

THE HERPETOFAUNA OF THE NATURAL RESERVATION FROM THE INFERIOR COURSE OF THE TUR RIVER AND ITS SURROUNDING AREAS

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Abstract. In the studied area we encountered 14 species of amphibians (*Salamandra salamandra*, *Triturus vulgaris*, *Triturus cristatus*, *Triturus dobrogicus*, *Bombina bombina*, *Bombina variegata*, *Pelobates fuscus*, *Hyla arborea*, *Bufo bufo*, *Bufo viridis*, *Rana ridibunda*, *Rana lessonae*, *Rana dalmatina*, *Rana arvalis*) and 9 species of reptiles (*Emys orbicularis*, *Lacerta agilis*, *Lacerta viridis*, *Zootoca vivipara*, *Anguis fragilis*, *Natrix natrix*, *Coronella austriaca*, *Elaphe longissima* and *Vipera berus*). Hybrids between *Triturus cristatus* and *Triturus dobrogicus*, *Bombina bombina* and *Bombina variegata* and *Rana kl. esculenta* are also present in this region. The herpetofauna of this reservation from the inferior course of the Tur River stands out through the glacier relicts that live here, in the woody swamps from the plains (*R. arvalis*, *Z. vivipara* and *V. berus*). Population of *Salamandra salamandra* and *Bombina variegata* can be found here at altitudes of no more than 140 m. In this reservation, all the three forms of the *Rana* green complex that live in Romania are present. The most important sectors of the reservation, from what the herpetofauna is concerned, are the afforested areas. These shelter most of the species and the biggest population of the protected species. The results of our study show the necessity to include into the reservation the forests from Livada.

Rezumat. Herpetofauna Rezervației Naturale „Râul Tur” și a împrejurimilor. În zona studiată am întâlnit 14 specii de Amfibieni (*Salamandra salamandra*, *Triturus vulgaris*, *Triturus cristatus*, *Triturus dobrogicus*, *Bombina bombina*, *Bombina variegata*, *Pelobates fuscus*, *Hyla arborea*, *Bufo bufo*, *Bufo viridis*, *Rana ridibunda*, *Rana lessonae*, *Rana dalmatina*, *Rana arvalis*) și 9 de reptile (*Emys orbicularis*, *Lacerta agilis*, *Lacerta viridis*, *Zootoca vivipara*, *Anguis fragilis*, *Natrix natrix*, *Coronella austriaca*, *Elaphe longissima* și *Vipera berus*). În zonă sunt prezenți hibridi între *T. cristatus* și *T. dobrogicus*, *B. bombina* și *B. variegata*, precum și *Rana kl. esculenta*. Herpetofauna rezervației Turului inferior se individualizează prin relictele glaciale prezente în mlaștinile forestiere de la câmpie (*R. arvalis*, *Z. vivipara* și *V. berus*). În zonă există populații de *Salamandra salamandra* și *Bombina variegata* prezente la 140 de m altitudine. În rezervație sunt prezente toate cele trei forme ale complexului broaștelor verzi din România. Cele mai importante regiuni ale rezervației din punct de vedere herpetofaunistic sunt zonele împădurite. Acestea adăpostesc cele mai multe specii și cele mai mari populații ale speciilor ocrotite. Rezultatele noastre subliniază necesitatea includerii în rezervație a pădurilor de la Livada.

Introduction

The herpetofauna of the Tur River hydrographic basin, just like the one from the entire Satu-Mare County, was little investigated. In the most recent monograph about the amphibians from Romania (Cogălniceanu et al 2000) a very common species in our country – *Bufo bufo* – wasn't documented in any locality here. No study was dedicated only to the herpetofauna of the Tur River's inferior course, although there are some information regarding the entire county or some other regions from it, found in a few works (Fuhn 1960, Fuhn & Vancea 1961, Ardelean 1998, Ardelean & Karacsonyi 2002, Ghira et al 2002, Covaciu-Marcov et al 2005, Iftime 2005). The most recent data about some sectors of the investigated area (the Livada region) can be found in an article about the herpetofauna of the Oas region (Covaciu-Marcov et al 2004). Hence, we set of to analyze the herpetofauna of the Tur River's inferior course and its surrounding areas.

The objectives of our study were: **1.** to establish the composition and the geographic distribution of the herpetofauna, **2.** to ascertain the numbers of samples in the identified population, **3.** to establish which of the species are rare, which vulnerable and important to this region, **4.** to determine which are the most important areas for the herpetofauna from the investigated region and **5.** to evaluate the damage done by human activities and to determine the main threats for the herpetofauna of the reservation.

Material and Methods

The study took place in 2005 and 2006, but some observations were made previously, between 2001 and 2003.

In order to establish the composition and the geographic distribution of the herpetofauna we used the transects method (Cogălniceanu 1997), making numerous surveys. 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 and measurements indicated in the specialty literature (Berger 1966, 1973, Cogălniceanu et al 2000, Csata 1998, Fuhn 1960, Stugren 1980, Szymura 1993).

