HERPETOZOA 22 (1/2): 55 - 64
Wien, 30. Juni 2009

Observations on the herpetofauna of the Iezer-Păpuşa Massif (southern Carpathians, Romania)

Beobachtungen über die Herpetofauna des Iezer-Păpuşa Massivs (Südkarpaten, Rumänien)

ALEXANDRU IFTIME & OANA IFTIME & DORIN ALEXANDRU POP

KURZFASSUNG

Die vorliegende Arbeit präsentiert das Ergebnis herpetologischer Begehungen des Iezer-Păpuşa Massivs (Südkarpaten, Rumänien) und seiner Umgebung. Für die 19 festgestellten Formen (*Salamandra salamandra*, *Triturus cristatus*, *Mesotriton alpestris*, *Lissotriton montandoni*, *Lissotriton vulgaris*, *Bombina variegata*, *Bufo bufo*, *Bufo viridis*, *Hyla arborea*, *Rana temporaria*, *Rana dalmatina*, *Pelophylax ridibundus*, *Pelophylax* kl. *esculentus*, Hybriden von *L. montandoni* mit *L. vulgaris*; *Lacerta agilis*, *Zootoca vivipara*, *Podarcis muralis*, *Anguis fragilis*, *Vipera berus*) werden Verbreitungsangaben im Untersuchungsgebiet gemacht und ökologische Beobachtungen mitgeteilt. Zu zwei Amphibienarten, *L. montandoni* und *B. bufo*, werden neue obere Höhengrenzen ihres Vorkommens in Rumänien angegeben.

ABSTRACT

The results of herpetological investigations in the Iezer-Păpuşa Massif (southern Carpathians, Romania) and its surrounding areas are reported here. Nineteen amphibian and reptile forms were identified (*Salamandra salamandra*, *Triturus cristatus*, *Mesotriton alpestris*, *Lissotriton montandoni*, *Lissotriton vulgaris*, *Bombina variegata*, *Bufo bufo*, *Bufo viridis*, *Hyla arborea*, *Rana temporaria*, *Rana. dalmatina*, *Pelophylax ridibundus*, *Pelophylax* kl. *esculentus*, hybrids of *L. montandoni* x *L. vulgaris*; *Lacerta agilis*, *Zootoca vivipara*, *Podarcis muralis*, *Anguis fragilis*, *Vipera berus*) and are presented together with distribution and ecological data. For two amphibian species, *L. montandoni* and *B. bufo*, we also give updated maximum altitude records for Romania.

KEYWORDS

Amphibia, Reptilia; ecology, populations, distribution, altitude, habitat, *Bufo bufo*, *Lissotriton montandoni* high altitude records, local herpetofauna, Iezer-Păpuşa Mountains, Romania

INTRODUCTION

The Iezer-Păpuşa Mountains (the coordinates for Iezer Glacial Lake, in the center of the high ridge of this massif, are 45°27' 32.57''N and 24°57'38.14''E) are among the highest in Romania, reaching 2472 m a.s.l. in the Roşu Peak. They form a southeastern branch of the larger Făgăraş Mountain range (itself a part of the Southern Carpathians), to the main chain of which they are connected by a high ridge (1800-2000 m a.s.l.) (Fig. 1). Mainly composed of crystalline shales, with occasional granitic, dolomite and marble intrusions, the Iezer-Păpuşa Massif contains the headwaters of several tributaries of the Argeş River: Râuşor, Brătia, Brătioara, Bughea, Râul Târgului, Argeşel (from west to east), and is delimited to the west by the Zârna headwaters, Zârna River and, after its confluence with Râul Doamnei, by this river, and to the east by the Dâmboviţa headwaters and river course (GHINEA 2002). On these rivers a few dams were built, leading to the creation of dam lakes, of which Râuşor on Râul Târgului River and Pecineagu on Dâmboviţa River are the largest. The uplands of the Iezer-Păpuşa Mountains were glaciated during the Pleistocene, resulting in the formation of glacial calderas and lakes (see, e.g., SAWICKI 1912, for an early synthesis of works dealing with the glacial landscapes in the Carpathians). The present-day vegetation (Fig. 2; after MÂCIU et al. 1982, and satellite imagery data) is dominated by beech (*Fagus sylvatica*) forest on the lower mountain reaches, replaced by beech-spruce forest at

ca. 1000 m a.s.l, then by spruce (*Picea abies*) stands at ca. 1200 m a.s.l., sporadic maple (*Acer platanoides*, *A. pseudoplatanus*), hornbeam (*Carpinus betulus*) and birch (*Betula pendula*) trees appearing through the above-mentioned forest types. At ca. 1700 m a.s.l. isolated Swiss pines (*Pinus cembra*) and mountain pines (*Pinus mugo*) appear, the mountain pines developing further as arbustive dense stands, of lower and lower height, up to ca. 2000 m, above which there are alpine grasslands, rhododendron (*Rhododendron myrtifolium*) cushions and scree vegetation, with local areas of alpine fens (Fig. 3). Alder (*Alnus incana*) thickets are present along the river valleys. Anthropogenic impact in the area includes logging, which is intense in some places, and some touristic development, with associate road traffic.

