crisul Alb. It lives only at altitudes lower than 150m, areas having a plain relief. In certain situations, as Ineu for instance, it can reach the hills' lower limit, but only if the contact between these and the field is a sudden one. The populations are generally not very large, because of the radical anthropic change of the field area. Usually *Triturus dobrogicus* is to be found in the canals or the hitches near the roads. We have not identified hybrids between the two species of comb tritons in the area, although such populations have been seen previously in other places from Arad district (COVACIU-MARCOV et al., 2006 a). This is due perhaps to the steep way of contact between hills and fields – in the region under study, which has the function of a barrier between the areas of the two species. This practically does not allow other intermediary species.

Triturus vulgaris (LINNAEUS, 1785) is the most common Urodele species in the region in question. It lives in the field but also in the mountains. It can be found in every kind of aquatic biotope, from the canals or the hitches near the roads up to temporary puddles in the forest areas.

Bombina bombina (LINNAEUS, 1761) lives mostly in the field area of the region in question. It can be practically found in every aquatic biotope, and especially in the spring one can notice it in the temporary puddles on the farmers' fields. It does not live in the higher areas of the region we studied, as its altitude limit is 150 m. This is common to the general situation from other places in western Romania (COVACIU-MARCOV et al., 2000, 2002, 2003 b, 2004, 2005 a, b, 2006 a), but its presence is lower than in other places in the country, for instance Transylvania (GHIRA et al., 2003), Moldavia (STRUGARIU et al., 2006 b) or Dobrogea (COVACIU-MARCOV et al., 2006 a).

Bombina variegata (LINNAEUS, 1758) is well represented in the hilly and mountains area of the region under study, living in an area having several spreadings. This is different from other species of the same gene. Generally, the lower altitude limit of the species is 150 m, but it can happen for this to reach 140m as well. In this way, the two species' spread depends on the same altitude factors as in west of the Apuseni Mountains in general.

Bombina bombina X *Bombina variegata*. The hybrids between the two *Bombina* species are rare in this region. We have met only one hybrid population, near Dud village, between the field and Nadasului Hills, at an altitude of 150 m, the same altitude as other hybrid populations' from western Romania (COVACIU-MARCOV et al, 2000, 2002, 2003 a,b, 2004, 2005 a,b). The hybrids were found in the puddling area. At the level of a permanent brook. Unfortunately, because there is a village in the vicinity, the biotope is very polluted with litter.

Pelobates fuscus (LAURENTI, 1768) is relatively rare in the area under study. The species has been identified only in 10 villages situated solely in the field area, but not very far from the hilly area. This fact, along with the species' rarity in the field area, can be considered a consequence of the field area's anthropic change. Thus, the field from the lower hydrographic basin of Crisul Alb is almost completely cleared and drained, being cut by a series of canals that drain the water quickly. In this way, the species lacks its normal reproduction biotope. However, at the hills' edge, the hydrographical net is more developed, the humidity level is higher, which allows the digging frogs' survival.

Bufo bufo (LINNAEUS, 1758) is almost exclusively spread in the high hilly and mountain area, where is quite common. It is very rare in the field area, and in general one can see it only at the edge between this one and the high relief, as described above, at the former species. In point of reproduction, this takes place in the ditches near the roads. Nevertheless, the massive forest clear has led to a smaller after-laying area.

Table 1. Distribution of the amphibian and reptile species in the studied region
Tabel 1. Distribuția speciilor de amfibieni și de reptile în regiunea cercetată

