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ANTROPOGENIC IMPACT UPON THE HERPETOFAUNA AND THE LAKE SYSTEM FROM THE FUTURE NATURAL RESERVE FROM "FAUREI SWAMP" (NEAMT COUNTY, ROMANIA)

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Abstract. In the territory that will soon be proposed as the "Faurei Swamp" Natural Reservation we have identified 13 species of amphibians (*Salamandra salamandra, Triturus cristatus, Triturus vulgaris, Bombina bombina, Bombina variegata, Hyla arborea, Rana ridibunda, Rana esculenta, Rana dalmatina, Rana temporaria, Bufo bufo, Bufo viridis and Pelobates fuscus*) and one types of hybrid among the species of amphibians (*Bombina variegata, Hyla arborea, Rana ridibunda, Rana esculenta, Rana dalmatina, Rana temporaria, Bufo bufo, Bufo viridis and Pelobates fuscus*) and one types of hybrid among the species of amphibians (*Bombina bombina X Bombina variegata*);only one species of reptile was identified (*Natrix natrix*). The amphibians and reptiles from this area are directly affected by the humans through killing – especially the snakes (*Natrix natrix*) and the toads (*Bufo bufo, Bufo viridis* and *Pelobates fuscus*) and indirectly through dumping of chemical wastes (fertilizers) and oil wastes. We consider that the area is important from the herpetofauna and the aquatic system's point of view.

Keywords: natural reservation, Faurei Swamp, amphibians, reptiles, human activities, Neamt County.

Rezumat. Impactul antropic asupra herpetofaunei si sistemului lacustru din viitoarea rezervatie din "Mlaștina Făurei" (Județul Neamț, Romnânia). În teritoriul ce va fi in curand rezervația naturală "Mlaștina Făurei" am identificat 13 specii de amfibieni (Salamandra salamandra, Triturus cristatus, Triturus vulgaris, Bombina bombina, Bombina variegata, Hyla arborea, Rana ridibunda, Rana esculenta, Rana dalmatina, Rana temporaria, Bufo bufo, Bufo viridis and Pelobates fuscus) si un tip de hibrid (Bombina bombina X Bombina variegata); o singură specie de reptilă a fost identificată (Natrix natrix). Amfibienii și reptilele din această zonă sunt afectați direct de către activitășile umane precum uciderea deliberată și indirect de către depozitarea deșeurilor chimice in apă. Considerăm că zona reprezintă un reprezentativ sit de importanță herpetofaunistică.

Cuvinte cheie: rezervație naturală, Mlaștina Făurei, amfibieni, reptile, activități umane, Județul Neamț.

Introduction

During our study we have established the human impact in the Faurei Swamp region, a territory in which the herpetofauna was not studied until now. In the scientific literature there are very few papers related to the human impact on the herpetofauna and its distribution so far (Cogalniceanu & Andrei, 1992, Andrei & Torok, 1997). Even nowadays the most complex studies referring to the Romanian herpetofauna are the volumes about the "Fauna of the Peoples Republic of Romania": Amphibian (Fuhn, 1960) and Reptilia (Funh & Vancea, 1961); from that time there weren't any substantial studies about reptiles, only for amphibians – a monograph (Cogalniceanu *et al.*, 2000), but all these works missed our study area. The only research on the human activities and their impact on the herpetofauna was realized in the Western Plain, in the thermal ecosystem from 1 Mai Spa (Covaciu-Marcov, 2000). Until now there are only two works upon the herpetofauna of Neamt County (Ghiurca et. al., 2005, Gherghel & Ile, 2006), the first one going around this particular territory and the latter concerning only about a certain group from the herpetofauna – Caudata.

Having in mind the very little data upon the herpetofauna and the human impact from Romania and Neamt County, we initiated a series of studies to establish the distribution of the herpetofauna in Moldova and the impact of the human activities in different ecosystems, important for the herpetofauna.

Material and Methods

Our study took place between 2004 and 2006 and focused upon an area that it is wished to become a natural reservation. We used the quadrate method and the chemical and visual communication technique in the water environments (Cogalniceanu, 1997). The region was investigated and equal periods of time, when we followed in which way the human activities affect the area, in general, and the swamp specifically and also the way they manifest over the herpetofauna and the lake system.

The investigated territory (Fig. 1) is situated in the Moldova Sub-Carpathians, at about the equal distance from the cities of Piatra Neamt (25km) and Roman (24km). The geographical coordinates are: $46^{0}54^{\circ} - 46^{0}55^{\circ}$ N. Lat. and $26^{0}42^{\circ} - 26^{0}43^{\circ}$ E long., while the altitude varies between 362 and 370 m (Fig 1).



Figure 1. The location of the study area: Faurei Swamp.