Although faunistically interesting because of the high altitude reached and because it is the south-western limit of the distribution of the Carpathian endemic *Lissotriton montandoni* (BOULENGER, 1880), the Iezer-Păpuşa Mountains were not much investigated from a herpetological point of view. Thus, FUHN (1960) mentioned *Bombina variegata* (LINNAEUS, 1758) in the foothills of the range at Câmpulung, FUHN & VANCEA (1961) recorded *Lacerta agilis* LINNAEUS, 1758, *Zootoca vivipara* JACQUIN, 1787, *Podarcis muralis* (LAURENTI, 1768) and *Coronella austriaca* LAURENTI, 1768 at Rucăr, likewise in the foothills, FUHN (1963) recorded *L. montandoni* at the Mâra Valley in the eastern part of the massif, FUHN (1969) added a record of the same species at the headwaters of Dâmboviţa, the northern edge of the massif. COGĂLNICEANU et al. (2000) recorded, with the imprecision inherent in country-wide 10x10 UTM square charting, a few more species on the outskirts of the range: *Salamandra salamandra* (LINNAEUS, 1758), *Triturus cristatus* (LAURENTI, 1768), *Bufo viridis* LAURENTI, 1768, *Hyla arborea* (LINNAEUS, 1758), *Rana dalmatina* BONAPARTE, 1840. Our study intends to give a better comprehension on the herpetofauna of this mountain range.

MATERIALS AND METHODS

This paper relies upon the field observations performed in the region between March and July 2008 (and, for upper Dâmboviţa, also in June 2005); the amphibians and reptiles were searched using the active transect method (active search – including, for instance, searching under rocks – of specimens along a 4 m wide randomly chosen transect; see COGĂLNICEANU 1997). Five longer transects (red dotted lines in Fig. 1) were inspected:

1. Râul Doamnei Valley, from above Slatina village (45°20’31.24’’N, 24°52’ 5.66’’E), ca. 650 m a.s.l. to the mouth of the Zârna tributary (45°28’57.94’’N, 24°52’ 5.66’’E), ca. 1000 m a.s.l., 16 kilometers; checked in early April, ca. 10 person-hours, lightly overcast weather with sunny breaks, ca. 15 °C;

2. Brătia Valley, from above Cândeşti village (45°19’42.59’’N, 24°57’27.01’’E), ca. 650 m a.s.l. to 45°24’13.51’’N, 24°56’ 5.44’’E, ca. 800 m a.s.l., 8 kilometers; checked in mid-April; ca. 8 person-hours, sunny weather, ca. 20-25 °C;

3. Brătioara Valley, from above Cândeşti village (45°19’32.16’’N, 24°58’53.53’’ E), ca. 650 m a.s.l., to 45°22’6.78’’N, 24° 58’6.57’’E, ca. 700 m a.s.l., 6 kilometers; checked in late April; ca. 8 person-hours, lightly overcast weather with sunny breaks, ca. 20 °C;

4. Râul Târgului Valley and the basin of its tributary Bătrâna, from below Râuşor dam (45°23’9.29’’N, 25°3’47.69’’E), ca. 600 m a.s.l., to Cuca chalet (45°28’4.21’’N, 25°2’26.12’’E), 1200 m a.s.l., and into the uplands through Bătrâna watershed, to Iezer Glacial Lake (45°27’32.57’’N, 24°57’ 38.14’’E), 2130 m a.s.l., and Plaiul Iezerului (45°27’46.44’’N, 24°57’46.17’’E), 2180 m a.s.l., 16 kilometers; checked in March, April, May and July, over 100 person-hours; diverse weather conditions ranging from cold overcast and windy, ca. 5-7 °C (with ice persisting in places) to lightly overcast weather with sunny breaks, ca. 15 °C, relatively warm weather with showers, ca. 15-20 °C, and warm, sunny weather, ca. 20-25 °C.

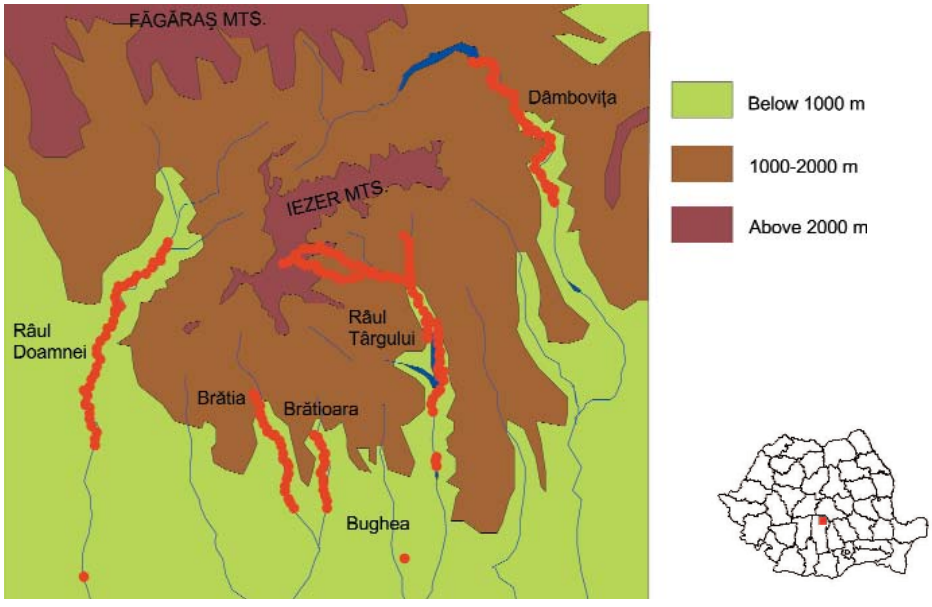

Fig. 1. Altitudinal map of the Iezer Mountains (southern Carpathians, Romania); studied transects and stations in red. The outline map of Romania shows the position of the study area.