	S	T	T	T	T	B	B	B	P	B	B	H	R	R	R	R	E	L	L	P	A	C	E	N	N
	s	a	d	c	v	b	v	b	f	u	u	a	r	e	d	t	o	a	v	m	f	a	l	n	t
Agrișu Mare	-	-	-	-	X	-	X	-	-	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Arăneag	X	-	-	X	X	-	X	-	-	X	X	X	-	-	X	X	-	-	X	-	X	X	-	-	-
Camna	-	-	-	-	X	-	X	-	-	X	X	X	-	-	X	-	-	-	-	-	-	-	-	X	-
Caporal Alexa	-	-	-	-	X	X	-	-	X	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-
Chier	-	-	-	-	X	X	-	-	X	X	-	-	X	-	X	-	-	X	-	-	-	-	-	X	-
Chișinău Criș	-	-	X	O	S	S	-	-	-	-	S	O	S	-	X	-	-	S	-	-	-	-	-	S	O
Cintei	-	-	X	-	X	X	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Cuied	X	-	-	X	X	-	X	-	-	X	-	X	X	-	X	-	-	X	X	-	-	-	-	X	-
Curtici	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	S	-	-	-	-	-	-	-
Dud	-	-	-	X	X	X	X	X	-	X	X	-	X	X	X	-	-	X	-	-	-	-	-	X	-
Drauț	-	-	-	-	-	-	-	-	-	X	X	-	-	-	X	-	-	-	X	-	-	-	-	-	-
Galșa	-	-	-	-	X	X	X	-	X	X	X	-	X	-	X	-	-	X	X	-	-	-	-	X	-
Grâniceri	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hodiș	-	-	-	X	X	-	X	-	-	-	-	-	-	-	X	-	-	S	-	-	-	-	-	-	-
Iercoșeni	-	-	-	X	X	-	X	-	-	X	-	X	-	-	X	-	-	X	X	-	-	-	-	X	-
Ineu	-	-	X	O	S	S	-	-	X	O	O	S	S	X	S	-	S	X	-	-	O	-	-	S	-
Luguzău	-	-	-	X	X	-	X	-	-	X	X	X	-	-	X	-	-	X	X	-	-	-	-	X	-
Macea	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Măderat	-	-	-	-	X	X	X	-	-	X	S	O	S	-	S	-	-	S	-	-	-	-	-	S	-
Măasca	-	-	-	-	X	X	X	-	X	X	X	-	X	-	X	-	-	X	X	-	-	-	-	-	-
Minișu de Sus	X	-	-	X	X	-	X	-	-	X	X	X	-	-	X	-	-	X	X	-	-	-	-	X	X
Minișel	X	-	-	X	X	-	X	-	-	X	-	X	-	-	X	-	-	X	X	-	-	-	-	X	-
Mocrea	-	-	-	-	X	X	-	-	X	X	-	-	X	X	X	-	X	X	-	-	-	-	-	X	-
Nădab	-	-	X	O	S	S	-	-	-	O	X	-	S	-	-	-	-	S	-	-	-	-	-	-	O
Nădaș	S	S	-	X	S	-	S	-	-	S	X	S	X	-	S	S	-	X	X	X	S	S	O	X	X
Olari	-	-	X	-	S	X	-	-	-	-	O	O	X	-	-	-	O	-	-	-	-	-	O	-	-
Pâncota	-	-	-	-	X	X	-	-	X	X	X	-	X	-	X	-	-	X	-	-	-	-	-	-	-
Pilu	-	-	X	-	X	X	-	-	-	-	O	O	X	-	-	-	S	-	-	-	-	-	-	-	-
Satu Mic	-	-	-	-	X	-	-	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Sântana	-	-	-	-	X	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Seleuș	-	-	X	O	S	X	-	-	X	-	X	-	X	-	-	-	O	S	-	-	-	-	-	-	-
Sintea Mică	-	-	X	-	X	X	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Socodor	-	-	X	-	X	X	-	-	-	-	-	-	X	-	X	-	X	X	-	-	-	-	-	X	-
Șiclău	-	-	X	-	X	X	-	-	-	-	O	-	S	-	-	-	-	-	-	-	-	-	-	S	-
Șicula	-	-	X	-	S	S	-	-	X	-	-	-	X	-	-	-	-	X	-	-	-	-	-	X	-
Șilindia	-	-	-	-	X	X	-	-	-	X	X	-	X	-	-	-	-	X	-	-	-	-	-	X	-
Șimand	-	-	-	-	X	S	-	-	-	-	X	-	-	-	-	-	O	-	-	-	-	-	-	-	-
Șiria	-	-	-	O	S	X	X	-	X	X	X	X	X	-	X	-	-	S	X	O	-	O	X	S	-
Tăuț	-	-	-	S	S	-	S	-	O	S	S	S	S	-	S	O	-	X	X	-	-	-	-	S	S
Târnova	-	-	-	X	X	X	-	-	-	X	X	-	X	-	X	-	-	X	-	-	-	-	-	X	-
Vârșand	-	-	S	-	X	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Zărand	-	-	X	-	S	X	-	-	-	X	O	-	-	-	-	-	-	-	-	-	-	-	-	O	-
Σ X	4	-	1	1	2	2	1	1	1	2	2	8	2	3	2	1	2	1	1	1	1	1	1	1	2
Σ S	1	1	1	1	1	5	2	-	-	2	3	3	6	-	4	1	2	7	-	-	1	1	-	6	1
Σ O	-	-	-	5	-	-	-	-	1	2	5	4	-	-	-	1	3	-	-	1	1	1	1	2	2

X – new localities, S – reconfirmed, O – signaled but don't reconfirmed

Ss=*Salamandra salamandra*, Ta=*Triturus alpestris*, Td=*Triturus dobrogicus*, Tc=*Triturus cristatus*, Tv=*Triturus vulgaris*, Bb=*Bombina bombina*, Bv=*Bombina variegata*, BbXBv=*Bombina bombina*X*Bombina variegata*, Pf=*Pelobates fuscus*, Buf=*Bufo bufo*, Buv=*Bufo viridis*, Ha=*Hyla arborea*, Rr=*Rana ridibunda*, Re=*Rana esculenta*, Rd=*Rana dalmatina*, Rt=*Rana temporaria*, Eo=*Emys orbicularis*, La=*Lacerta agilis*, Lv=*Lacerta viridis*, Pm=*Podarcis muralis*, Af=*Anguis fragilis*, El=*Elaphe longissima*, Ca=*Coronella austriaca*, Nn=*Natrix natrix*, Nt=*Natrix tessellata*

Bufo viridis (LAURENTI, 1768) it a well-represented species in this region, living mostly in the high areas. Unlike the former population, it prefers the field areas which are very changed anthropically. Larger groups are to be seen at the western limit of the Zarandului Mountains, where this meets the field.