Results and Discussion

In the territory that will soon be proposed as the "Faurei Swamp" Natural Reservation we have identified 13 species of amphibians (*Salamandra salamandra, Triturus cristatus, Triturus vulgaris, Bombina bombina, Bombina variegata, Hyla arborea, Rana ridibunda, Rana esculenta, Rana dalmatina, Rana temporaria, Bufo bufo, Bufo viridis* and *Pelobates fuscus*) and one type of hybrid among the species of amphibians (*Bombina bombina X Bombina variegata*); amongst the reptiles, only one species was identified (*Natrix natrix*).

Through our study, we've encountered 10 different types of human activities which negatively affect the herpetofauna, the lake system and the periferic areas:

Nr.	Activities				The negative impact made upon the future reservation area		
		Existing	[raditional]	ermited			
	~ .	I	5	I	Permanent	Periodical	Sporadic
1	Grazing		Х	Х		Х	
2	Agriculture	Х	Х		Х		
3	Agro-chemichal treatment	Х			Х		
4	Bee – keeping	Х	Х	Х		Х	
5	Deliberate dry-ups	Х					Х
6	Electrical networks	Х			Х		
7	Hunting	Х	Х			Х	
8	Poaching	Х			Х		
9	Biological material collecting	Х				Х	
10	Road constructions	Х	Х	Х	Х		

Table 1. The human activities which negatively influence the herpetofauna and its habitat.

- 1. **Grazing**: is a traditional/periodical activity which takes place from March to September. It negatively effects the herpetofauna and the lake system by the erosion that in creates on the lake shore and by creating "golf" zones (1-2 m²) in which amphibians tend to reproduce; countless larva die each year because these "golfs" dry up before they finish developing. Protected species such as *Bombina bombina, Bombina variegata, Bufo viridis, Hyla arborea* fall victims to this activity indirectly.
- 2. **Agriculture**: is a traditional/permanent activity that affects the herpetofauna and the lake system due to the dumping of large amounts of soil into the water and therefore destroying large areas of the swamp.
- 3. **Agro-chemical treatments**: The chemically treated agricultural lands surrounding the pond may cause severe larval mortality through algal blooming. This was the case in 2005. Occasionally oil spill can be observed at the pond surface.
- 4. **Bee-keeping:** does not have a major impact over the herpetofauna but, due to the way that it is done, is destructive. This happens because the bee-keepers try to level the terrain situated in the vicinity of the swamp and, therefore, large quantities of soil are deposited in the lake system.

- 5. **Water drainages**: were observed during spring. The intentions of these activities are to extend the agricultural fields. This activity especially affects the eggs and the larva of amphibians, causing many fatalities each year.
- 6. **Electric wiring**: doesn't directly affect the amphibians and reptiles but it represents an anthropogenic stress factor in recovering the territories occupied by agriculture.
- 7. **Hunting**: even though it has an organized character, it negatively affects the herpetofauna by creating temporary dirt roads which sometimes directly traverse the swamp and sometimes are responsible for the death of amphibians.
- 8. **Poaching**: takes place throughout the year and has the same negative effect on the herpetofauna as hunting.
- 9. **Illegal collecting of animals**: is a periodical activity which is practiced by locals who kill numerous amphibian (*Triturus cristatus, Triturus vulgaris, Bombina bombina, Bombina variegata, Hyla arborea, Rana ridibunda, Rana esculenta, Rana dalmatina, Rana temporaria, Bufo bufo, Bufo viridis si Pelobates fuscus) and reptile (<i>Natrix natrix*) species due to false popular beliefs.
- 10. **Transport ways and traffic**: this aspect is caused by hunting, poaching and agriculture and negatively affects the herpetofauna by creating dirt roads around and inside the swamp.

We consider that all the human activities mentioned above must stop in order to protect the lake system and the herpetofauna.

We consider necessary to mention that species of Filopoda have been identified in the swamp, amongst which we mention *Triops cancriformis*; because of this we consider that the area should also be investigated by limnlologists.

Conclusions

The herpetofauna from the future natural reserve is exposed to a powerfull antropogenic stress. We have identified ten human activities which negatively affect the herpetofauna and the lake system.

Due to false popular beliefs (Fuhn, 1969, Eliade, 1992, Nicoara, 2003) concerning the herpetofauna, amphibian and reptile species (*Triturus cristatus, Triturus vulgaris, Bombina bombina, Bombina variegata, Hyla arborea, Rana ridibunda, Rana esculenta, Rana dalmatina, Rana temporaria, Bufo bufo, Bufo viridis, Pelobates fuscus si Natrix natrix*) are being killed regardless of their role in maintaining the crucial natural equilibrium.

One of the greatest problems that the studied area faces is the constant degradation on the swamp ecosystem caused especially by agriculture and the dumping of various wastes in the area.

Due to the fact that the Moldavian Subcarpathians host an unique swamp ecosystem, Faurei Swamp hosts a rich herpetofauna, both from a quantitative and qualitative point of view. Numerous species are included in the Bern Convention, the Habitat Directive (Law 462/2001 and MMGA order 1198/2001). Thus, we consider that this area is a representative important herpetofaunal area (Torok, 1999) from the Moldavian Supcarpathians.

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