Abb. 1: Karte der Höhenzonen des Iezer Gebirges (Südkarpaten, Rumänien); Untersuchungs-Transekte und Stationen sind rot markiert. Die Übersichtskarte von Rumänien zeigt die Lage des Untersuchungsgebietes.

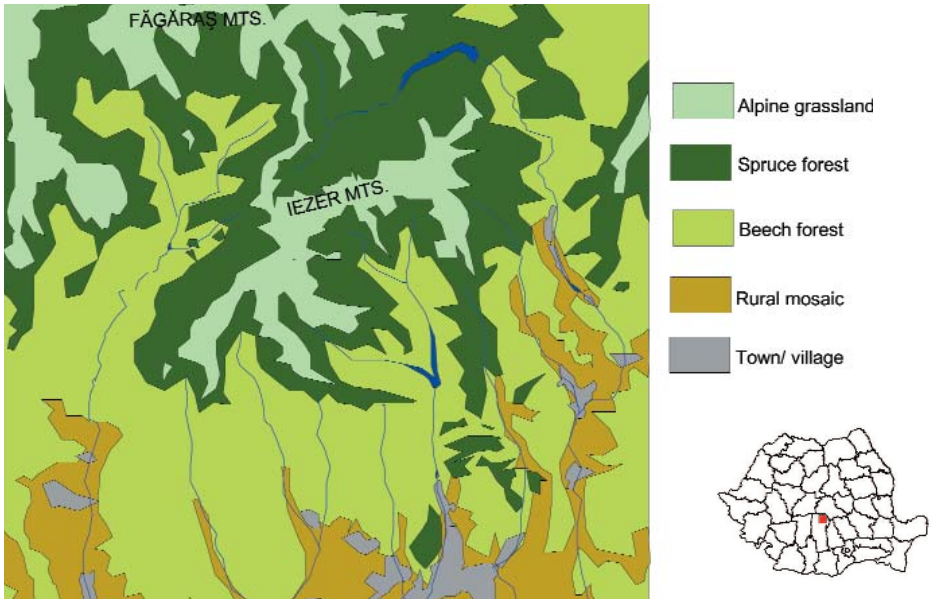

Fig. 2: Map of major habitat categories in the study area (Iezer Mountains, southern Carpathians, Romania). The outline map of Romania shows the position of the study area.

Abb. 2: Karte der hauptsächlichen Habitattypen im Untersuchungsgebiet (Iezer Gebirge, Südkarpaten, Rumänien). Die Übersichtskarte von Rumänien zeigt die Lage des Untersuchungsgebietes.

5. Dâmboviţa Valley, from above Sătic village (45°30'3.79''N, 25°8'31.96'' E), ca. 850 m a.s.l., to Pecineagu dam (45°33' 54.09''N, 25°5'38.93''E), ca. 1100 m a.s.l., checked in late April (cool, rainy weather, ca. 10-15 °C) and June (sunny weather, ca. 20-25 °C).

Additionally, three pond sites were investigated with very short transects: at Corbi village on Râul Doamnei Valley (45°17' 51.33N, 24°47'58.49''E), 550 m a.s.l., checked in early April (overcast, ca. 15 °C), at Albeşti-Muscel village on Bughea Valley (45°18'29.58''N, 25°1'49.04''E), 700 m a.s.l., checked in late April and in May (always sunny days, ca. 15-25 °C), and at Pojorâta village on Râul Târgului Valley (45°20' 43.4''N, 25°1'49.04''E), 550 m a.s.l., checked in April and May (lightly overcast weather with sunny breaks, ca. 15 °C, relatively warm weather with showers, ca. 15-20 °C).

The purpose of these surveys was mainly qualitative; an exact count of specimens was not taken for the more frequent species. On Râul Târgului, upper course (above Râuşor dam), on a length of ca. 2 km, the spawn clutches (egg masses) of *R. temporaria* were counted (on March 22nd), a method often used to evaluate population size of "brown frogs" (*Rana* s. str.) – see, e.g., HARTEL 2003 and literature quoted therein. For the identification of (morphologically manifest) *Lissotriton* hybrids, we used the criteria from KOTLIK & ZAVADIL (1999) and BABIK et al. (2003), also used in IFTIME (2004).

RESULTS

We have recorded 12 amphibian species – *S. salamandra*, *T. cristatus*, *M. alpestris* (LAURENTI, 1768), *L. montandoni*, *L. vulgaris* (LINNAEUS, 1758), *Bombina variegata*, *Bufo bufo* (LINNAEUS, 1758), *B. viridis*, *H. arborea*, *Rana temporaria* LINNAEUS, 1758, *R. dalmatina*, *Pelophylax ridibundus* – as well as the hybrid *Pelophylax* kl. *esculentus* and hybrids between *L. montandoni* and *L. vulgaris*. Moreover, five reptile species – *L. agilis*, *Z. vivipara*, *P. muralis*, *Anguis fragilis* LINNAEUS, 1758, and *Vipera berus* (LINNAEUS, 1758) were found.