THE FLORA AND FAUNA OF THE TUR RIVER NATURAL RESERVE

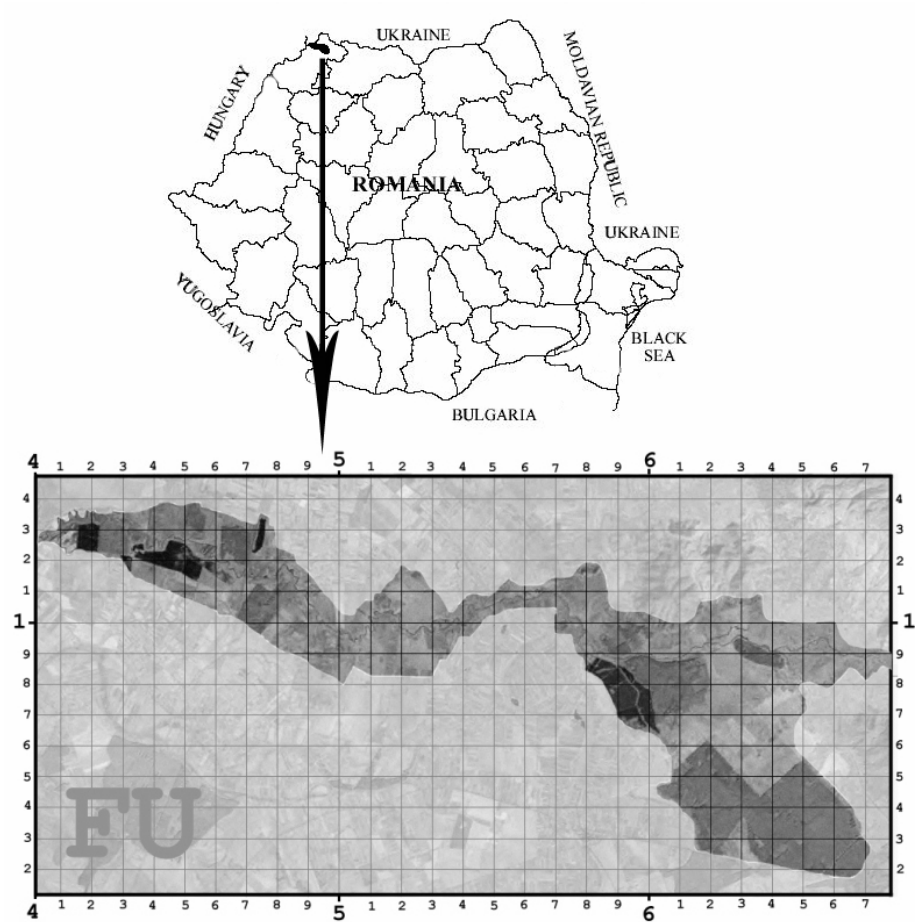


Figure 1. The studied Area in Satu-Mare county (Romania)
(Satellite image scale to UTM scale 10x10 and 1x1 km)

Determining the effectives of the populations was made using the quantitative transects through various types of habitats. Thus we counted the specimens from transects of different lengths and different time intervals, in the most proper period for encountering the species. Then we extrapolated these results for the entire territory occupied by that biotope, regarding the whole reservation. In the case of amphibians, in their breeding period, we also counted the spawn they laid, while in the case of the newts, the estimation of the effectives was realized in their aquatic period.

Results

In the natural reservation from the inferior course of the Tur River and its surrounding area we managed to find 23 species and 3 hybrids belonging to the herpetofauna (Table 1). In the appendix 1 we are presented some maps for the most important species or the species that have local distributions. The other species distribution includes the whole area of the Nature Reserve.

Table 1. The estimated number of different amphibian and reptile species in the studied area, and their Nature2000 Mark.

Species	Estimated population sizes	Nature 2000 Mark
Amphibians		
<i>Salamandra salamandra</i>	50 - 80	D
<i>Triturus vulgaris</i>	5000 - 7000	B / C
<i>Triturus cristatus</i>	2000 - 4000	C
<i>Triturus dobrogicus</i>	500 - 1000	B / C
<i>T. cristatus</i> X <i>T. dobrogicus</i>	200 - 300	B
<i>Bombina bombina</i>	18000 - 20000	A
<i>Bombina variegata</i>	300 - 500	D
<i>B. bombina</i> X <i>B. variegata</i>	400 - 800	A
<i>Pelobates fuscus</i>	2000 - 4000	B / C
<i>Hyla arborea</i>	3000 - 5000	A / B
<i>Bufo bufo</i>	3000 - 5000	B / C
<i>Bufo viridis</i>	2000 - 4000	C
<i>Rana ridibunda</i>	17000 - 20000	D
<i>Rana lessonae</i>	500 - 1000	A
<i>Rana Kl. esculenta</i>	10000 - 13000	A / B
<i>Rana dalmatina</i>	5000 - 9000	A / B
<i>Rana arvalis</i>	2000 - 3000	A
Reptiles		
<i>Emys orbicularis</i>	500 - 800	A
<i>Lacerta agilis</i>	7000 - 10000	B
<i>Lacerta viridis</i>	70 - 150	D
<i>Zootoca vivipara</i>	4000 - 7000	A
<i>Anguis fragilis</i>	50 - 100	C / D
<i>Coronella austriaca</i>	70 - 130	C / D
<i>Elaphe longissima</i>	30 - 60	C / D
<i>Natrix natrix</i>	5000 - 8000	A / B
<i>Vipera berus</i>	200 - 400	C

The biggest populations are those of the common species from Romania, mostly characteristic to the plain areas (*Bombina bombina*, *Rana ridibunda* and *Lacerta agilis*).

These are encountered throughout all the investigated territory. The smallest effectives belong to the species from the hills and mountains and those attached to the forests, which find very few favorable habitats in this region. The mountains species are to be found here at their lowest altitude limit. Thus, *Salamandra salamandra*, *Bombina variegata* and *Lacerta viridis* are represented by a small number of specimens. However, these populations are in direct connection with the ones from the Oas Mountains, where this species are well represented (Covaciu-Marcov et al 2004). The species from the afforested areas – *Anguis fragilis*, *Elaphe longissima* – are present with extremely few individuals mostly because of the small surfaces occupied by the woods and the fact that nowadays these are actually only islands of small forests, isolated from one-another. The only large forest, also connected with the ones in the Oas Mountains, is the one from Livada, which is not yet included in the reservation.

Discussions

The herpetofauna of the investigated region presents some particularities that individualize it among other regions of Romania, underlining the importance to protect it. Thus, the herpetofauna of this region is characterized by glacier relicts, which most of the times occupy what it was thought to be uncommon plain habitats. Also in this territory, numerous mountainous or hilly elements from Romania are to be found at very low altitudes. Another important aspect is the fact that rare species from our country live here, among which the species least documented in Romania (*Rana lessonae*) together with the other forms from the green frog complex. A short segment of the hybridizing area between *Bombina bombina* and *Bombina variegata* overlaps the northern limit of the reservation, as well.

The glacier relicts are represented by: *Rana arvalis*, *Zootoca vivipara* and *Vipera berus*. They appear together, in the same biotopes represented by the forest swamps from the plain sectors of the reservation. This particular complex was previously documented for the first time in the plain sectors of Romania in the Oas region (Covaciu-Marcov et al 2004). If *Rana arvalis* is mostly linked with the plain areas in Romania (Fuhn 1960), the other two species were considered mountain species for a very long time, *Zootoca vivipara* being popularly called “the mountain lizard” (Fuhn & Vancea 1961). It is only recently that these other two species were identified in the plain region from the northern part of the country, both in the Western Plain and the Moldova Plain (Ghira et al 2002, Covaciu-Marcov et al 2002, 2003, 2004, 2005, Strugariu et al 2006). In this context, identifying these species in the inferior course of the Tur River reservation expands the knowledge referring to their plain areal, while at the same time, permitting the protection of these rare plain relict populations inside the reservation.

