Preliminary data concerning the distribution of amphibian fauna in Suceava county (Romania)

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Abstract. The present study focused upon an area in which the herpetofauna had previously been very poorly studied and aimed to identify the species of amphibians from the research area and to establish distribution areas. In the 54 investigated localities 16 species of amphibians (*Salamandra salamandra, Triturus vulgaris, Triturus cristatus, Triturus alpestris, Triturus montandoni, Pelobates fuscus, Bombina bombina, Bombina variegata, Hyla arborea, Bufo bufo, Bufo viridis, Rana dalmatina, Rana temporaria, Rana arvalis, Rana ridibunda & Rana lessonae*) and 2 hybrids (*Bombina bombina* X *Bombina variegata & Rana kl. esculanta)* have been identified. Of these, the *Bombina* hybrids have been identified for the first time in the studied region.

Key words: *Suceava County, herpetofauna, amphibians, geographical distribution.*

Introduction

The most recent comprehensive work regarding the distribution of Romanian herpetofauna refers only to Transylvania (Ghira et al, 2002). Complete data concerning the other areas of Romania has not been written for more than 40 years, the most comprehensive field studies being included in the "Fauna Republicii Populare Romane" volumes: "Clasa Amphibia"(Fuhn, 1960) and "Clasa Reptilia"(Fuhn & Vancea, 1961). A single book (Cogalniceanu, 2000) has been written since then that describes the indigenous amphibian species and their distribution; however, this publication only contains general distribution maps and the localities in which the species were collected are not mentioned. The knowledge gained in the last century is thought to cover only 5% of the actual distribution for the Romanian herpetofauna (Ghira et al, 2002). Acording to recent publications, many species of amphibians are threatened or vulnerable and require strict protection (Iftime, 2005) but, in order to establish conservation measures, the precise geographical distribution of the herpetofauna must me known. Taking the above stated into consideration the authors of this paper aimed to realize a synthesis of the knowledge concerning the composition and distribution of the amphibian fauna in Suceava County..

The "Fauna Republicii Romane" volumes concerning the Romanian herpetofauna were published in 1960 and 1961 and contained very scarce data in regards to the distribution of amphibians in Suceava County. Since then, very few papers that contain data regarding the herpetofauna in Suceava County have been published: Stugren & Popovici, 1961, Ionescu et al 1968, Şova & Cruce 1969, Şova, 1970, 1972, Cogălniceanu 1991, Cogălniceanu et al 2000, Ion et al, 2005, Strugariu et al 2006.

Material and Methods

The research area is situated in the North-Eastern sector of Romania (Fig. 1). The territory of the investigated area partially covers two major geographical units: the eastern Carpathians in the west and the Suceava Plateau in the east (Botnariuc 1980). Most of the hydrographical units consist of rivers and streams but lakes, ponds, swamps and important sub-terrestrial springs are also present (Botnariuc, 1980). Almost all rivers flow into the *Siret* river. The most important of these rivers are Suceava, Moldova and Bistrita (Botnariuc 1980). In some of the investigated areas, the forests have been cleared, being replaced by agricultural terrain with typical vegetation (Strugariu et al, 2006).

Figure 1. The investigated region

The field work was carried out in the years 2004 (from March to October), 2005 (from March to October) and 2006 (from February to August) and covered 54 localities. With the aim of mapping the amphibian fauna, the transects method (Cogalniceanu, 1997) was used, each locality being investigated repeatedly. The animals were either observed directly or captured by hand and subsequently released. All species mentioned in this paper have been personally identified by the authors. The hybrids were determined by 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,

Ghira & Mara 2000, Stugren 1980, Szymura 1993). For every quoted species, a list, that contains the names of the localities in which they were identified was made, the result being a final list that contains all the new localities for every identified amphibian species.

Results and Disscusions

During our research, 16 amphibian species (*Salamandra salamandra, Triturus vulgaris, Triturus cristatus, Triturus alpestris, Triturus mondandoni, Pelobates fuscus, Bombina bombina, Bombina variegata, Hyla arborea, Bufo bufo, Bufo viridis, Rana dalmatina, Rana temporaria, Rana arvalis, Rana ridibunda & Rana lessonae*) which belong to the studied region's herpetofauna and 2 hybrids (*Bombina bombina X Bombina variegata & Rana kl. esculenta*) were identified. The *Bombina* hybdrids are premiers for the investigated region. For all this species, new distribution areas have been established. The geographical distribution of each species is showed in table 1. We have identified 386 localities, of which 345 are new distribution areas for the Romanian herpetofauna, in the 54 investigated localities.

