

***Ichthyosaura (Mesotriton) alpestris* Low Altitude Population from Poiana Ruscă Mountains, Western Romania, Another Apuseni Mountains Scenario?**

Covaciu-Marcov Severus-Daniel*, Ilieș Alexandru*, Bogdan Horia-Vlad, Cicort-Lucaciu Alfred-Ștefan and Ferentî Sára

Department of Biology, Faculty of Sciences, University of Oradea, Universităţii str. No. 1, Oradea 410087, Romania (CMSD, BHV, CLAS, FS), and University of Oradea, Faculty of History, Geography and International Relation, Department of Geography, Tourism and Territorial Planning, Universităţii str. No. 1, Oradea 410087, Romania (IA)

Abstract.- *Ichthyosaura alpestris* was encountered for the first time ever at low altitudes in the western region of the Poiana Ruscă Mountains. The species comes down to 208m a.s.l., being present in forest habitats. On the eastern side of the massif, *I. alpestris* is absent from low altitudes and it is rare even at normal altitudes. The presence of these populations at low altitudes in a region found at the limit of sub-Mediterranean influences is explained by the existence of a glacial refuge for *I. alpestris* in this area, which migrated very little to the east afterwards, due to the massif's particularities. Thus, the presence of low altitude *I. alpestris* populations from the Poiana Ruscă Mountains is similar with that from the Apuseni Mountains, being determined by the same factors.

Key words: *Ichthyosaura alpestris*, low altitude population, Poiana Ruscă Mountains.

INTRODUCTION

The Poiana Ruscă Mountains are a small and rather short massif, belonging to the Western Carpathians (Mândruț, 2006). Because of this lower altitude, some mountain related species were not pointed out in this massif in the past. This is the case of the alpine newt, *Ichthyosaura (Mesotriton) alpestris*, which, in conformation with classic Romanian herpetology literature, should be absent from this massif (Fuhn, 1960; Cogălniceanu *et al.*, 2000; Iftime, 2005a). The newt's absence from the Poiana Ruscă Mountains seemed fine, *I. alpestris* being considered a species related to the mountains in Romania, found at altitudes starting from 500 or 700m a.s.l. (Fuhn, 1960; Cogălniceanu *et al.*, 2000). This is why only a fraction of the massif would suit its ecological demands. Only recently, the species was indicated for the Poiana Ruscă Mountains, in only one location (Ghira *et al.*, 2002). It is situated in the higher area of the massif, at over 800m a.s.l., thus in the normal altitude limit of the newt for

Romania. Despite the fact that in the last few years *I. alpestris* was encountered in many different areas of Romania (*e.g.* Iftime, 2005b; Strugariu *et al.*, 2006; Covaciu-Marcov *et al.*, 2008; Gherghel and Ile, 2006; Gherghel *et al.*, 2008), the western Apuseni Mountains is the only region where the species frequently comes down under its altitude limit, reaching all the way to 150 m a.s.l. (Covaciu-Marcov *et al.*, 2009a). The aim of our present study is to indicate, as a premiere for the western Poiana Ruscă Mountains, a second region in Romania where *I. alpestris* comes down to very low altitudes. Recently, the name of the mountain newt genus has changed from *Triturus* to *Mesotriton*, while presently it is used the *Ichthyosaura* name (Schmidtler, 2009).

MATERIALS AND METHODS

The study took place in the springs of 2009 and 2010. In 2009 we had the chance of encountering 3 low altitude localities in the north-western part of the Poiana Ruscă Mountains. Consequently, in 2010, we've investigated the entire massif and identified other low altitude populations. The Poiana Ruscă Mountains are situated in the south-eastern part of Romania, being separated to

* Corresponding authors: scovaciu@uoradea.ro - ilies@uoradea.ro

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the north from the Apuseni Mountains by the Mureş River and to the south, from the Southern Carpathians by the Bistra River (Posea and Badea, 1984). Also to the north, the massif is flanked by the Lugoş and Lăpuş Hills (Posea and Badea, 1984). Its maximum altitude - 1374m a.s.l. - is on Padeşu Peak (Tufescu, 1986).

The alpine newts were captured from their aquatic habitats with nets mounted on long (2m) metallic poles, handled either from the sides or sometimes directly from the water. We investigated most of the localities surrounding the Poiana Ruscă Mountains and the bordering hills. We particularly searched all the forest sectors. After determining and sometimes photographing, the animals were set free in their original habitats.



Fig. 1. The location of low altitude *I. alpestris* populations from Poiana Ruscă Mountains.