Besides the forest swamps, *Zootoca vivipara* is present in other areas of the reservation, too, populating places like clear marshes or even vegetation girdles that surround the

channels and ditches. Isolated individuals were found in the wet areas from between the dykes of the Tur River. However, the natural habitat of the lizard is the forest marsh. All the other biotopes are secondary, as consequence of the human activities, practically replacing the natural one. *Zootoca vivipara* can survive in these secondary habitats as well, unlike the other two relict species (*Rana arvalis* and *Vipera berus*). Therefore it is imperative to protect the populations of these two species, alongside those of *Zootoca vivipara*, as they are a model in many evolutionary and biogeographical problems (Stugren-Groba et al 2001).

The studied region shelters large populations of *Rana arvalis*, species found in Romania at the southern limit of its areal (Cogalniceanu et al 2000). It is present only in the northern sector of the Western Plain. These populations from the Ier River Basin are very small and isolated from one-another (Sas et al 2006). Our results indicate that in the inferior course of the Tur River reservation live some of the biggest population of this species from Romania, population that therefore need special protection.

Due to the colder and more humid climate of the region (Stoenescu et al 1966), situated near the Oas Depression, some of the species come down at very low altitude. This is the case of *Salamandra salamandra*, which can be found at 140 m. This is so far the lowest altitude for this species in Romania, the previous altitude limit being 200m (Cogalniceanu et al 2000). Salamander larvae were found in the small streams that replenish the slopes that limit the reservation to the north, between the localities of Turulung Vii and Gherta Mica. Populations of *Bombina variegata* live in this same sector and also come down to 140m or even 130m. This is the lowest point in which this species was signaled in the western part of Romania. Prior, it used to be 140m, found at Felix Spa, in Bihor County (Covaciu-Marcov 1999). It is to be found mainly in the streams from the same slopes mentioned above, but in spring it also populates temporary ponds from the plains near the Tur River or even from between the dykes, in the Turulung Vii and Calinesti Oas sector.

In the investigated region, we also found a short sector of the hybridizing zone between *Bombina bombina* and *Bombina variegata*, situated between the localities of Turulung Vii, Gherta Mica and Calinesti Oas, at altitudes of 120 to 150m. Thus, the hybridizing zone is situated at similar altitudes as the ones from near the Apuseni Mountains (Covaciu-Marcov et al 2002, 2006). However, the particularity of this place here is that *Bombina variegata* comes down to very low altitudes, even lower than the ones from the Western Hills. An explanation to this could be the absence of the hills from near the Oas Mountains and, as a result, the specific habitats for the species reaching the borderline with the plain.

In the Tur River's inferior course reservation all three forms from the green frog complex from Romania are to be found. Thus, we identified both *Rana ridibunda* and *Rana lessonae*, and the hybrid between them – *Rana esculenta*. The best represented species of these three, both from the number of individuals and the occupied surface's point of view is *Rana ridibunda*. It populated basically any relatively permanent still

water from the studied area. It occurs in the forest marshes, together with the other two forms, as well as in the channels and ponds from the plain. Numerous specimens are present in the remaining wet areas from between the dykes of the Tur River. In these kinds of habitats it's usually the only form from the green frog complex. *Rana lessonae* is much rarer, identified exclusively in the afforested areas or their vicinities. It inhabits the wet areas, being found in the great marshes from within the forests as well as in the channels and ditches from the skirts of these forests, places where it generally mates. These habitats, very much alike those used by *Rana arvalis*, are similar to those in which the species was previously documented in the western part of Romania (Covaciu-Marcov et al 2004, 2006) and other places, too (Rybacki & Berger). The populations from the Tur River Basin are probably in contact with the ones from Ukraine (Gunther et al 1997). As far as we know, this is the only area in our country where the species occupies a unitary territory, because the prior indications were only about isolated populations or individuals (Cogalniceanu & Tesio 1997). *Rana esculenta* is better represented than the previous species, both when it comes to numbers as well as occupied surface.

The green frogs can appear in different combinations, more than one system being described (Tunner & Heppich-Tunner 1991). Many of these systems are present in the inferior course of the Tur River reservation. In the afforested swampy areas, the E-L system is most likely found, the R-E-L one appearing only occasionally. In the clear marshes, channels and ditches, the most often occurrence is that of the R-E system. In the puddles from between the dykes of the Tur River, *Rana ridibunda* is usually the sole inhabitant. We never identified independent populations of *Rana lessonae* or *Rana esculenta*. When the R-E-L system is encountered, the most numerous species is *Rana esculenta*, while the rarest is *Rana ridibunda*, although in the entire reservation it has the widest spreading.

The Danube Crested Newt, *Triturus dobrogicus*, is found in the Tur River Hydrographic Basin at the northern borderline of its areal (Arntzen et al 1997). It is present only in the sectors with an altitude lower than 120m, on flat relief. At higher altitudes, towards the hills that limit the region to the north and east, it is replaced by *Triturus cristatus*. Between the areal of the two species there is a band where specimens with intermediate characters appear, alongside individuals that belong to one of the two species.

The herpetofauna of the studied region isn't evenly distributed throughout all of the territory. Most of the species are bonded to the five main isles of woods from the reservation and three forest areas from near it. Thus, *Hyla arborea*, *Rana arvalis*, *Rana lessonae*, *Anguis fragilis*, *Cornella austriaca*, *Elaphe longissima* and *Vipera berus* were identified exclusively in the afforested areas. These are now isolated from each other, surrounded by agricultural fields, and therefore must benefit from strict protection. The rest of the studied territory, represented by agricultural fields and pastures, doesn't have the same importance for the herpetofauna, sheltering only a small number of widely distributed species (*Rana ridibunda*, *Lacerta agilis*). Hence, alongside

the special protection that these woods must receive, it is also imperative to include in the reservation the forests from Livada. This last one offers refuge for a very rich herpetofauna, being also very vast and in direct contact with the afforested areas from the Oas Mountains.

The human activities upon the herpetofauna of the reservation of the inferior course of the Tur River and its surrounding areas don't seem to be too strong nowadays. However, the overall aspect of the region is the result of radical activities, mostly represented by forest clearings and dyke building. The forest clearings have the most negative influence over the herpetofauna, activities that still take place in the Livada area. Another negative effect over the reptiles is represented by isolated human actions, manifested mostly by snake killing.