Salamandra salamandra Linnaeus 1758

The Fire-Salamander usually inhabits moist, forested biotopes situated at altitudes above 200m (Fuhn 1960, Cogalniceanu et al. 2000), although some populations from western Romania have been found at altitudes below 200m (Covaciu-Marcov et al. 2006). Prior to our study, this species has been found in only 5 localities (Fuhn 1960, Cogălniceanu 1991) in Suceava County, 1 of which coincides with our research area, and has been identified by us in 19 new localities (Table 1). We have also reconfirmed its presence in the localities in which it has previously been quoted. We have observed this species in moist regions, usually in or near coniferous or mixed forests. On a national level, this species is vulnerable due to loss of habitat (Cogalniceanu et al. 2000); this is also valid for the populations in Suceava County.

Fig. 2 Distribution of *Salamandra salamandra*

Triturus alpestris Laurentus 1768

The Alpine Newt can mostly be encountered in mountain areas, at altitudes between 500 and 2000m (Fuhn 1960). Recently, populations of *Triturus alpestris* in western Romania were discovered at below 200m ASL (Covaciu-Marcov et al. 2006). Prior to our study, this species was identified in 19 localities (Ionescu et al. 1968, Şova 1970, 1972, Cogălniceanu 1991) in Suceava County, only 4 of these coicinding with our studied region. We reconfirmed the presence of *Triturus alpestris* in 2 previously quoted localities and encountered it in 15 new localities (Table 1) for the Romanian herpetofauna. This species prefers small, shallow mountain pools (even man-made ones) and calm, shallow springs. We often encountered this species coexisting with *Triturus montandoni*. It is not obviously threatened in Suceava County.

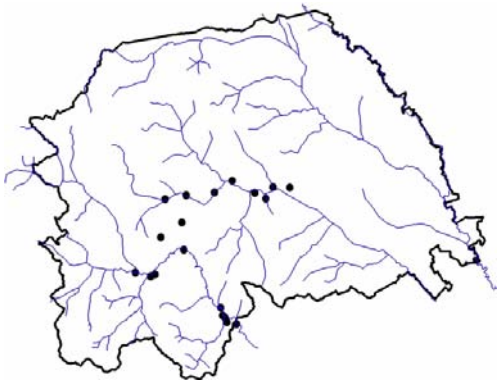

Fig. 3 Distribution of *Triturus alpestris*

Triturus cristatus Laurentus 1768

The Crested Newt was previously identified in 12 localities (Fuhn, 1960, Şova, 1972, Cogălniceanu, 1991) in Suceava County, 3 of which were also investigated by us. We reconfirmed this species' presence in 2 of the previously investigated areas and identified it in 22 new localities (Table 1). This species can frequently be found in medium sized pools that are mostly situated in deciduous or mixed forests. We have encountered many specimens that were killed by local people. Even if, on a large scale, *Triturus cristatus* is not endangered in Suceava County, we consider that immediate action must be taken to protect certain populations situated in more urban areas, especially the ones living in the town of Suceava.

