# THE CURRENT STATUS OF THE HERPETOFAUNA AND THE IMPORTANT HERPETOFAUNAL AREAS FROM SUCEAVA COUNTY (ROMANIA)

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Abstract. Since 2001, the authors of this paper have been conducting herpetological surveys in Suceava County, studying the composition and geographical distribution of the native amphibian and reptile species, time in which we have identified 16 species of amphibians (*Salamandra salamandra, Triturus vulgaris, Triturus montandoni, Triturus cristatus, Triturus alpestris, Bombina bombina, Bombina variegata, Pelobates fuscus, Bufo bufo, Bufo viridis, Hyla arborea, Rana lessonae, Rana ridibunda, Rana arvalis, Rana temporaria & Rana dalmatina)* and 8 species of reptiles (*Emys orbicularis, Anguis fragilis, Zootoca vivipara, Lacerta agilis, Natrix natrix, Coronella austriaca, Zamenis longissimus and Vipera berus)* along with *B. bombina X B. variegata* and *Rana kl. esculenta (R. lessonae X R. ridibunda)*. Based on our previous work, this paper presents the current status of the local herpetofauna and identifies and describes the most obvious important herpetological areas from Suceava County. The most important areas for the herpetofauna seem to be the decidous forests form the Suceava Plateau, the mountain forested areas and the lake system from the Moara-Fälticeni area.

Keywords: herpetofauna, amphibians, reptiles, protected species, human impact, glacial relicts.

Rezumat. Situația actuală a herpetofaunei si zonele de importanță herpetofaunistică din județul Suceava (România). Începând cu anul 2001 autorii prezentului articol au efectuat studii herpetologice în județul Suceava, cercetând compoziția și răspândirea geografică a speciilor indigene de amfibieni și reptile, timp în care am identificat 16 specii de amfibieni (*Salamandra salamandra, Triturus vulgaris, Triturus montandoni, Triturus cristatus, Triturus alpestris, Bombina bombina, Bombina variegata, Pelobates fuscus, Bufo bufo, Bufo viridis, Hyla arborea, Rana lessonae, Rana ridibunda, Rana arvalis, Rana temporaria & Rana dalmatina)* și 8 specii de reptile (*Emys orbicularis, Anguis fragilis, Zootoca vivipara, Lacerta agilis, Natrix natrix, Coronella austriaca, Zamenis longissimus and Vipera berus*) precum și hibrizi între B. bombina și B. variegata și hibridul Rana kl. esculenta (R. lessonae X R. ridibunda). Pe baza cercetărilor noastre precedente, această lucrare prezintă situația actuală a herpetofaunei și identifică și descrie cele mai evidente zone de importanță herpetofaunistică. Cele mai importante zone pentru herpetofauna sunt pădurile de foioase din Podișul Sucevei, zonele împădurite montane și sistemul lacustru din zona Moara-Fălticeni.

Cuvinte cheie: herpetofauna, amfibieni, reptile, specii protejate, impact antropic, relicte glaciare.

## Introduction

The Moldavian herpetofauna has been very poorly studied, compared to the other regions of the country. Up untill recently the most comprehensive data regarding the composition and geographical distribution of herpetological fauna in Moldavia could be found in the two "Fauna Republicii Populare Române" volumes published by Fuhn (1960) and Fuhn & Vancea (1961) regarding the native romanian amphibian and reptile species. Other publications in the past include the work of Şova (1970, 1972) and Ionescu *et al.* (1968). Cogălniceanu (1991) published a prelimiary report regarding the distribution of amphibian fauna in Romania followed by a more complete one in 2000. Since then,

herpetological work in Moldavia has been restricted to individual counties or river basins and has been carried out by Covaciu-Marcov *et al.* (2003), Ghiurcă *et al.* (2005), Strugariu *et al.* (2006 a,b,c), Gherghel & Ilie (2006). Even with these recent publications, that contain data about the herpetofauna in Suceava, Neamț and Botoșani counties, almost nothing has been written about the other regions of Moldavia.