References

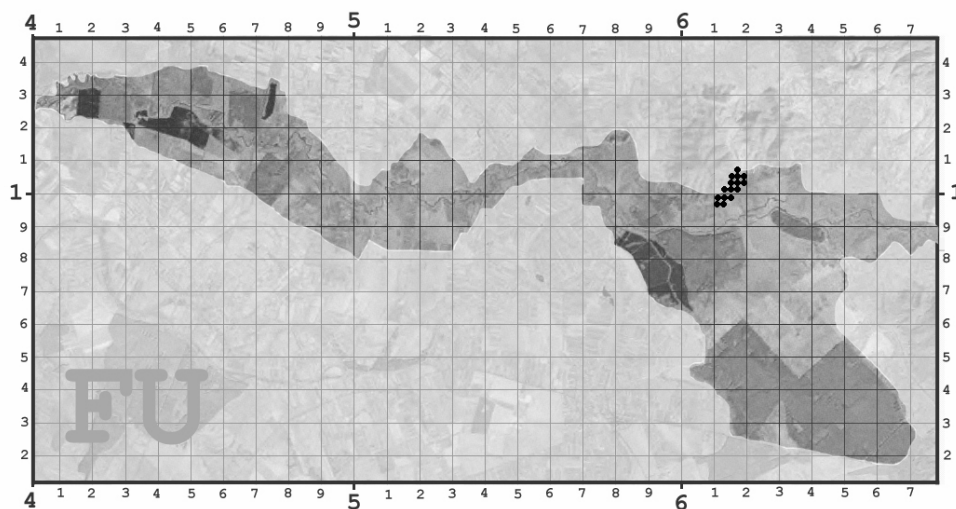
- Ardelean G., 1998. Fauna județului Satu – Mare, Țara Oașului, Culmea Codrului și Câmpia Someșului. Arad – “Vasile Goldiș” University Press, 1 – 515.
- Ardelean G., Karácsonyi C., 2002. Flora și Fauna Văii Ierului (înainte și după asanare). Ed. Bion, Satu – Mare, 1 – 675.
- Arntzen J. W., Butger R. J. F., Cogălniceanu D., Wallis G. P., 1997. The distribution and conservation status of the Danube crested newt, *Triturus dobrogicus*. Amphibia – Reptilia, 18, 133 – 142.
- Berger L., 1966. Biometrical studies on the population of water frog from the environs of Poznan. Ann. Zool. 23, 303 – 324.
- Berger L., 1973. Systematics and hybridization in European green frogs of *Rana esculenta* Complex. J. Herpetol. 7, 1 – 10.
- Cogălniceanu, D. 1997. Practicum de ecologie a *Amfibienilor* – metode și tehnici în studiul ecologiei *Amfibienilor*. Ed. Universității din București, 1 – 122.
- Cogălniceanu, D., Tesio C., 1993. On the presence of *Rana lessonae* in Roumania. Amphibia – Reptilia 14, 90 – 93.
- Cogălniceanu D., Aioanei F., Bogdan M. 2000. Amfibienii din România, Determinator. Ed. Ars Docendi, București, 1 – 99.
- Covaciu - Marcov S. D., 1999. Contribuții la studiul herpetofaunei pădurii Dealului Șomleu. Analele Universității din Oradea, Fasc. Biologie, Tom VI, 175 – 191
- 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, 2002, 47 – 58.
- Covaciu - Marcov S. D., Sas I., Cicort - Lucaciu A. Șt., Kovacs E. H., 2003. Notes upon the herpetofauna of the northern area of the Botoșani county (Romania). Univ. din Bacău, Studii și Cercetări Științifice, Biologie, 8, 201 - 205.

- 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., Ile R. D., 2005. 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. The herpetofauna from the Teuz River hydrographic basin (Arad County, Romania). North-Western Journal of Zoology, Vol 2, No.1, 27 – 38.
- Csata Z., 1998. Studiu serologic și morfologic asupra formelor aparținând complexului *Rana esculenta*. Acta, Muzeul Secuiesc, Sfântu Gheorghe, 111 – 140.
- 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.
- 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.
- Gunther R., 1997. *Rana lessonae* Camerano 1882. In: Gasc J. P., (ed.). Atlas of Amphibians and Reptiles in Europe, pp. 148 – 149. Museum National D’Histoire Naturelle, Paris.
- Ifțime Al., 2005. Amfibieni și Reptile. În: Cartea Roșie a Vertebratelor din România, editori: Botnariuc & Tatole. Ed. Acad. Române, 1 – 325.
- Rybacki M., Berger L., 1994. Distribution and Ecology of water frogs in Poland. Zoologica Poloniae, 39, 3 – 4, 293 – 303.
- Sas I., Covaciu - Marcov S.D., Kovacs E.H., Radu N.R., Toth A., Popa A., 2006. The populations of *Rana arvalis* Nills. 1842 from the Ier Valley (The Western Plain, Romania): present and future. North-Western Journal of Zoology, Vol 2, No.1, 1 – 16.
- Stoenescu Ș. M., Șchiop A., Dica I., Popescu E., Patrichi E., Țepeș E., 1966. Atlasul climatologic al R. S. R., București
- Strugariu Al., Săhlean T.C., Volosciuc-Hutuleac M.V., Pușcașu Cr.M., 2006. Preliminary data regarding the distribution of reptilian fauna in Suceava County (Romania). North-Western Journal of Zoology, Vol 2, No.1, 39 – 43.
- 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.
- Surget - Groba Y., Huelin B., Guillaume C. - P., Thorpe R. S., Kupriyanova L., Vogrin N., Maslak R., Mazzotti S., Venczel M., Ghira I., Odierna G., Leontyeva O., Monney J. C., Smith N., 2001. Intraspecific Phylogeography of *Lacerta vivipara* and the Evolution of Viviparity. Molecular Phylogenetics and Evolution. Vol. 18, No. 3, 449 – 459.