Fig. 4 Distribution of *Triturus cristatus*

Table 1. The distribution of amphibian fauna in Suceava County

Species → / **Locality ↓**	Ss	Ta	Tc	Tm	Tv	Bb	Bv	BX	Pf	Bfb	Bfv	Ha	Rl	Re	Rr	Ra	Rd	Rt
Adâncata	X	-	X	-	X	X	X	-	-	X	-	X	-	X	X	-	X	X
Bosanci	-	-	-	-	-	X		-	-	-	X	X	-	-	-	-	-	X
Broşteni	-	S	S	S	-	-	S	-	-	-	-	-	-	-	-	-	-	S
Bucşoaia	X	X	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	X
Buneşti	-	-	-	-	X	X		-	-	-	X	X	-	-	X	-	-	X
Cacica	S	0	S	O	S	O	X	-	-	S	O	S	-	S	X	-	O	S
Câmpulung Moldovenesc	S	X	O	X	-	-	S	-	-	-	-	-	-	-	-	-	-	S
Chiril	-	X	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	X
Ciprian Porumbescu	X	-	X	-	-	-	X	-	-	X	-	X	-	-	-	-	-	X
Cojoci	-	X	-	X	X	-	X	-	-	-	-	X	-	-	-	-	-	-
Costâna	-	-	X	-	X	X	X	X	-	X	X	X	X	X	X	-	-	X
Cozăneşti	X	X	-	X	X	-		-	-	X	-	X	-	-	-	-	-	X
Crucea	-	S	0	X	-	-	X	-	-	-	-	-	-	-	-	-	X	X
Cumpărătură	-	-	-	-	X	X		-	-	-	X	X	-	X	X	-	-	X
Dărmăneşti	-	-	X	-	X	X	X	X	X	-	X	X	X	X	X	-	X	X
Dorna-Arini	X	X	X	X	X	-	X	-	-	X	X	X	-	-	-	-	-	X
Dragomirna	-	-	X	-	X	X		-	-	X	-	X	X	X	X	X	X	X
Fălticeni	-	-	O	O	S	X	O	-	-	X	X	X	-	X	X	X	X	S
Feteşti	X	-	X	-	X	X	X	X	-	X	-	X	-	X	X	-	X	X
Forăşti	-	-	-	-	X	X		-	-	X	X	X	-	-	X	-	-	X
Frasin	S	X	O	S	O	-	S	-	-	O	O	O	-	-	-	-	O	S
Gheorghiseni	-	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	X
Gura Humorului	S	X	O	S	O	O	S	-	-	S	S	S	O	O	X	-	O	S
Haleasa	-	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-
Ilişeşti	X	-	X	-	X	-	X	-	-	X	-	X	-	-	-	-	-	X
Lipoveni	-	-	X	-	X	X		-	-	X	-	X	X	X	X	X	X	X
Lungeni	X	-	-	X	-	-		-	-	-	-	-	-	-	-	-	-	X
Marginea	X	-	X	-	X	-		-	-	X	-	X	-	-	-	-	X	-
Mărițela Mică	-	-	X	-	X	X	X	X	X	-	X	X	X	X	X	-	-	X
Mitocaş	-	-	X	-	X	X		-	-	X	-	X	X	X	X	X	X	X
Mitocu Dragomirnei	-	-	X	-	X	X		-	-	X	-	X	X	X	X	X	X	X
Moara Mică	-	-	-	-	X	X		-	-	-	X	X	-	-	X	-	-	X
Molid	X	X	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	X
Mt. Rarău	X	S	-	S	-	-	S	-	-	O	O	O	-	-	-	-	-	S
Mt. Giumalău	X	O	-	S	-	-	X	-	-	-	-	-	-	-	-	-	-	X
Neagra	-	X	X	X	X	-	X	-	-	-	-	-	-	-	-	-	-	X
Oniceni	-	-	-	-	X	X		-	-	-	X	X	-	-	X	-	-	X
Ortoaia	-	-	X	X	X	-	X	-	-	X	-	-	-	-	-	-	-	X
Păltinoasa	X	X	-	X	-	O	S	-	-	X	S	X	-	O	X	-	-	X
Pârteştii de jos	X	-	X	-	X	-	X	-	-	X	-	X	-	X	X	-	-	X
Pârteştii de sus	-	-	X	-	X	-	X	-	-	-	-	X	-	X	X	-	-	X
Pietroasa	X	X	X	X	X	-	X	-	-	-	-	-	-	-	-	-	-	X
Pojorâta	X	X	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	X
Prisaca Dornei	X	X	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	X
Râşca	-	-	-	-	-	-		-	-	-	-	X	-	X	X	-	-	X
Satu Mare	-	-	X	X	-	-	X	-	-	-	-	-	-	-	-	-	X	X
Slatina	-	-	-	-	-	-	X	-	-	-	-	-	-	X	X	-	-	X
Suceava	-	-	X	-	X	X	X	X	O	X	X	X	X	X	X	-	X	S
Stroieşti	-	-	-	-	X	X	X	-	-	X	X	X	-	-	-	-	-	X
Şcheia	-	-	X	-	X	X	X	X	-	X	X	X	-	X	X	-	-	X
Vadu Moldovei	-	0	-	-	X	X		-	-	-	X	X	-	-	X	-	-	X
Vatra Dornei	X	S	-	S	-	-	S	-	-	-	-	-	-	-	-	-	-	S
Vâlcele	-	-	-	-	X	X	X	-	-	X	X	X	-	-	-	-	-	X
Voroneț	X	X	-	X	-	-	X	-	-	X	X	X	-	-	X	-	-	X
Σ(X)	19	15	22	19	31	21	31	6	2	21	17	32	7	17	26	5	12	42
Σ(S)	4	4	2	6	2	-	7	-	-	2	2	2	-	1	-	-	-	9
Σ(O)	-	3	5	2	4	3	1	-	1	1	3	2	1	2	-	-	3	-
Σ(L)	23	22	29	27	37	24	39	6	3	24	22	36	8	20	26	5	15	51