RESULTS

We identified 20 low altitude *I. alpestris* populations (Table I) in the areas surrounding the Poiana Ruscă Mountains (Fig. 1). All these localities represent new indications, the species not being encountered before on the western side of the massif. *I. alpestris* populates both the Poiana Ruscă Mountains and the Lugoş and Lapuş Hills. Surprisingly, the species is also present in the Bulza Hills, too. They belong to the Lipova Hills, being situated to the north of the Poiana Ruscă Mountains, between the Lăpuş Hills and the Mureş River. The lowest altitude that we found the species at in the

region was 208m a.s.l., near the village of Drinova. Low altitude alpine newt populations are present along the entire western side of the massif, including its south-western part. These low altitude localities from the Poiana Ruscă Mountains are situated more to the south than those from the Apuseni Mountains and thus in a climate even more surprising for a species with the ecological needs such as *I. alpestris*.

Table I.- *M. alpestris* distribution localities in Poiana Ruscă Mountains (Cs - Caraş-Severin County, Tm - Timiş County).

Locality	Geographical coordinates	Altitude
Barajul Fârdea Strâmtori (Tm)	45°45'06,70" N // 22°07'35,98" E	218 m
Boteşti (Tm)	45°42'46,05" N // 22°05'36,29" E	251 m
Drăgsineşti (Tm)	45°47'10,50" N // 22°12'20,03" E	246 m
Drinova (Tm)	45°40'01,45" N // 22°04'22,21" E	208 m
Coşteiu de Sus (Tm)	45°54'36,93" N // 22°21'47,64" E	291 m
Fărăşeşti (Tm)	45°47'54,57" N // 22°20'48,12" E	286 m
Fârdea (Tm)	45°44'32,22" N // 22°10'49,36" E	221 m
Gladna Montană (Tm)	45°44'23,63" N // 22°11'27,69" E	329 m
Gladna Româna (Tm)	45°44'18,27" N // 22°14'53,13" E	308 m
Hăuzeşti (Tm)	45°41'26,46" N // 22°09'35,12" E	288 m
Jureşti / Pogăneşti (Tm)	45°41'56,34" N // 22°01'54,12" E	269 m
Luncanii de Jos (Tm)	45°44'04,04" N // 22°18'48,23" E	361 m
Nădrag (Tm)	45°37'57,46" N // 22°12'01,62" E	340 m
Nemeşeşti (Tm)	45°53'30,98" N // 22°20'23,95" E	213 m
Oţelu Roşu (Cs)	45°31'47,85" N // 22°22'10,81" E	305 m
Pietroasa (Tm)	45°49'48,42" N // 22°22'09,02" E	238 m
Rusca Montană (Cs)	45°34'48,05" N // 22°26'55,30" E	395 m
Valea lui Liman (Tm)	45°45'09,63" N // 22°19'35,66" E	308 m
Voislova (Cs)	45°32'43,36" N // 22°27'44,10" E	347 m
Zold (Tm)	45°45'14,48" N // 22°15'39,54" E	326 m

All alpine newt populations were found in forest areas – either inside of a woodland or, rarer on the skirts of one. *I. alpestris* usually mates in smaller habitats like ditches from along country or forest roads, puddles or small areas of stagnant water near streams or torrents. In rare situations, the alpine newt is encountered in larger still water accumulations (including artificial) such as ponds formed through damming streams. In most cases, *I. alpestris* is the only newt species occupying its habitat. However, it has been identified together

with *Lissotriton vulgaris* or *Triturus cristatus* or even both at the same time. Also generally speaking, the common frog *Rana temporaria* reproduces in the same habitats as the alpine newt. In some cases, in the habitats of the mountain newts there are also present other amphibian species, such as *Bombina variegata*, *Bufo bufo*, *Hyla arborea*, *Rana dalmatina* or *Salamandra salamandra* larvae.

DISCUSSION

I. alpestris' previous distribution in the Poiana Ruscă Mountains seemed very logical judging by the specie's needs in Romania (Fuhn, 1960; Cogălniceanu *et al.*, 2000; Iftime, 2005a). Thus, the newts seemed to be present only at normal altitudes of over 800 m, being rare in a massif situated to the south of the Apuseni Mountains. This is how our surprise finding of these alpine newt populations in the Poiana Ruscă Mountains totally dismisses the theory of a normal distribution in this area. Explaining how a mountain related species is present at a low altitude, in a region from south-western Romania with sub-Mediterranean climate influences (Mândruț, 2006) seems extremely difficult.