Distribution data

Râul Doamnei Valley (Transect 1 and pond at Corbi): *M. alpestris* (ca. 200 specimens) appears upwards from 800 m a.s.l., *L. vulgaris* (four specimens) only at ca. 650 m above Slatina village, *B. variegata* (15 specimens) from 650 to ca. 1000 m a.s.l., *B. bufo* (ca. 20 specimens) upwards from ca. 650 m a.s.l., *H. arborea* (7 specimens) only in Corbi pond at 550 m a.s.l., *R. dalmatina* (ca. 20 egg masses) only in Corbi pond at 550 m a.s.l., *R. temporaria* (numerous larvae in ca. 30 ponds) upwards from ca. 650 m a.s.l., *P. ridibundus* (five specimens) and *P.* kl. *esculentus* (one specimen) both only at ca. 650 m a.s.l. above Slatina village. *Lacerta agilis* and *P. muralis* (one specimen each) were found in rocky areas in the upper part of the valley.

Brătia Valley (Transect 2): *S. salamandra* (ca. 20 larvae, four adults) all along the transect, from 650 to 800 m a.s.l.; *T. cristatus* (1 adult) only at 650 m above Cândeşti village; *M. alpestris* (ca. 20 specimens); *L. vulgaris* (ca. 25 specimens); *B. variegata* (ca. 25 specimens); *B. bufo* (ca. 15 specimens), and *R. temporaria* (ca. 10 specimens) all along the transect, from 650 to 800 m a.s.l.; *P. ridibundus* (four specimens) at ca. 700 m a.s.l.; *L. agilis* (five specimens) was found at ca. 650-700 m a.s.l., and *A. fragilis* (one specimen) at ca. 800 m a.s.l.

Brătioara Valley (Transect 3): *S. salamandra* (ca. 10 larvae, one adult) all along the transect, from 650 to 700 m a.s.l.; *L. montandoni* (one specimen) only at ca. 680 m a.s.l.; *L. vulgaris* (ca. 20 specimens), *M. alpestris* (ca. 15 specimens), *B. variegata* (ca. 20 specimens) *B. bufo* (several egg strings) and *R. temporaria* (larvae in ca. 10 ponds) all along the transect, from 650 to 800 m a.s.l.; *L. agilis* (two specimens) was found at ca. 650 m a.s.l.

Bughea Valley, at Albeşti-Muscel, 700 m a.s.l., *T. cristatus* (eight specimens), *L. vulgaris* (five specimens), *R. temporaria* (ca. 10 specimens) and *P. ridibundus* (over 30 specimens) were found.

Table 1: Summary table on the occurrence of amphibian and reptile species in different habitat types in the Iezer-Păpuşa Massif, southern Carpathians (Romania).

Tab 1: Zusammenfassende Tabelle zum Vorkommen der Amphibien- und Reptilienarten in verschiedenen Lebensraumtypen in den Bergen des Iezer-Păpuşa Massivs, Südkarpaten (Rumänien).

Species	Alder thicket and marsh	Beech and mixed broad-leaf forest	Beech forest	Beech-spruce forest	Spruce forest	Sub-alpine thickets	Alpine grass-land	Alpine fen
	Erlen-bruchwald und Sumpf	Buchenwald und Laub-mischwald	Buchen-wald	Buchen-Fichten-Mischwald	Fichten-wald	Subalpine Strauch-vegetation	Alpine Gras-flächen	Alpines Flach-moor
Salamandra salamandra	+		+	+				
Triturus cristatus	+	+						
Mesotriton alpestris	+		+	+	+			+
Lissotriton vulgaris	+	+	+	+				
Lissotriton montandoni	+		+	+	+			+
L. vulgaris x *L. montandoni*			+	+				
Bombina variegata	+	+	+	+	+			
Bufo bufo	+	+	+	+	+			+
Bufo viridis	+	+						
Hyla arborea	+	+						
Rana temporaria	+		+	+	+			+
Rana dalmatina		+						
Pelophylax ridibundus	+	+		+				
Pelophylax kl. *esculentus*				+				
Lacerta agilis	+	+	+	+				
Zootoca vivipara	+		+	+	+	+	+	
Podarcis muralis			+	+				
Anguis fragilis				+	+			
Vipera berus				+				