The knowledge regarding the composition and geographical distribution of the herpetofauna from Suceava County has been, up untill recently, limited to very old or scarce data (Fuhn, 1960, Fuhn & Vancea, 1961, Ionescu *et al.*, 1968, Şova, 1970, 1972, Cogălniceanu, 1991, Cogălniceanu *et al.*, 2000). Due to the fact that a large part of the native amphibian and reptile species are considered to be vulnerable, threatened or endangered (Iftime, 2001, 2005) and because, in order to establish effective conservation measures for these species their precise distribution must be known (Ghira *et al.*, 2002), we aimed to study the herpetofauna in Suceava County (Strugariu *et al.*, 2006 a, b, c). The precarity of the previous data about the area was showed by us in our previously published papers, as we mentioned several species for the first time for Suceava County.

Taking the above stated into consideration, the aims of the present paper are:

1. To asses the situation of the amphibian and reptile species native to Suceava County.

2. To evaluate the damage done by human activities and to determine the main threats for the herpetofauna.

3. To determine which are the most important areas for the herpetofauna in the investigated region.

#### **Material and Methods**

Our field investigations took place between 2001 and 2006 and covered a total of 84 geographical localities. With the aim of mapping the herpetofauna we used the transect method (Cogălniceanu, 1997), making numerous surveys in the investigated areas. The animals were determined mostly directly, without the necessity of capturing them. When the capture of some specimens was compulsory, it was usually done by hand, the only exceptions being the venomous snakes, for which we used herpetological hooks. 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 and measurements indicated in the scientific literature (Berger, 1966, 1973, Cogălniceanu *et al.*, 2000, Csata, 1998, Fuhn, 1960, Stugren, 1980, Szymura, 1993). As mentioned above, the precise data regarding the distribution of the herpetofauna in Suceava County is showed in our previous papers (Strugariu *et al.*, 2006 a,b,c).

Based on our previous work we established the important herpetofaunal areas, these being areas that sustain populations of national threatened or endangered species that are protected by law, which are of community or national interest and demand the establishment of protected areas trough their presence (Torok, 1999).

The studied area is situated in the North-Eastern sector of Romania and partialy covers the northern group of the Eastern Carpathians an on the Suceava Plateau. Most of the hydrographical units consist of rivers and streams but lakes, ponds, wamps and important sub-terrestrial springs are also present. Almost all rivers flow into the Siret River. The most important of these rivers are Suceava, Moldova and Bistrita (Botnariuc, 1980).

### **Results and Discussion**

### 1. The herpetofauna in Suceava county:

As discovered in our previous studies, the herpetological fauna in our research area consists of 16 species of amphibians and 8 species of reptiles, as showed in Table 1 and 2; the current protection status of the native herpetofauna is showed in Fig. 1 and 2:

Species	No. of localities in	National status	Local status
	which we identified it	(Iftime, 2001)	(this study)
Emys orbicularis	6	Vulnerable	Endangered
Anguis fragilis	34	Vulnerable	Vulnerable
Zootoca vivipara	34	Vulnerable	Near threatened
Lacerta agilis	57	Vulnerable	Least concern
Natrix natrix	44	Least concern	Least concern
Coronella austriaca	4	Vulnerable	Endangered
Zamenis longissimus	5	Vulnerable	Endangered
Vipera berus	20	Endangered	Vulnerable

Table 1. The current status of the species of reptiles from Suceava County.

Table 2. The current status of the species of amphibians from Suceava County.

	*			
Species	No. of localities in	National status	Local status	
	which we identified it	(Iftime, 2001)	(this study)	
Salamandra salamandra	29	Vulnerable	Vulnerable	
Triturus alpestris	21	Vulnerable	Near threatened	
Triturus cristatus	28	Vulnerable	Vulnerable	
Triturus montandoni	28	Vulnerable	Near threatened	
Triturus vulgaris	44	Near threatened	Least concern	
Bombina bombina	30	Near threatened	Vulnerable	
Bombina variegata	53	Near threatened	Least concern	
Pelobates fuscus	3	Vulnerable	Data deficient	
Bufo bufo	35	Near threatened	Near threatened	
Bufo viridis	30	Near threatened	Near threatened	
Hyla arborea	48	Vulnerable	Near threatened	
Rana lessonae	9	Least concern	Data deficient	
Rana ridibunda	40	Least concern	Least concern	
Rana arvalis	5	Endangered	Endangered	
Rana dalmatina	16	Vulnerable	Vulnerable	
Rana temporaria 61		Vulnerable	Least concern	



Figure 1. Protection status of the amphibians from Suceava County.