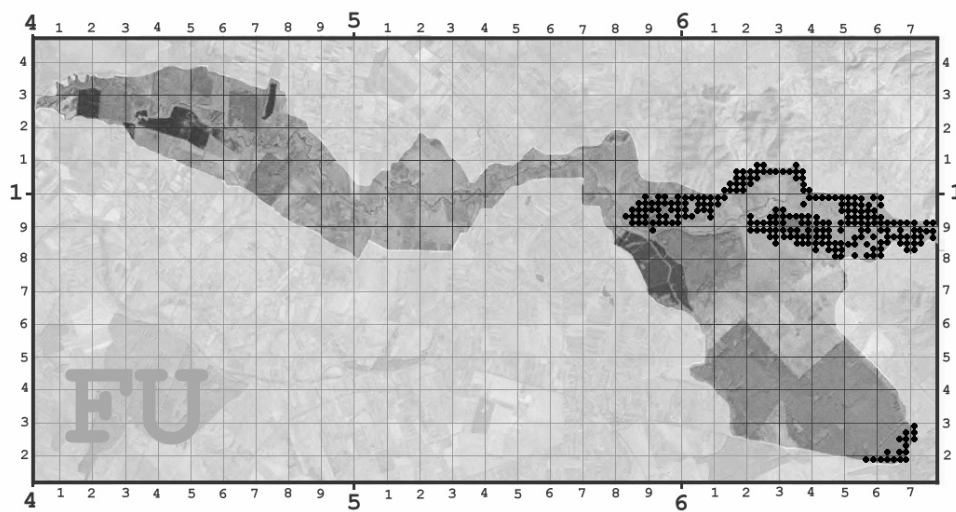
FLORA ȘI FAUNA REZERVAȚIEI NATURALE „RÂUL TUR”

- 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.
- Tunner H. G., Heppich – Tunner S., 1991. A new population system of the water frogs discovered in Hungary. In Koros Z., Kiss I. (ed), Proc. Sixth. Ord. Gen. Met. S. H. E., 453 – 460, Budapest.

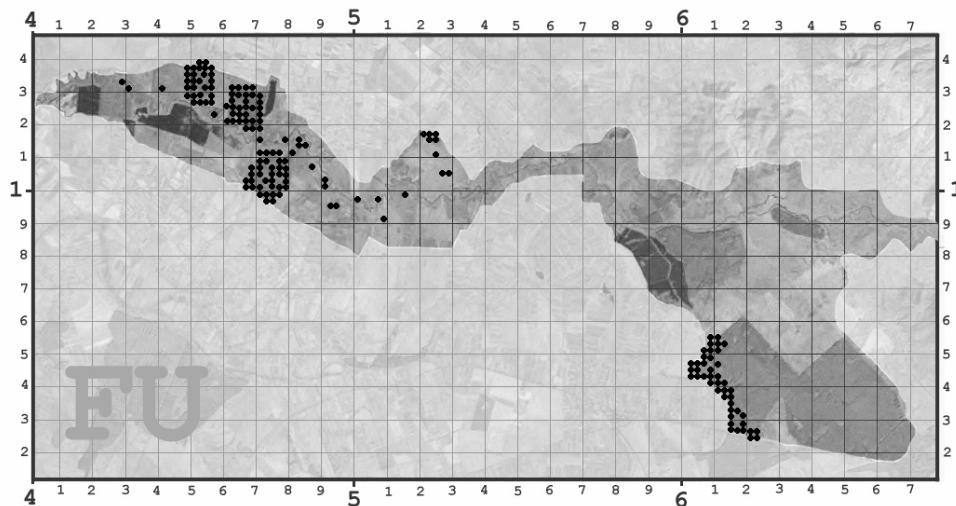
Appendix 1. Distribution maps for the most important species in the studied area
(the black spots represent 200 x 200 m)



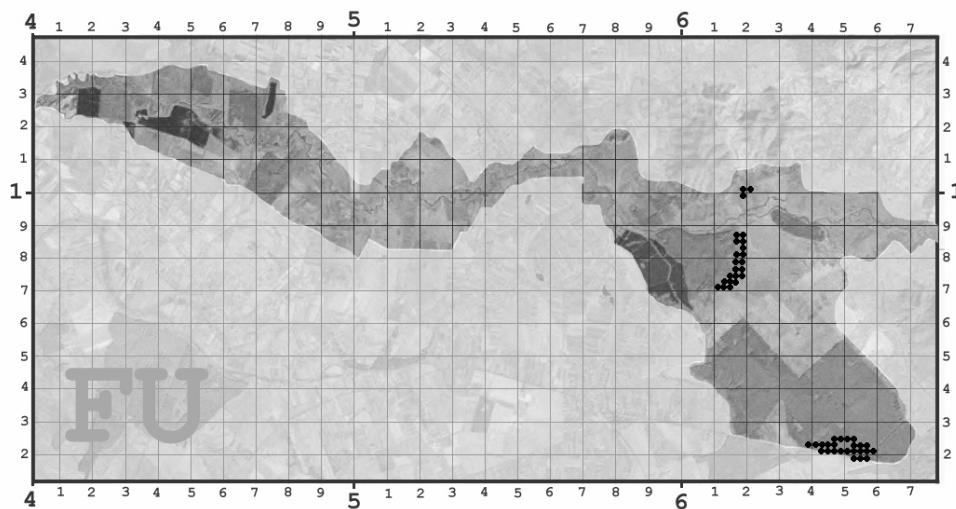
The distribution of *Salamandra salamandra*