Râul Târgului Valley (Transect 4 and pond at Pojorâta): *S. salamandra* (two specimens) only at ca. 1050-1080 m a.s.l., *M. alpestris* (ca. 100 specimens) and *L. montandoni* (ca. 70 specimens) from ca. 900 m a.s.l to 2130 m a.s.l. (alpine fen adjacent to Iezer Glacial Lake), *L. vulgaris* (ca. 80 specimens) from ca. 900 m to ca. 1000 m a.s.l.; four hybrids between *L. montandoni* and *L. vulgaris* were also found sporadically at ca. 1000 m a.s.l.; *B. variegata* (ca. 80 specimens) from ca. 900 to ca. 1200 m a.s.l.; *B. bufo* (ca. 100-120 specimens) from ca. 550 m a.s.l. (pond at Pojorâta) to 2130 m (alpine fen adjacent to Iezer Glacial Lake); *B. viridis* (ca. 20 specimens) at ca. 550 m a.s.l. only (the pond at Pojorâta); *R. temporaria* (ca. 30 adults seen, but ca. 700 egg clutches were counted) from ca. 900 m a.s.l to 2130 m a.s.l. (alpine fen adjacent to Iezer Glacial Lake); *L. agilis* (ca. 20 specimens) from ca. 900 to ca. 1000 m a.s.l.; *Z. vivipara* (ca. 50 specimens) from ca. 900 to 2180 m a.s.l.; *P. muralis* (ca. 40 specimens) in rocky stations at ca. 900 m a.s.l.; *A. fragilis* (two specimens) and *V. berus* (one specimen) both at ca. 950 m a.s.l. (*V. berus* was reportedly seen in past years by mountaineers at ca. 1200 m a.s.l.).

Dâmboviţa Valley (Transect 5) *M. alpestris* (ca. 250-300 specimens), *L. montandoni* (ca. 250-300 specimens), *B. variegata* (ca. 40 specimens), *B. bufo* (one pond held egg strings), and *R. temporaria* (ca. 20 ponds held egg clutches or tadpoles) all along the transect, from ca. 850 to ca. 1000 m a.s.l.; *L. agilis* (five specimens) was found at ca. 850 m a.s.l.

The occurrence of amphibian and reptile species in different habitat types, and of reproducing amphibians in different water-body types is summarized in tables 1 and 2, respectively.

Phenological data

The first species to emerge in spring was *R. temporaria*, which started breeding in early March, even as high as ca. 1000 m a.s.l., with some spawn clutches lost to pond freezing episodes. *Rana temporaria* adults were still in the water in April at ca. 1000-

Table 2: Summary table on the occurrence of reproducing amphibians in different waterbody types in the Iezer-Păpuşa Massif, southern Carpathians (Romania).

Tab. 2: Zusammenfassende Tabelle zum Vorkommen reproduzierender Amphibien in verschiedenen aquatischen Lebensräumen in den Bergen des Iezer-Păpuşa Massivs, Südkarpaten (Rumänien).

Species	Slow-flowing brooks langsam fließende Bäche	Riverside ponds, oxbows Flußufer-tümpel, Altwässer	Small, temporary ponds kleine, temporäre Stillwässer	Large, permanent ponds große, permanente Stillwässer	Alpine fens Alpine Moore	Dam lakes Stauseen	Man-made ditches angelegte Gräben
Salamandra salamandra	+		+				
Triturus cristatus			+	+			
Mesotriton alpestris	+	+	+	+	+		+
Lissotriton vulgaris		+	+	+			+
Lissotriton montandoni	+	+	+	+	+		+
L. vulgaris x *L. montandoni*			+				+
Bombina variegata	+	+	+	+			+
Bufo bufo	+	+	+	+	+	+	+
Bufo viridis		+				+	
Hyla arborea				+			
Rana temporaria	+	+	+	+	+	+	+
Rana dalmatina				+			
Pelophylax ridibundus		+	+	+			
Pelophylax kl. *esculentus*				+			

1200 m a.s.l., but above 2000 m the breeding is late and started in late June to early July, by which time at lower altitudes (ca. 900 m a.s.l) the first metamorphs left water.

Bufo bufo started breeding at lower altitudes (ca. 700-900 m a.s.l.) in early April, by late April and early May it also bred in upper locations to ca. 1200 m a.s.l., and at over 2000 m a.s.l. it started breeding in early July together with *R. temporaria*. *Bufo viridis* was only seen breeding in early April in a lower location (ca. 550 m a.s.l.), which it shared with a more abundant population of *B. bufo*.

Bombina variegata starts breeding later than other tailless amphibians; no adults were seen in the water till late April, and the reproduction continued till at least July.

Among the tailed amphibians, in *S. salamandra*, a first deposition of larvae occurred in early March; newt species started breeding in late March – early April at 900-1000 m a.s.l., continued in May – June at 1000-1200 m a.s.l., and over 2000 m a.s.l. – *M. alpestris* and *L. montandoni* only – breeding started in early July.

Lizards emerged from hibernation in late March – early April, depending on the weather and exposure to sunlight; at ca. 900 m a.s.l., courtship in *P. muralis* was seen in April and copulation in *L. agilis* in May.

Threats

During the period when they congregated in waters to breed, amphibians suffered strong mortality due to various factors. For *R. temporaria*, an early breeder, freezing was an important cause of mortality, some adults dying when caught underwater by ice forming across the surface of their breeding ponds. The trapped frogs cannot get access to air unless the ice breaks or melts, and thus die of hypoxia. In the upper Râul Târgului Valley, an area of sporadic frosts in early spring, we also found a dead subadult *S. salamandra* and a dead adult *Z. vivipara*, apparently also caught by a cold spell and killed by frost, a phenomenon that frequently strikes the amphibian and reptile species which are the earliest to emerge from hibernation, such as *R. temporaria* or *Z. vivipara*. Predation by mustelid carnivores – most likely polecats, *Mustela putorius*, as this species is a regular predator of both ranid and bufonid anurans (see e.g., LODÉ 1996 and literature quoted therein) – upon both *R. temporaria* and *B. bufo* was recorded at some ponds, where the remains

Fig. 3. Alpine fen at 2130 m a.s.l., transect 4; habitat of *Lissotriton montandoni*, *Mesotriton alpestris*, *Bufo bufo* and *Rana temporaria* (photo: A. IFTIME).