Figure 2. Protection status of the reptiles from Suceava County.

#### 2. Human impact and main threats for the herpetofauna:

Human activities that threaten the herpetofauna from Suceava County and their habbitats are mainly represented by:

- <u>Illegal collecting for commercial purposes</u>: these activities mainly pose a threat to the frogs from the *Rana esculenta* complex, *Rana temporaria* and *Rana dalmatina*. We have personaly seen the effects of these actions near the Moldova river, in Gura Humorului and in the lakes near Suceava. We have reason to believe that these actions are not restricted to these areas and that countless frogs are being butchered each year for the commercial meat trade. Wild caught *Emys orbicularis* have been seen by us in pet stores from the city of Suceava. Adders (*Vipera berus*) could also be the target of illegal collections for the venom market (Iftime, 2001). In Neamt and Iasi counties, significant numbers of newts are being collected and sold as pets (Gherghel & Ilie, 2006; Hutuleac-Volosciuc, personal communication); this is not to be excluded for Suceava County.
- <u>The use of pesticides and insecticides</u>: being that amphibians and reptiles, in general, are dependent on a certain habitat and are especially sensitive to any chemichal disturbance in their habitat (Iftime, 2001), this threat is a very serious one.
- <u>The deliberate dry-ups of the amphibian breeding pools</u>: this activity is especialy common in urban areas or in areas with a high urbanisation activity. In the town of Suceava, water pools inhabited by *Triturus cristatus, Triturus vulgaris, Bombina bombina, Bufo viridis* and *Hyla arborea* have been destroyed in this way.
- <u>The clearing of forests</u>: being that Suceava County is the most forested county in Romania, forest exploitations ar a common activity in the area; this activity is probably the most destructive and has the most negative effect on the herpetofauna, most of the species being linked to forested areas. The species which are most threatened by these activities are *Salamandra salamandra*, *Rana dalmatina*, *Rana temporaria*, *Anguis fragilis*, *Coronella austriaca*, *Zamenis longissimus* and *Vipera berus*.
- <u>Heavy traffic</u>: as we have observed during our surveys, countless amphibians and reptile are killed each year by cars on the local roads. The most victims belong to the anuran species, such as *Bufo bufo*, that commonly migrate during the breeding period

and often cross roads. A reptile species that was often observed dead on the roads from the area is *Anguis fragilis*.

The deliberate killing of the animals: due to various preconceptions, mithology (Fuhn, 1969, Nicoara, 2003), fear or ignorance, a large number of amphibians and reptiles are intentionally killed each year by the local people. Snakes are mostly the victims of these habits, because they are thought of as venomous and dangerous and usually killed on sight. Another important victim is, again, the slow-worm (*Anguis fragilis*) which is usually mistaken for the adder.

## 3. Important herpetofaunal areas:

During our 6 year survey in Suceava County we were able to identify several areas that are very important for the herpetological fauna. We have organized these areas into six sites. The limits of these areas and medium altitudes are showed in Table 3. The location of the sites in Suceava County can be seen in Fig. 3.

Site	Medium altitude	Northern limit	Southern limit	Western limit	Eastern limit
No.	(m a.s.l.)				
1	420	47°53'07'' N	47°41'16" N	47°45'57" N	47°46'31" N
		26°08'35" E	26°15'18" E	26°08'40" E	26°18'03" E
2	840	47°33'44" N	47°30'25" N	47°31'48" N	47°31'37" N
		25°34'17" E	24°33'05" E	25°29'15" E	25°37'26'' E
3	510	47°39'11" N	47°32'37" N	47°37'54" N	47°35'08" N
		25°51'45" E	25°59'42" E	25°50'24" E	26°03'04" E
4	285	47°32'47" N	47°27'38" N	47°31'58" N	47°27'38'' N
		26°14'13" E	26°19'25" E	26°13'35" E	26°19'25" E
5	930	47°22'36" N	47°17'14" N	47°21'58" N	47°20'22'' N
		25°17'39" E	25°11'37" E	25°06'09" E	25°26'06'' E
6	1230	47°27'41" N	47°24'29" N	47°25'40" N	47°26'40" N
		25°31'45" E	25°32'28" E	25°27'39" E	25°37'04" E

Table 3. The medium altitudes and limits of the important herpetofaunal areas.