Ss = *Salamandra salamandra*, Ta = *Triturus alpestris*, Tc = *Triturus cristatus*, Tm = *Triturus montandoni*, Tv = *Triturus vulgaris*, Bb = *Bombina bombina*, Bv = *Bombina variegata*, BX = *Bombina bombina* X *Bombina variegata*, Pf = *Pelobates fuscus*, Bf b = *Bufo bufo*, Bf v = *Bufo viridis*, Ha = *Hyla arborea*, Rl = *Rana lessonae*, Re = *Rana kl. esculenta*, Rr = *Rana ridibunda*, Ra = *Rana arvalis*, Rd = *Rana dalmatina*, Rt = *Rana temporaria*.

X – New localities for the Romanian herpetofauna.
S – Localities in which we reconfirmed the presence of the species.
O – Localities in which we could not reconfirm the presence of the species.
Σ – The sum of localities

Triturus montandoni Boulenger 1880

Montandon`s Newt was first described in Suceava County based on samples from Broşteni (Boulenger 1880). *Triturus montandoni* was previously known in Suceava County from 18 localities (Fuhn 1960, Ionescu et al. 1968, Cogălniceanu 1991, Şova 1972), of which only 6 coincide with our study areas. We reconfirmed this species' presence in 6 previously quoted areas and identified it in 19 new localities (Table 1) for the Romanian herpetofauna. This species' habitat preferences are very similar to those of *Triturus alpestris*, with which it frequently coexists. In some localities, we found 3 or even all 4 newt species living together. This species is not severely threatened in the studied area.

Fig. 5 Distribution of *Triturus montanodni*

Triturus vulgaris Linnaeus 1758

The Smooth Newt is the most common and wide-spread *Triturus* species in Suceava County, being encountered by us in a multitude of habitats, from shallow, road side ditches to larger than average lakes and even man-made pools. The smooth newt is not threatened in Suceava County.

Fig. 6 Distribution of *Triturus vulgaris*

Bombina bombina Linnaeus 1761

The Fire-Bellied Toad is a typical plain species, that can be found, in Romania, up to an altitude of 400m (Fuhn 1960, Cogalniceanu 2000). We identified this species in Suceava County, in 21 new localities for the Romanian herpetofauna (Table 1). Bombina bombina is generely present at altitudes of 300m in Suceava County, but also climbs to 400m ASL. Thus, in the studied region the fire bellied toad is at its superior altitude limit in Romania, climbing higher than in western Romania where it only reaches an altitude of about 200m (Covaciu-Marcov et al 2000, 2002, 2004, 2006) and where its actualy absent in regions situated at 200m ASL that are sorounded by higher regions (Covaciu Marcov et al. 2003a) We have found the Fire-Bellied Toad in a variety of habitats: irrigation canals, small ponds and larger lakes. This species is relatively common in the investigated region but, compared to the other anuran species, it is vulnerable.

Fig. 7 Distribution of *Bombina bombina*

Bombina variegata Linnaeus 1758

The Yellow-Bellied Toad was previously mentioned for 11 localities in Suceava County (Fuhn, 1960, Ionescu et al, 1968, Şova & Cruce,1969, Cogălniceanu, 1991), 8 of which coincide with our research area. We reconfirmed its presence in 7 of the previously quoted areas and also identified it in 31 new localities (Table 1). The species is very common in the studied areas and can be encountered in or near almost any type of water pool. It is not threatened in Suceava County.

Fig. 8 Distribution of *Bombina variegata*

Bombina bombina X *Bombina variegata*

In 6 of the investigated localities (Feteşti, Adâncata, Suceava, Şcheia, Costâna and Dărmăneşti)

we identified specimens with intermediate characteristics between *Bombina bombina* and *Bombina variegata*. In western Romania hybrid *Bombina* populations are usualy situated at around 150m ASL (Covaciu-Marcov et al, 2000, 2002, 2003, b, c, 2004, 2005 a, b, 2006, Sas et al 2005) and just above 300m ASL (Ghira et al, 2002) but the hybrids in Suceava County were observed at altitudes of around 400m in the Suceava Plateau, these being some of the highest known hybridization zones in Romania. Still, the collected data on this subject is very scarce, therefore we plan to further investigate it. The presence of *Bombina* hybrids is also a premier for Suceava County.