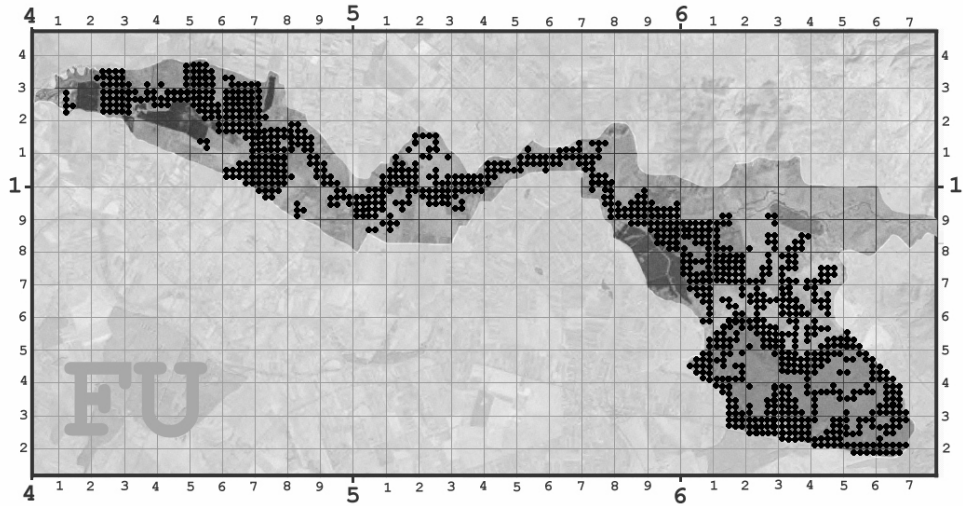
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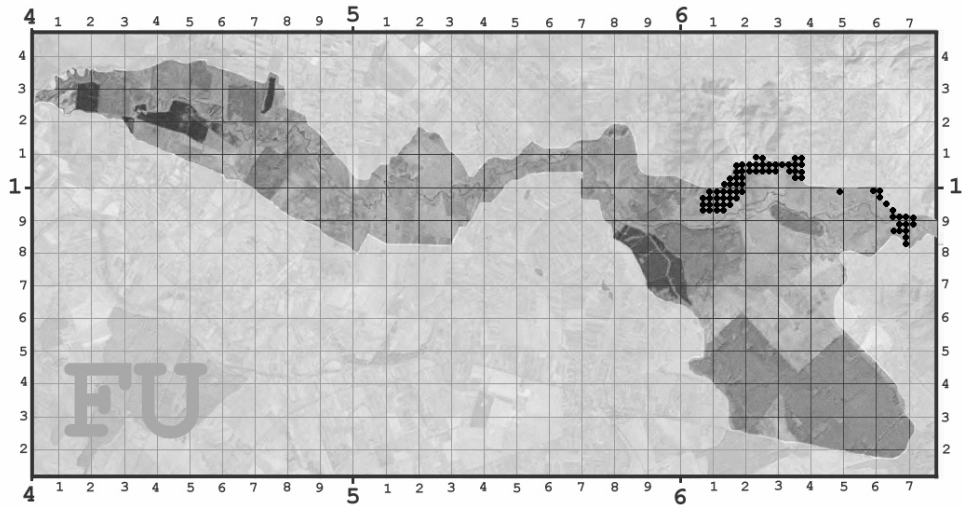
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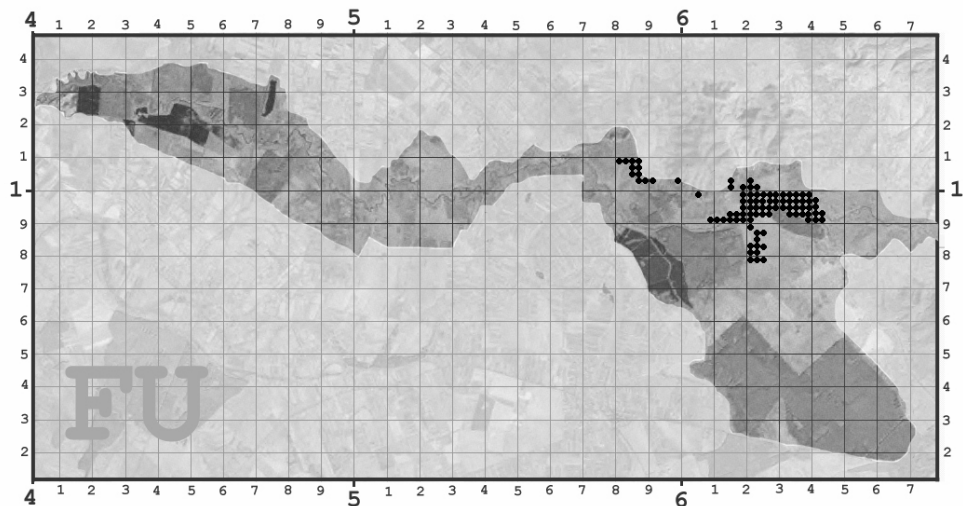
The distribution of the hybrids between *Triturus dobrogicus* and *Tr. cristatus*