Figure 3. Location of the Important Herpetofaunal Areas in Suceava County.

<u>Site 1</u> – The deciduous forest area from Adancata-Mitocu Dragomirnei-Patrauti-Darmanesti hosts a large number of nationaly threatened amphibians and reptiles and two glacial relicts (*Rana arvalis* and *Zootoca vivipara*). The amphibian fauna is composed of *Salamandra salamandra, Triturus vulgaris, Triturus cristatus, Bombina bombina, Bombina variegata, Bufo bufo, Bufo viridis, Hyla arborea, Rana lessonae, Rana ridibunda, Rana arvalis, Rana temporaria* and *Rana dalmatina*. Of these, *Salamandra salamandra, Bombina bombina, Rana lessonae* and *Rana arvalis* seem to be the most threatened in the area. Except for these 13 amphibian species, in the area, we have also observed the *Rana kl. esculenta hybrid* (*R. lessonae X R. ridibunda*) and *Bombina bombina X Bombina variegata*. The reptile fauna is composed of *Emys orbicularis, Anguis fragilis, Zootoca vivipara, Lacerta agilis, Natrix natrix, Coronella austriaca* and *Zamenis longissimus*. Of these, *Emys orbicularis, Zootoca vivipara, Coronella austriaca* and *Zamenis longissimus* are the most threatened, each of these species being observed on very few ocasions. The most obvious threats to the herpetofauna from this area are the clearing of forests, the heavy traffic and the deliberate killing of the animals.

<u>Site 2</u> – The forested (conniferous and mixed) areas and their surroundings from around the town of Câmpulung Moldovenesc are home to 6 species of amphibians (*Salamandra salamandra, Triturus montandoni, Triturus alpestris, Triturus cristatus, Bombina variegata* and *Rana temporaria*) and 5 species of reptiles (*Anguis fragilis, Zootoca vivipara, Lacerta agilis, Natrix natrix* and *Vipera berus*). The most threatened species in the area seem to be *Triturus cristatus* and *Natrix natrix*. The most significant human activities that negatively affect the herpetofauna are the clearing of forests and the deliberate killing of the animals. *Vipera berus*, a species that is endangered on a national level (Iftime, 2005) is represented in the area by strong and numerous populations (Strugariu *et al.*, 2006 a).

<u>Site 3</u> – The deciduous, confierous and mixed forested areas between Gura Humorului – Paltinoasa – Cacica host a relatively large number of nationally threatened and endangered species of amphibians (*Salamandra salamandra, Triturus vulgaris, Triturus cristatus, Triturus montandoni, Triturus alpestris, Bombina variegata, Bufo bufo, Bufo viridis, Hyla arborea, Rana temporaria*) and reptiles (*Emys orbicularis, Anguis fragilis, Zootoca vivipara, Lacerta agilis, Natrix natrix, Coronella austriaca, Zamenis longissimus and Vipera berus*). The most vulnerable or threatened species in the area are *Bufo bufo, Bufo viridis, Emys orbicularis, Coronella austriaca, Zamenis longissimus and Vipera berus,* the most significant human activities that affect them being the clearing of forests and the deliberate killing of the animals.

<u>Site 4</u> – The pond system from between Suceava and Fälticeni is probably the most important habitat for *Emys orbicularis* from Suceava County. Except for this species, in the area, we have identified 7 amphibian species (*Triturus vulgaris, Triturus cristatus, Bombina bombina, Bufo bufo, Bufo viridis, Rana ridibunda and Rana temporaria*), 3 species of reptiles (*Zootoca vivipara, Lacerta agilis and Natrix natrix*) and the *Rana kl. esculenta* hybrid. Near this area we have observed the endangered glacial relict *Rana arvalis,* therefore we cannot exclude the possibility that this species could exist in the region. All of the mentioned species are threatened in the area due to the extent of the agricultural fields that surround the lake system, the use of insecticides and pesticides and the illegal collecting of the animals for commercial purposes.