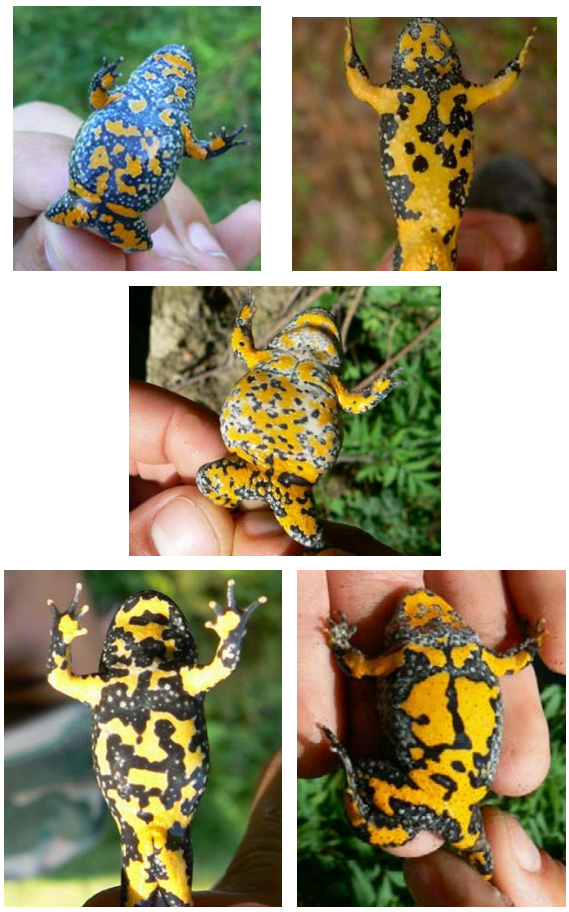

Fig. 9 Samples of *Bombina* sp. from the same habitat near Suceava (first line: left – *B. bombina*, right – *B.variegata* second and third line: hybrids)

Fig. 10 Distribution of *Bombina* hybrids

Pelobates fuscus Laurentus 1768

The Common Spade-Foot Toad was previously found in 3 localities in Suceava County (Fuhn, 1960). Probably due to its elusive life style we were unable to reconfirm its presence there. We only found *Pelobates fuscus* in 2 new localities (Table 1). The spade-foot toad's situation is yet unclear, therefore further investigations are imperative.

Fig. 11 Distribution of *Pelobates fuscus*

Bufo viridis Laurentus 1768

The green toad was previously found in 5 localities in Suceava County. We have managed to reconfirm its presence in 2 of them and also identified it in 17 new localities for the Romanian herpetofauna (Table 1). Most individuals were found in urban and rural areas. This species is not threatened in the research area.

Fig. 12 Distribution of *Bufo viridis*

Bufo bufo Linnaeus 1758

The Common Toad was found, prior to our research, in 4 localities in Suceava County (Fuhn, 1960, Ionescu et al, 1968, Stugren & Popovici, 1961). We encountered this species in 23 new localities (Table 1). Most individuals were found in April and May, during the reproductive period in forested areas (deciduous forests). In some localities we could find hundreds or even thousands of individuals in a single day. Several specimens were found dead on communal roads. The common toad does not seem to be threatened in the research area.

Fig. 13 Distribution of *Bufo bufo*

Hyla arborea Linnaeus 1758

The Tree-Frog is the only arboreal frog species in Romania (Fuhn, 1960) and is very common in many of the investigated localities (Table 1). Most individuals were encountered in or near forested areas. Fortunately, this species is not threatened in Suceava County.

Fig. 14 Distribution of *Hyla arborea*

Rana lessonae Camerano 1878

The Pool Frog has previously been found in Romania in very few localities (Cogalniceanu et al, 2000). We identified this species in 7 new localities (Table 1).

Fig. 15 *Rana lessonae* from Dragomirna

We found this species living either by its self, or coexisting with *Rana kl. esculenta* or *Rana ridibunda* or both, forming the R-E-L system (Tunner & Heppich-Tunner 1991), which is also present in western Romania (Covaciu-Marcov et al 2004, 2006). In the research area, this species was found in small ponds, slow shallow rivers and even in temporary puddles, road-side ditches and irrigation canals. Taking the fact that very few data have been collected on this species in Suceava County we cannot make any statements regarding its status, further investigations being necessary.