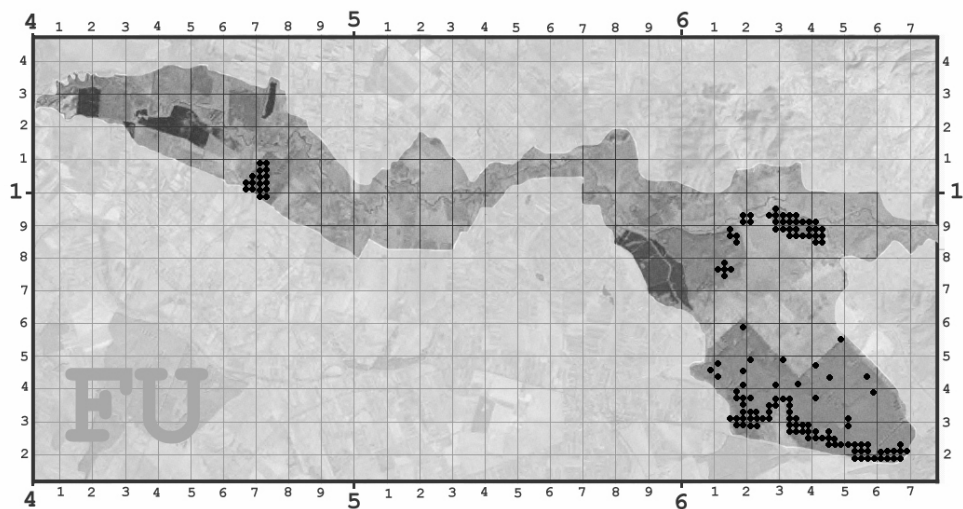
The distribution of *Bombina bombina*



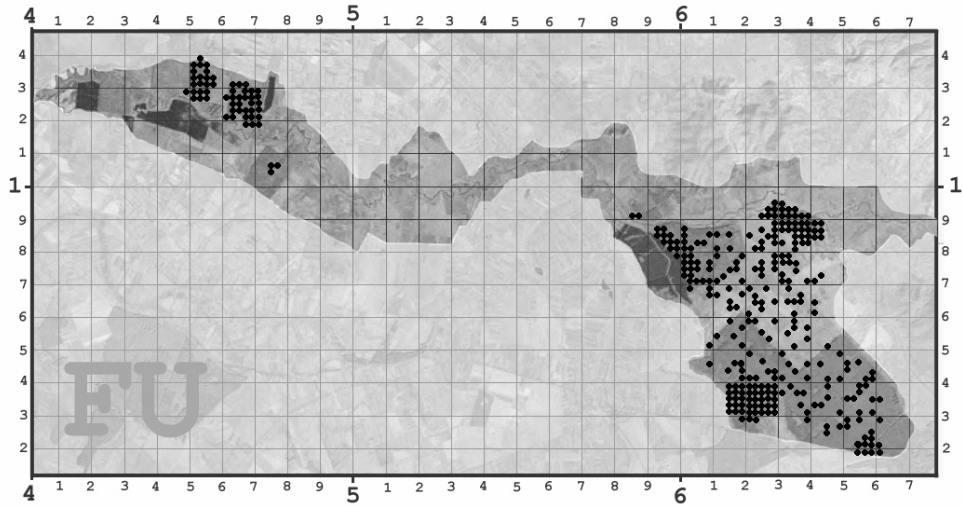
The distribution of *Bombina variegata*



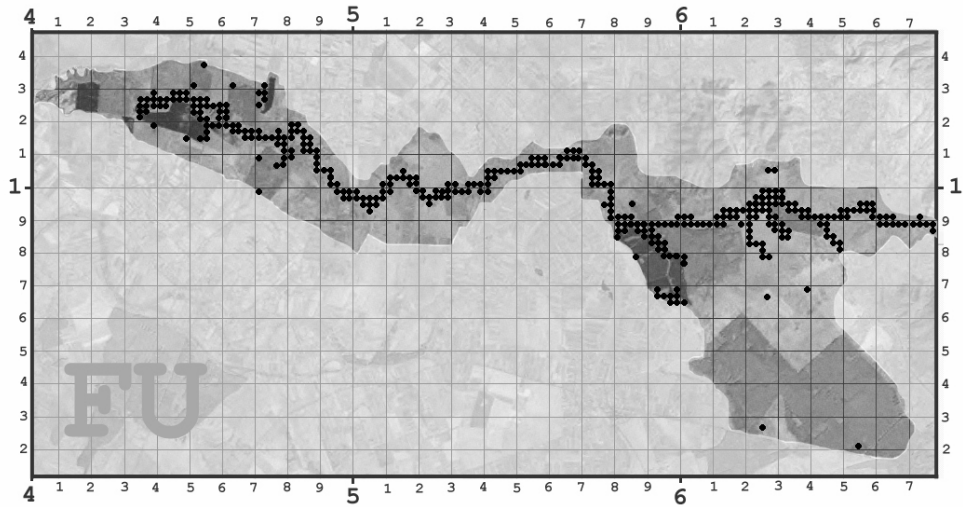
The distribution of the hybrids between *Bombina bombina* and *B. variegata*