<u>Site 5</u> – The valleys and forrested mountain slopes from Vatra Dornei - Poiana Stampei are a refuge for the endemic species *Triturus montandoni*, which is present in the area in numerous populations. Other 5 amphibian species (*Salamandra salamandra, Triturus alpestris, Bombina variegata and Rana temporaria*) and 6 reptile species (*Emys orbicularis, Anguis fragilis, Zootoca vivipara, Lacerta agilis, Natrix natrix and Vipera berus*) are present in the area. Of these, *Emys orbicularis* and *Natrix natrix are* the most

threatened species. The human activity that has the most negative effect on the herpetofauna is forest clearing.

<u>Site 6</u> – The Rarău-Giumalău region is another refuge for *Triturus montandoni* as well as other 6 amphibian (*Salamandra salamandra, Triturus alpestris, Bombina variegata, Bufo bufo and Hyla arborea*) and 6 reptile (*Anguis fragilis, Zootoca vivipara, Lacerta agilis, Natrix natrix, Coronella austriaca* and *Vipera berus*). The most threatened species in the area seem to be *Bufo bufo, Hyla arborea, Natrix natrix and Coronella austriaca*. Again, the clearing of forests and the deliberate killing of the animals have the most negative effect on the herpetofauna in the area.

#### Conclusions

During our 6 year herpetological survey in Suceava County we have identified 16 species of amphibians (Salamandra salamandra, Triturus alpestris, Triturus cristatus, Triturus montandoni, Triturus vulgaris, Bombina bombina, Bombina variegata, Pelobates fuscus, Bufo bufo, Bufo viridis, Hyla arborea, Rana arvalis, Rana temporaria, Rana dalmatina, Rana lessonae and Rana ridibunda) and 8 species of reptiles (Emys orbicularis, Anguis fragilis, Zootoca vivipara, Lacerta agilis, Natrix natrix, Coronella austriaca, Zamenis longissimus and Vipera berus). The presence of hybrids between Bombina bombina and Bombina variegata and between Rana ridibunda and Rana lessonae (Rana kl. esculenta) has also been validated by our research in the area.

Eight of the 16 amphibian species from Suceava County are vulnerable on a national level, 5 of them are near threatened and 1 is endangered. Of the reptiles, 6 species are vulnerable and 1 is endangered on a national level. On a local level, 4 amphibian species are vulnerable, 5 are near threatened and 1 is endangered; 1 species of reptiles is near threatened, 2 are vulnerable and 3 are endangered. All of the mentioned species are protected by the national and European legislation. The most endangered species from Suceava County are *Rana arvalis, Emys orbicularis, Coronella austriaca* and *Zamenis longissimus. Vipera berus*, a species that is endangered on a national level (Iftime, 2001, 2005) is a common and wide spread species in the mountain areas from our research area, and, even if it is vulnerable due to human activities that are mentioned in this paper, a good part of the present populations are not in immediate danger.

We have established 6 important herpetofaunal areas in Suceava County, following both quality and quantity criteria. Human activities that have a negative impact on the herpetofauna have been observed in every site; these activities seem to be more common and more frequent in the Suceava Plateau (Site 1 and 4) than in the mountain areas.

In site 1 and 2, *Zootoca vivipara*, a glacial relict that was previously considered a strictly mountain species (Fuhn, 1960), is present at very low altitudes. This fact has a high scientific value especially from a biogeographical point of view (Covaciu-Marcov *et al.*, 2003, Strugariu *et al.*, 2006 a,c).

In site 1, *Bombina bombina* and the hybrids between this species and *Bombina variegata* are present at higher altitudes then anywhere else in the country.

All the sites that we identified as important herpetofaunal areas suit the demands of the "Special Areas for Conservation", therefore we propose that these areas should be taken into consideration for the establishment of protected natural areas.

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