Hyla arborea (LINNAEUS, 1758) is well represented in the hilly and mountainous forest areas. We have not identified any population in the field area, where this species' biotopes have practically disappeared because of the anthropic activities. In this way, the fields lack forests and permanent swamp areas almost completely. The species can be found only where the field meets the hills, at Ineu and Siria.

Rana ridibunda (PALLAS, 1771) is a common species in the area in question. It loves the hilly and field low areas. It does not like the dark narrow valleys in the mountains areas. The species has large populations, living in almost every aquatic biotope.

Rana kl. esculenta (LINNAEUS, 1758) is rare in the area, being identified only in 3 places in the contact zone between the field and the hills, at altitudes of 150 m. It lives generally in gutters and ditches, but also in the puddle and swamp areas, generally near brooks. The biotopes and the altitude are similar to those in which the species has been identified previously in Arad district (COVACIU-MARCOV et al., 2005 a, 2006 a).

Rana dalmatina (BONAPARTE, 1839) is a common species the forest areas of the mountain and hilly sides from the lower hydrographic basin of Crisul Alb. However it is very rare in the field – we have only identified it in three places, in the wet areas near some canals, or the few forest islands. The fact that the species is extremely rare is a consequence of the massive forest clear and the field area's draining.

Rana temporaria (LINNAEUS, 1758) is much rarer than the previous one – we have identified it only in two places around the Zarandului Mountains. It lives at altitudes higher than 200 m.

Emys orbicularis (LINNAEUS, 1758) is rare in the region in question, and we have identified it only in four places in the field area. It lives only around Crisul Alb's border zone, in canals, ditches, puddle areas, etc.

Lacerta agilis (LINNAEUS, 1758) is a common species in the region, living not only in the field but also in the high areas.

Lacerta viridis (LAURENTI, 1768) is rarer than the previous one. It only lives in the mountain and hilly areas, 150 m and even higher. It prefers the uneven relief, the bush hilly slopes or the forest skirt.

Podarcis muralis (LAURENTI, 1768) is a very rare species, identified in only one place in the Zarandului Mountains.

Anguis fragilis (LINNAEUS, 1758) is also rare, being exclusively identified in the forest areas in the Zarandului Mountains.

Coronella austriaca (LAURENTI, 1758) lives in a zone similar to the previous one, living in the forest areas of the Zarandului Mountains as well. But, in these places the populations seem to be rather large, as we have met a lot of types killed by the local people or run over by cars.

Elaphe longissima (LAURENTI, 1768) has been identified in a sole place, at Siria. It lives around the western slope of the Zarandului mountains, in direct contact with the field.

Natrix natrix (LINNAEUS, 1758) is the most common snake species in the region under study. It lives not only in the field but also in the high areas, generally in wet areas, near canals or ditches. However, in some cases they are the cars' victims.

Natrix tessellata (LAURENTI, 1768) is spread exclusively in the Zarandului Mountains, along the valleys covering these mountains. Despite the fact this territory is a small one, the number of the types was a large one. A larger population is to be found in the vicinity of the Taut artificial lake. In the proximity of the lake we have noticed a lot of dead bodies run over by cars.

CONCLUSIONS

In the lower hydrographical basin of the Crisul Alb from the district of Arad, we have identified 23 species belonging to the herpetofauna, along with two categories of hybrids between certain amphibian species. We have identified 290 places for the respective species in the 42 places in the region. Among these, 232 places are considered new places for Romania's herpetofauna. The structure of the lower hydrographical basin of Crisul Alb – the district of Arad -, is similar to other structures in this district (GHIRA et al., 2002, COVACIU-MARCOV et al., 2005 a, 2006 a). The hybrid zones between the two *Bombina* species is situated at about 150 m – *Bombina bombina* lives lower and *Bombina variegata* is to be found higher. The same is to be found in the Apuseni Mountains.

The field area in the lower hydrographical basin of Crisul Alb has quite a poor herpetofauna, because of the massive anthropic change, such as forest clearing and draining. Practically, the simplified herpetofauna of the field area is now living in the close vicinity of the rivers, in the narrow space between the breakwaters of the different draining canals, or in the very few forest islands that still exist. A different herpetofauna area is to be noticed in the vicinity of Siria. Here, the direct contact between the field area and the Zarandului Mountains is determining the existence of a great variety of biotopes and therefore a great variety of species. Thus, we may consider that the region in question should be paid a great attention and be given the possibility of becoming a protected area.

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