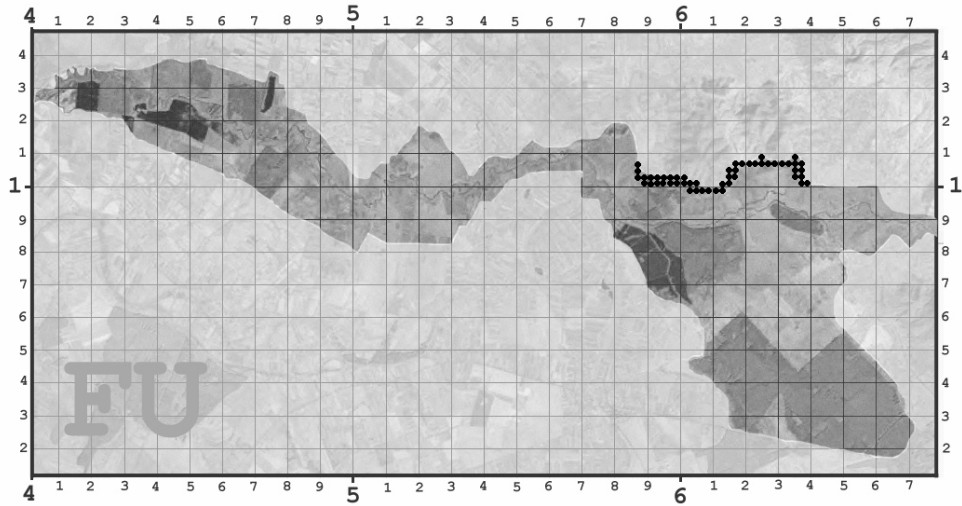
The distribution of *Rana lessonae*



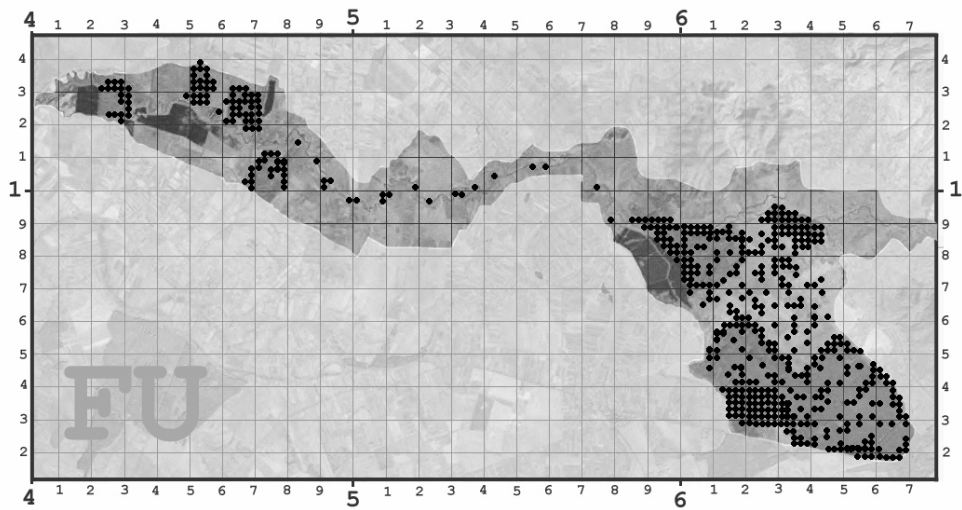
The distribution of *Rana arvalis*



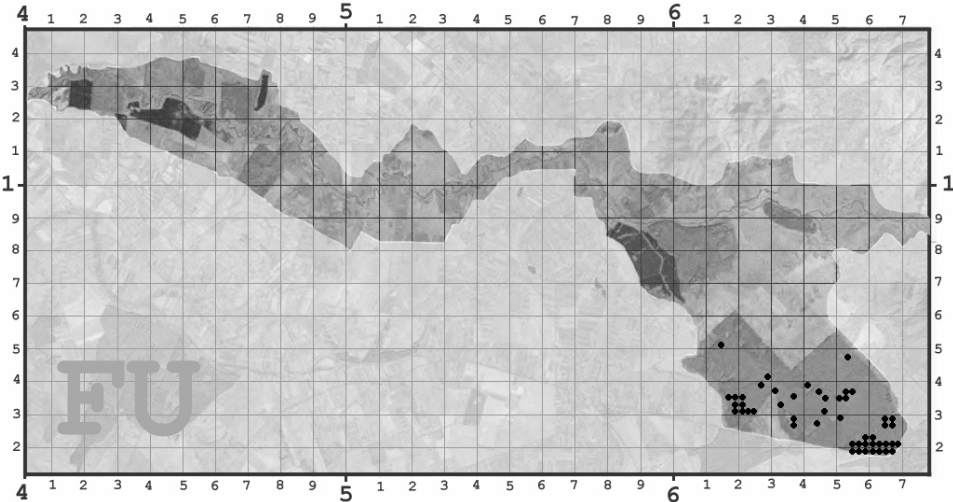
The distribution of *Emys orbicularis*



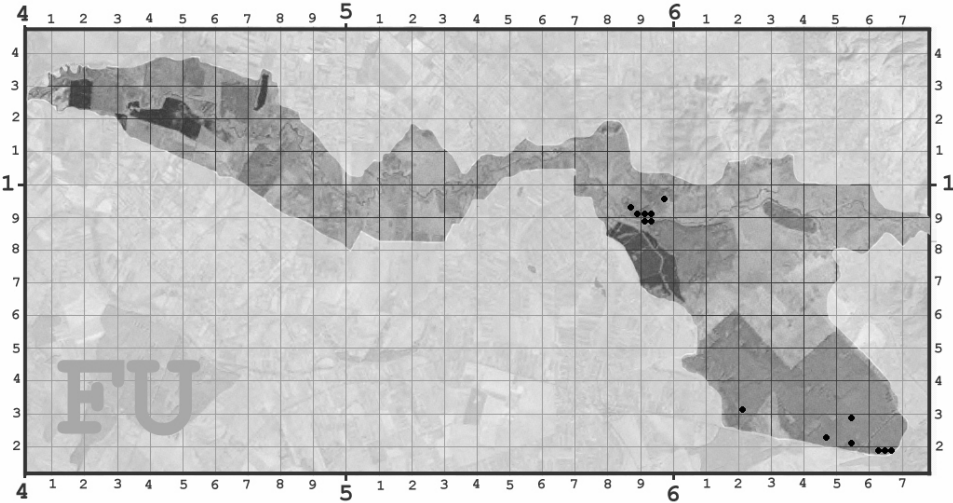
The distribution of *Lacerta viridis*



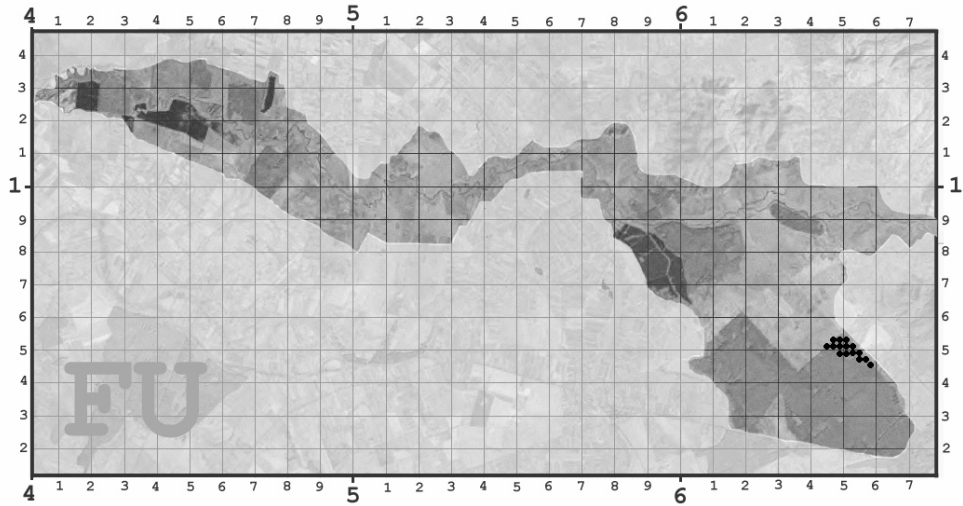
The distribution of *Zootoca vivipara*



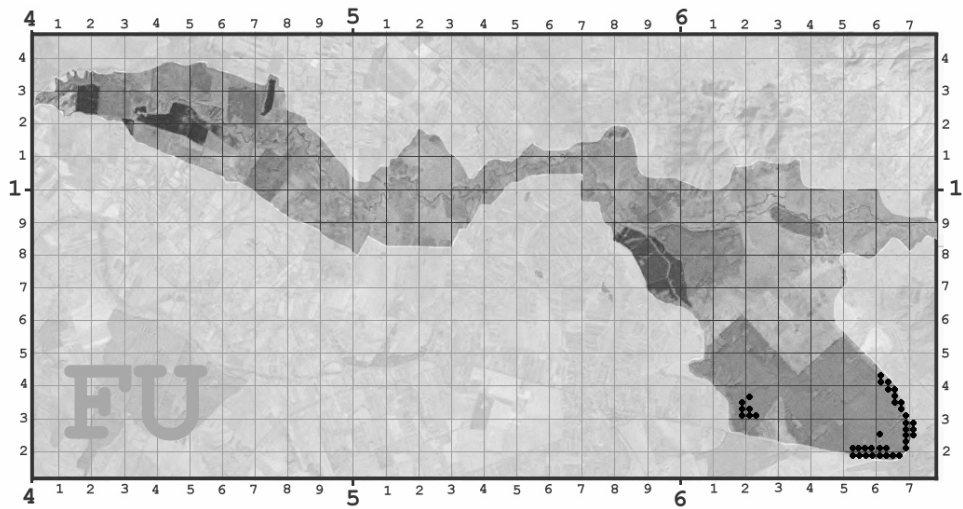
The distribution of *Anguis fragilis*



The distribution of *Coronella austriaca*



The distribution of *Elaphe longissima*



The distribution of *Vipera berus*