The presence of low altitude *I. alpestris* populations in the Poiana Ruscă Mountains cannot be explained by nowadays climate conditions. That is because the thermal regime from the region is higher and the amount of precipitations is lower than other areas of the country where the species is found at normal altitudes (Stoenescu *et al.*, 1966). The most eloquent comparison is the one with the northern part of Moldova where the species never comes down to such low altitudes (Strugariu *et al.*, 2006; Covaciu-Marcov *et al.*, 2008) despite the climate being much more in its favour. Furthermore, in the Ciuc Depression – one of the coldest areas of Romania – *I. alpestris* is found only at altitudes of 847 m a.s.l. or higher (Demeter *et al.*, 2006).

If the presence of the low altitude populations would be determined by a colder and more humid climate, it would be expectable that *I. alpestris* be common and more abundant on the eastern side of the Poiana Ruscă Mountains – a side oriented towards the Transylvanian Plateau – where the climate regime is more favourable for the species.

However, this fact is not confirmed. On the eastern side, the alpine newt was only identified here once and at high altitudes (Ghira *et al.*, 2002). On the other side, we, too, have investigated the eastern side of the massif in order to re-check the specie's distribution and found no populations what so ever. We went searching all the way to 860 m a.s.l., but still didn't encounter any alpine newts.

This is how *I. alpestris* is present at low altitudes in the Poiana Ruscă Mountains but only on the western side, in the sectors where the climate is least favourable for it. Taking this into consideration, we believe that the species' presence in the region cannot be explained by any present climate factor, only through past causes. Prior to this study, the presence of the alpine newt at low altitudes, to the west of the Apuseni Mountains, was considered a consequence of the existence of a secondary glacial refuge for the Apuseni populations group (Covaciu-Marcov *et al.*, 2009a). Thus, just like for the western side of the Apuseni Mountains, the western side of the Poiana Ruscă Mountains held another secondary refuge for this species. The existence, in the past, of a glacial refuge in the lower sectors near the Banat Mountains was suggested for some plant species, as well (Pașcovschi, 1967).

In the last glacial maximum (LGM) *I. alpestris* survived on the western side of the Poiana Ruscă Mountains because the areas is sheltered by higher mountains that flank the massif to the north, east and south-east. To the west, the Poiana Ruscă Mountains border the Pannonian Plain, a region where the presence of woodland in the LGM was recently demonstrated (Ravazzi, 2002). Together with the warming of the climate, *I. alpestris* migrated to the east, reaching the higher areas of the massif, in conformation with its climate gradient. To the north, its migration was blocked by the Mureș River. Once it reached the highest sectors of the mountain, the advance of the species was halted, because it couldn't come down to areas where the temperature was warmer than the areas where it already lived. This is how we explain the absence or the rarity of the species from the eastern side of the massif. The *I. alpestris* populations from the Poiana Ruscă Mountains behaved just like the ones from the Apuseni Mountains (Covaciu-Marcov *et al.*,

2009a), following the same evolution simply because that evolution was governed by the exact same factors. These data argue again the importance of the Carpathian Basin as a glacial refuge, where many species linked to a colder climate had survived (eg: Wallis and Arntzen, 1989, Brunhoff *et al.*, 2003; Palme *et al.*, 2003; Babik *et al.*, 2005; Ursenbacher *et al.*, 2006).

It is likely that in the LGM the Poiana Ruscă Mountains populations were separated from those in the Apuseni Mountains and they are still separated by them by the Mureş River. This fact indicates a triple division of the refuge situated between the Pannonian Plain and the Western Carpathians. A double fragmentation was previously invoked, proved by the survival of *Lissotriton montandoni* in the western Oaş Mountains, to the north of the Someş River, and the survival of *I. alpestris* to the west of the Apuseni Mountains and to the south of the Someş River (Covaciu-Marcov *et al.*, 2007, 2009a). Presently, the triple fragmentation is proved by identifying of the second group of *I. alpestris*, separated to the one from the Apuseni. This detail confirms the dividing of classic refuges into sub-refuges (Gomez and Lundt, 2006). Different groups of populations survived in different refuges but not all had the same importance in the following colonization of the nowadays' area (Babik *et al.*, 2005, Magri *et al.*, 2006, Ursenbacher *et al.*, 2008, Liepelt *et al.*, 2009). The *I. alpestris* group from the Poiana Ruscă Mountains represents a southern group, present mostly in its former refuge – just like the one from the Apuseni.