Abb. 3: Alpines Flachmoor in 2130 m Seehöhe, transect 4; Lebensraum von *Lissotriton montandoni*, *Mesotriton alpestris*, *Bufo bufo* und *Rana temporaria* (Photo: A. IFTIME).

Fig. 4: Hybrid of *Lissotriton vulgaris* and *L. montandoni*, Râul Târgului Valley. Notice striped head, greenish dorsal color, prominent paravertebral canthi and low dorsal crest (photo: A. IFTIME).

Abb. 4: Hybrid von *Lissotriton vulgaris* und *L. montandoni* aus dem Tal Râul Târgului. Man beachte den längsgestreiften Kopf, die grünliche Rückenfärbung, die hervortretenden paravertebralen Leisten und den niedrigen Rückenkamm (Photo: A. IFTIME).

of partly consumed amphibians were found alongside fresh mustelid scat and tracks. Toads (*B. bufo*) were killed by opening the abdomen, but only the entrails and thigh meat were consumed. An important mortality cause for adults is roadkill; on the road along Râuşor dam, hundreds of *R. temporaria* and *B. bufo* adults were crushed by cars. Roadkill mortality, albeit on a far smaller scale due to lower traffic intensity, was found along logging roads where animals are killed by lorries, or in tourist areas where cars and all-terrain vehicles killed *R. temporaria*, *B. bufo*, *S. salamandra*, *L. montandoni* (and potentially any other species).

Egg clutches in *R. temporaria* and *Bufo* are mostly lost to freezing and drying of the ponds. On Râul Târgului Valley (Transect 4, upper part) we counted ca. 700 *R. temporaria* egg clutches. We estimate that, in 2008, ca. 30% of them were lost before tadpole eclosion, but only one or two ponds dried after tadpole eclosion. Newt species, i.e. *M. alpestris* and *L. montandoni* were seen consuming *R. temporaria* eggs, from both viable and compromised clutches. Later in the year, tadpoles were the target of diverse predators, of which larvae of large dytiscid beetles (*Dytiscus* sp., *Cybister* sp.) were the most important in this area, as we found ponds with a great density of such larvae, continuously capturing and eating tadpoles. Other potential predators include other dytiscid beetles and the carabid *Carabus* (*Hygrocarabus*) *variolosus*, which was seen by us in other areas to consume tadpoles in drying ponds, and also frequents tadpole-harboring ponds here.

DISCUSSION

The list of amphibian and reptile species known for this area was expanded with 8 species: *L. vulgaris*, *M. alpestris*, *B. bufo*, *R. temporaria*, *P. ridibundus*, *P.* kl. *esculentus*, *A. fragilis*, and *V. berus*; hybrids between *L. montandoni* and *L. vulgaris* (Fig. 4) were also noted for the first time here. The only species previously found but not confirmed by us is *C. austriaca*, whereas we found numerous common montane species such as *M. alpestris*, *B. bufo*, *R. temporaria* not recorded before. This is probably because previous workers focused more on the outskirts and foothills of the massif than on its high, central area, while our study did the opposite.

We note that our records of amphibians, gathered in spring and early summer (when the amphibians are concentrated in breeding ponds), are more complete than our records of reptiles (e.g. the lack of *Coronella* records); for reptiles, the number of species recorded is greatest in the area where the search effort invested was highest (Râul Târgului Valley).

Our results regarding the distribution of newts show the exact south-western limit of the range of the Carpathian endemic *L. montandoni*, passing from the Dâmboviţa headwaters through the highest ranges of the Iezer-Păpuşa Mountains to the Brătioara Valley. Although the colonization by this species of nearby valleys such as Brătia or Râul Doamnei looks possible, it apparently did not take place. Thus, *L. montandoni* is spread in Romania from this area in the Iezer-Păpuşa Mountains to the east along the Southern Carpathians in the Piatra Craiului and Bucegi Mountains, then along the entire Eastern Carpathians Range to the border with Ukraine.

It is interesting to note that in wider, sunnier, southern-slope valleys such as Brătia, Brătioara and Râul Târgului, *L. vulgaris* occurs up to higher altitudes such as 800-1000 m a.s.l., while on the narrow, shaded Râul Doamnei Valley it only attains ca. 650 m a.s.l., above which *M. alpestris* is the only newt, whilst on the northern-slope Dâmboviţa Valley it was not found at all, and *M. alpestris* shares the ground with *L. montandoni*. *Triturus cristatus* is also favored by the wider southern-slope situations being found on Brătia and Bughea Valleys.