Fig. 16. Habitat with Rana lessonae and Rana arvalis, near Dragomirna

Fig. 17 Distribution of *Rana lessonae*

Rana kl. *esculenta* Linnaeus 1758

The Edible Frog has a hybrid origin from *Rana lessonae* and *Rana ridibunda* **(**Cogălniceanu 2000). It was previously found in a single locality (Berger 1973)

in Suceava County but we were unable to reconfirm its presence in it. We identified it in 18 new localities. We found *Rana esculenta* in small to medium sized ponds, coexisting, mostly with *Rana ridibunda*. We class *Rana esculenta* as vulnerable in the research area.

Fig. 18 *Rana* kl. *Eculenta* from Adancata

Fig. 19 Distribution of *Rana* kl. *esculenta*

Rana ridibunda Pallas 1771

We identified this species in 26 new localities for the Romanian herpetofauna. We encountered this species in small to large sized ponds and lakes and even in slow or shallow rivers. It is not threatened in Suceava County.

Fig. 20 Distribution of *Rana ridibunda*

Rana temporaria Linnaeus 1758

The Common Frog stays true to its name throughout the investigated region, being the most common species of amphibian in Suceava County. Prior to our investigation, this species has been found in 17 localities (Fuhn 1960, Stugren & Popovici 1961, Ionescu et al. 1968, Şova 1970, 1972, Cogălniceanu 1991)**,** of which 9 coincide with our study area. We reconfirmed this species' presence in these 9 localities and also identified it in 41 new localities (Table 1) for the Romanian herpetofauna. We encountered the common frog in almost every investigated forest and even in open fields situated near ponds, streams or lakes. The only noticeable human threat to this species is the overwhelming butchering that takes place every spring, in some localities, with the aim of collecting frog meat for the commercial trade.

Fig. 21 Distribution of *Rana temporaria*

Rana arvalis Nillson 1842

We identified this species in 5 localities from Suceava County (Table 1). In the studied region, the moor frogs were observed in marshlands and small swamps situated in open areas near a permanent source of water. The moor frog seems to be abundant within its range but, because of its limited distribution in Suceava County, we class them as threatened.

Fig. 22 Distribution of *Rana arvalis*

Rana dalmatina Bonaparte 1840

The Agile Frog is a fairly common species in Romania, being mostly terrestrial (Fuhn, 1960). We

identified this species in 12 new localities (Table 1) for the Romanian herpetofauna. *Rana dalmatina* was mostly observed in or near warm deciduous forests situated at lower altitudes and is not threatened in Suceava County.

Fig. 23 Distribution of *Rana dalmatina*

Conclusions

During our research in Suceava County, we have identified 16 species of amphibians (*Salamandra salamandra, Triturus vulgaris, Triturus cristatus, Triturus alpestris, Triturus montandoni, Pelobates fuscus, Bombina bombina, Bombina variegata, Hyla arborea, Bufo bufo, Bufo viridis, Rana dalmatina, Rana temporaria, Rana arvalis, Rana ridibunda & Rana lessonae***)** and 2 hybrids (*Bombina bombina X Bombina variegata & Rana kl. esculenta*). Of these, the *Bombina* hybrid populations are premiers for Suceava County.

Of the 386 quoted localities, 345 are new localities for the distribution of Romanian herpetofauna.

Rana temporaria, a species that is generaly linked, in Romania, to mountain regions, is very wide spread in Suceava County, being observed by us even along the main rivers in the region. This fact, along with the presence of some Rana arvalis populations, a glacial relict in Romania, is explained by the colder and moister climate of Sucaeva County, compared to other parts of the country

Bombina bombina the hybrids between this species and *Bombina variegata* are present at higher altitudes than in the rest of the country, in both cases being at their superior altitude limits.

Suceava County is home to all 3 romanian species of the „*Rana esculenta* complex". It is very important to identify more populations of Rana lessonae in the same territrory due to the fact that only a few dispersed licalities are knowed for its distribution in several counties in Romanian Moldavia.

In the town of Suceava, the populations of *Triturus cristatus* are threatened due to the destruction of their habitat. We have reports about people filling or drying their reproductive pools. We consider that immediate action must be taken to protect this species in the area.

We have reason to believe that massive numbers of *Rana temporaria* are being slaughtered every year in Gura Humorului and other localities in the County for the illegal meat trade.

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