Most likely the *I. alpestris* population group from the Poiana Ruscă Mountains is not currently in contact with any other alpine newt population. The link is highly improbable to the north because of the Mureş River. The only possible link seems to be the Iron Gate of Transylvania where the altitude is of about 700m a.s.l. (Tufescu, 1986). However, this link seems rather unlikely as well, because the *I. alpestris* group from the Southern Carpathians seems to be quartered to the highest altitudes from the country – on the Jiu River Defile, in the Parâng Mountains, it is identified only from 1200m a.s.l. up (Covaciu-Marcov *et al.*, 2009b). The situation seems more general, some plant species being present in the Banat Mountains at lower altitudes

than in the Southern Carpathians, too (Paşcovschi, 1956). We, too, have investigated the distribution of the species in the Southern Carpathians, in the Small Mountain (Muntele Mic) region, starting from the inferior limit of the massif. Up until 700 m a.s.l. we did not identify the species. Only from 700m a.s.l. does the alpine newt occur, thus from normal altitudes for the species. Hence, the communication between the populations from the Southern Carpathians and the ones from the Poiana Ruscă Mountains seems unlikely, but, for now, it can't be ruled out.

REFERENCES

- BABIK, W., BRANICKI, W., CRNOBRNJA-ISAILOVIC, J., COGĂLNICEANU, D., SAS, I., OLGUN, K., POYARKOV, N.A., GARCIA-PARIS, M. AND ARNTZEN, J.W., 2005. Phylogeography of to European newt species - discordance between mtDNA and morphology. *Mol. Ecol.*, **14**: 2475-2491.
- BRUNHOFF, C., GALBREATH, K.E., FEDOROV, V.B., COOK, J.A. AND JAAROLA, M., 2003. Holarctic phylogeography of the root vole (*Microtus oeconomus*): implications for late Quaternary biogeography of high latitudes. *Mol. Ecol.*, **12**: 957-968.
- COGĂLNICEANU, D., AIOANEL, F. AND BOGDAN, M., 2000. *Amfibienii din România, Determinator*. Ed. Ars Docendi, Bucureşti.
- COVACIU-MARCOV, S.D., CICORT-LUCACIU, A.Ş. AND FERENŢI, S., 2007. Some low altitude *Triturus montandonii* (Amphibia: Salamandridae) population records from Oaş region, North-Western Romania. *N. West. J. Zool.*, **3**: 109-114.
- COVACIU-MARCOV, S.D., CICORT-LUCACIU, A.Ş., SAS, I., STRUGARIU, A., CACUCI, P. AND GHERGHEL, I., 2008. Contributions to the knowledge regarding the composition and geographical distribution of the herpetofauna from Northern Moldavia (Suceava and Botoşani Counties, Romania). *N. West. J. Zool.*, **4(Suppl. 1)**: S25-S47.
- COVACIU-MARCOV, S.D., CICORT-LUCACIU, A.Ş., SAS, I., ILIEŞ, D.C. AND JOSAN, I., 2009a. Explaining the presence of low altitude *Mesotriton alpestris* (Laurenti, 1768) populations from the Apuseni Mountains, Western Romania – a possible zoogeographical scenario. *N. West. J. Zool.*, **5**: 406-419.
- COVACIU-MARCOV, S.D., CICORT-LUCACIU, A.Ş., DOBRE, F., FERENŢI, S., BIRCEANU, M., MIHUŢ, R. AND STRUGARIU, A., 2009b. The herpetofauna of the Jiului Gorge National Park, Romania. *N. West. J. Zool.*, **5(Suppl. 1)**: S01-S78.
- DEMETER, L., HARTEL, T. AND COGĂLNICEANU, D.,