It is also interesting to remark that the records in the alpine fen near Iezer Glacial Lake, at ca. 2130 m a.s.l., are the highest accurately known in Romania for two amphibian species. One, *L. montandoni*, is given as living up to 2000 m nationwide (COGĂLNICEANU et al. 2000) and Europe-wide (NÖLLERT & NÖLLERT 2003); it was found above

2000 m neither in the Bucegi, where it is recorded up to 2000 m (SCHLÜTER 2004), nor in the Rodnei Mountains where it reaches 1800 m (ARDELEAN & BERES 2000), nor in Piatra Craiului (GHIURCĂ et al. 2003; IFTIME 2003) and its Romanian range nowhere else includes such altitudes. The other, *B. bufo*, is given as living up to 1800 m nationwide (COGĂLNICEANU et al. 2000), up to ca. 1200 in Rodnei Mountains (ARDELEAN & BERES 2000); in the Făgăraş Massif it is recorded up to 1800 m (ARDELEAN & TRIFONOF 2000), in the Retezat at 1000-1300 m (GHIRA 1989; STUGREN & GHIRA 1993), 1997 m (COGĂLNICEANU et al. 2001), or somewhere between 1920 or 2000 and 2160 m a.s.l. (COGĂLNICEANU et al. 2006), but nowhere exactly recorded above 2100 m. The record of *B. bufo* at 2130 m a.s.l. matches the highest altitudes quoted for this species in Europe (NÖLLERT & NÖLLERT 2003).

Pelophylax ridibundus was also recorded at a quite high altitude, ca. 700 m a.s.l., in the south-facing and sunny Brătia Valley - where it shares ponds with *M. alpestris* and *Cottus* (*gobio*) *transsilvaniae* - which is above the 600 m a.s.l. limit given by COGĂLNICEANU et al. (2000), but comparable to the findings of COVACIU-MARCOV et al. (2003) in Pădurea Craiului Mountains, or DEMETER et al. (2006) in Ciuc, both at ca. 700 m a.s.l.

The hybridization between *L. montandoni* and *L. vulgaris* is also interesting as it is the first instance reported from the southern slopes of the South Carpathians in Romania. It was previously known from the Eastern Carpathians (FUHN et al. 1975; HARTEL et al. 2006; GHERGHEL et al. 2008) and the northern slopes of Piatra Craiului in the South Carpathians (IFTIME 2004). The rare occurrence of morphologically manifest hybrids (also noted by LITVINCHUK et al. 2003, for the Carpathians in Ukraine), as well as their presence in small, temporary ponds only, supports our interpretation of hybridization as characteristic of situations where one or both newt species occur in small numbers. This can happen as a result of anthropogenic disturbances (see discussion in IFTIME 2004) afflicting the metapopulational dynamics of these species by increasing the occurrence of such events as destruction or formation of small ponds, which are colonized by small numbers of newts of both species. And it apparently happens in Iezer also, for we found hybrids only in such temporary ponds as wheel-ruts and stagnant water in a road; one of such locations was partly filled over within the short duration of our study, highlighting the ephemeral nature of newt habitats under anthropogenic stress and the increasingly dynamic nature of newt metapopulations under such conditions.

The observed mortality factors are multiple, including weather and predation, but the most important are the anthropogenic ones, i.e. roadkill and logging. Roadkill is massive along the Râuşor dam, and significant all over the area. Logging also impacts unfavorably amphibian and reptile species, especially through log traction and associated erosion, frequently resulting in the loss of amphibian breeding ponds and other needed habitats. These need to be mitigated to ensure the conservation of amphibian and reptile species, of which most are threatened and all are protected under Romanian law (see, e.g., discussion in IFTIME 2001).

REFERENCES

ARDELEAN, G. & BERES, I. (2000): Fauna de vertebrate a Maramureşului. Cluj-Napoca (Dacia), 378 pp. [in Romanian].

ARDELEAN, G. & TRIFONOF, P. (2000): Vertebratele din Þara Făgăraşului.- Satu Mare – Studii şi comunicări (Muz. Judeþean Satu Mare), Satu Mare; 1: 333-363 [in Romanian].

BABIK, W. & SZYMURA, J. M. & RAFINSKI, J. (2003): Nuclear markers, mitochondrial DNA and male secondary sexual traits variation in a newt hybrid zone (*Triturus vulgaris* x *T. montandoni*).- Molecular Ecology, Oxford [Blackwell]; 12 (7), 1913-1930.

COGĂLNICEANU, D. (1997): Practicum de ecologie a amfibienilor: Metode şi tehnici în studiul ecologiei amfibienilor. Bucureşti (Universităţii din Bucureşti), 122 pp. [In Romanian].

COGĂLNICEANU, D. & AIOANEI, F. & MATEI, B. (2000): Amfibienii din România. Determinator. Bucureşti (Ars Docendi), 99 pp. [in Romanian].

COGĂLNICEANU, D. & GHIRA, I. & ARDELEANU, A. (2001): Spatial distribution of herpetofauna in the Retezat Mountains National Park (Romania).- Biota, Race; 2 (1): 9-16.

COGĂLNICEANU, D. & HARTEL., T. & PLĂIAŞU, R. (2006): Establishing an amphibian monitoring program in two protected areas of Romania; pp. 31-34. In: VENCES, M. & KÖHLER, J. & ZIEGLER, T.& BÖHME, W. (eds): Herpetologia Bonnensis II. Proceedings of the 13th Congress of the Societas Europaea Herpetologica, 27 September – 2 October 2005, Bonn, Germany.

COVACIU-MARCOV S. D. & SAS I. & CUPŞA D. & MELEG, G. & BUD, B. (2003): Studii herpetologice în regiunea Munţilor Pădurea Craiului şi Plopişului (Judeţul Bihor).- Analele Univ. din Oradea, Oradea; (Fasc. Biol.) 10: 81-95 [in Romanian].