2006. Distribution and conservation status of amphibians in the Ciuc basin, Eastern Carpathians, Romania. *Z. Feldherpetol*, **10 (Supplement)**: 217-224.
- FUHN, I., 1960. "Fauna R.P.R.", vol. XIV, Fascicola I, *Amphibia*. Editura Academiei R.P.R., București.
- GHERGHEL, I. AND ILE, R.D., 2006. Contributions to the distribution of Amphibia, Caudata in Neamț County, Romania. *N. West. J. Zool.*, **2**: 44-46.
- GHERGHEL, I., STRUGARIU, A., GHIURCĂ, D. AND CICORT-LUCACIU, A.Ș., 2008. The herpetofauna from the Bistrița river basin (Romania): geographical distribution. *N. West. J. Zool.*, **4(Suppl. 1)**: S71-S103.
- GHIRA, I., VENCZEL, M., COVACIU-MARCOV, S.D., MARA, GY., GHILE, P., HARTEL, T., TÖRÖK, Z., FARKAS, L., RÁCZ, T., FARKAS, Z. AND BRAD, T., 2002. Mapping of Transylvanian Herpetofauna. *Nymphaea, Folia Naturae Bihariae*, **29**: 145-203.
- GOMEZ, A. AND LUNDT, D.H., 2006. Refugia within refugia: patterns of phylogeographic concordance in the Iberian Peninsula. In: *Phylogeography of Southern European Refugia* (eds. S. Weiss and N. Ferrand), pp. 155-188. Springer, Netherlands.
- IFTIME, A., 2005a. Amfibieni și Reptile. In: *Cartea Roșie a Vertebratelor din România* (eds. Botnariuc and Tatole), pp. 1-231, Ed. Acad. Române.
- IFTIME, A., 2005b. Notes on the amphibians and reptiles in the region of Vidraru dam lake southern cline of the Făgăraș Massif, Romania. *Trav. Mus. Nat. Hist. Nat. Grigore Antipa.*, **48**: 317-326.
- LIEPELT, S., CHEDDADI, R., DE BEAULIEU, J.L., FADY, B., GÖMÖRY, D., HUSSENDÖRFER, E., KONNERT, M., LITT, T., LONGAUER, R., TERHÜRNEBERSON, R. AND ZIEGENHAGEN, B., 2009. Postglacial range expansion and its genetic imprints in *Abies alba* (Mill.) – A synthesis from paleobotanioc and genetic data. *Rev. Palaeobot. Palynol.*, **153**: 139-149.
- MAGRI, D., VENDRAMIN, G.G., COMPS, B., DUPANLOUP, I., GEBUREK, T., GÖMÖRY, D., LATAŁOWA, M., LITT, T., PAULE, L., ROURE, J.M., TANTAU, I., VAN DER KNAAP, W.O., PETIT, R.J. AND DE BEAULIEU, J.L., 2006. A new scenario for the Quaternary history of European beech populations: palaeobotanical evidence and genetic consequences. *New. Phytol.*, **171**: 199-221.
- MÂNDRUȚ, O., 2006. *Mic Atlas de Geografie a României*. Ed. Corint, București.
- PALME, A.E., SU, Q., RAUTENBERG, A., MANNI, F. AND LASCOUX, M., 2003. Postglacial recolonization and cpDNA variation of silver birch, *Betula pendula*. *Mol. Ecol.*, **12**: 201-212.
- PAȘCOVSCI, S., 1956. Câteva considerații biogeografice asupra Munților Banatului. *Ocotirea Naturii*. **2**: 111-134.
- PAȘCOVSCI, S., 1967. *Sucesiunea speciilor forestiere*. Ed. Agro-Silvică, București.
- POSEA, G. AND BADEA, L., 1984. *România, Harta Unităților de relief (Regionarea geomorfologică)*. Ed. Științifică și Enciclopedică, București.
- RAVAZZI, C., 2002. Late Quaternary history of spruce in southern Europe. *Rev. Palaeobot. Palynol.*, **120**: 131-177.
- SCHMIDTLER, J. F., 2009. *Ichthyosaura*, der neue Gattungsname für der Bergmolch – ein Lehrbeispiel in Sachen Nomenklatur. *Z. Feldherpetol*, **16**: 245-250.
- STRUGARIU, AL., GHERGHEL, I., VOLOSCIUC-HUTULEAC, M.V., SĂHLEAN, T.C., SAS, I. AND PUȘCAȘU, C.M., 2006. Preliminary data concerning the distribution of amphibian fauna in Suceava County (Romania). *Analele Univ. din Oradea, Fasc. Biol.*, **13**: 39-47.
- STOENESCU, Ș.M., ȘCHIOP, A., DICA, I., POPESCU, E., PATRICHI, E. AND ȚEPEȘ, E., 1966. *Atlasul climatologic al R. S. R.*, București.
- TUFESCU, V., 1986. *Harta R. S. România*. Ed. Did. și Pedag., București.
- URSENBACHER, S., CARLSSON, M., HELFER, V., TEGELSTRÖM, H. AND FUMAGALLI, L., 2006. Phylogeography and Pleistocene refugia of the adder (*Vipera berus*) as inferred from mitochondrial DNA sequence data. *Mol. Ecol.*, **15**: 3425-3437.
- URSENBACHER, S., SCHWEIGER, L., TOMOVIĆ, L., CRNOBRNJA-ISAILOVIĆ, J., FUMAGALLI, L. AND MAYER, W., 2008. Molecular phylogeography of the nose-horned viper (*Vipera ammodytes*, Linnaeus (1758): Evidence for high genetic diversity and multiple refugia in the Balkan peninsula. *Mol Phylogenet. Evol.*, **46**: 1116-1128.
- WALLIS, G.P. AND ARNTZEN, J.W., 1989. Mitochondrial - DNA variation in the crested newt superspecies; limited cytoplasmic gene flow among species. *Evolution*, **43**: 88-104.

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