DEMETER, L. & HARTEL, T. & COGĂLNICEANU, D. (2006): Distribution and conservation status of the amphibians in the Ciuc basin, eastern Carpathians, Romania.- Zeitschrift fûr Feldherpetologie, Bochum, Bielefeld [Laurenti]; Supplement 10: 217-224.

FUHN, I. (1960): Amphibia. In: Fauna R.P.R., 14 (1), Bucureşti (Academiei R.P.R.), 200 pp. [In Romanian].

FUHN, I. (1963): Tritonul carpatic (*Triturus montandoni*) în munţii Făgăraşului.- Natura, Bucureşti; 1: 78-79 [In Romanian].

FUHN, I. (1969): Broaşte, şerpi, şopârle. Bucureşti (Sport-Turism), 246 pp. [In Romanian].

FUHN, I. & VANCEA, ST. (1961): Reptilia. In: Fauna R.P.R., 14, 2, Ed. Academiei Române, Bucureşti, 288 pp. [In Romanian].

GHINEA, D. (2002): Enciclopedia geografică a României. Ed. Enciclopedică, Bucureşti, 1456 pp. [In Romanian].

GHIRA, I. (1989): Contribuţii la cunoaşterea herpetofaunei din Retezatul calcaros.- Sargetia – Acta Musei Devensis, 20: 563-566 [In Romanian].

GHIURCĂ, D. & MUNTEANU, A. & FENERU, F. (2003): Some herpetological observations in Piatra Craiului national park.- Research in Piatra Craiului National Park, Braşov; 1: 273-274.

HARTEL, T. (2003): The breeding biology of the frog *Rana dalmatina* in Târnava Mare Valley, Romania.- Russian Journal of Herpetology, Moskva; 10 (3): 169-174.

IFTIME, A. (2001): „Lista Roşie comentată a amfibienilor şi reptilelor din România", Ocrotirea Naturii, nr. 44 – 45: 39-49, 2000-2001 [In Romanian].

IFTIME, A. (2003): Contributions to the knowledge of the ichthyofauna and herpetofauna of Piatra Craiului national park and its surrounding areas.- Research in Piatra Craiului National Park, Braşov; 1: 267-272.

IFTIME, A. (2004): Occurence of *Triturus vulgaris* - *Triturus montandoni* hybrids (Amphibia: Salamandridae) in disturbed habitats in the Piatra Craiului massif (Southern Carpathians, Romania).- Herpetozoa, Wien; 17 (1/2): 91-94.

IFTIME, A. (2005): Amphibia. Reptilia; pp. 173-214. In: BOTNARIUC, N. & TATOLE, V. (eds.): Cartea Roşie a vertebratelor României, Ed. Curtea Veche, Bucureşti [In Romanian].

KOTLIK, P. & ZAVADIL, V. (1999): Natural hybrids between the newts *Triturus montandoni* and *T. vulgaris*: morphological and allozyme data evidence of recombination between parental genomes.- Folia zoologica, Brno; 48 (3): 211-218.

LITVINCHUK, S. & BORKIN, L. J. & ROSANOV J. M. (2003): On distribution of and hybridization between the newts *Triturus vulgaris* and *T. montandoni* from Ukraine.- Alytes, Paris; 20: 161-168.

LODÉ, T. (1996): Polecat predation on frogs and toads at breeding sites in western France.- Ethology, Ecology & Evolution, Firenze; 8: 115-124.

MĂCIU, M. & CHIOREANU, A. & VĂCARU, V. (eds.) (1982): Enciclopedia geografică a României. Ed. Ştiinţifică şi Enciclopedică, Bucureşti, 847 pp. [In Romanian].

NÖLLERT, A. & NÖLLERT, C. (2003): Guide des amphibiens d'Europe. Biologie – identification – repartition. Paris (Delachaux et Niestlé), 383 pp.

SAWICKI, L. (1912): Les études glaciaire dans les Karpates. Aperçu historique et critique.- Annales de Géographie, Paris; 21: 230-250.

SCHLÜTER, U. (2004): Anmerkungen zur Herpetofauna der Südkarpaten.- Elaphe, Rheinbach; 13 (3): 75-80.

STUGREN, B. & GHIRA, I. (1993): Cercetări faunistice şi de bioproductivitate asupra amfibienilor şi reptilelor din Munţii Retezat; pp. 189-191. In: POPOVICI, I. (ed.): Parcul Naţional Retezat. Studii ecologice. Braşov (West Side) [In Romanian].

DATE OF SUBMISSION: October 29, 2008 Corresponding editor: Heinz Grillitsch

AUTHORS: Alexandru IFTIME, "Grigore Antipa" National Museum of Natural History, Bd. Kiseleff No. 1, sector 1, Bucharest, Romania, < aiftime@antipa.ro >; Oana IFTIME, Department of Microbial Genetics & Biotechnology, Faculty of Biology – University of Bucharest, Aleea Portocalelor 1-3 060101 sector 6, Bucharest, Romania, < dorinalexandru@yahoo.com >; Dorin Alexandru POP, Department of Animal Biology and General Ecology, Faculty of Ecology - Ecological University of Bucharest, Vasile Milea 1G, sector 6, Bucharest, Romania, < ioannees@yahoo.com >