IN WATER WITH THE ENEMY! A *Lissotriton vulgaris* (AMPHIBIA: SALAMANDRIDAE) PAEDOMORPH LIVING TOGETHER WITH THE NON-NATIVE FISH, *Perccottus glenii* (PISCES: ODONTOBUTIDAE) IN ROMANIA

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Abstract. Paedomorphosis is a rare phenomenon, with remarkable evolutionary and conservative implications. Paedomorphic newts are sensitive to different threats, invasive fish eliminating many populations. In spite of this, in March 2016 we identified in south-western Romania a *Lissotriton vulgaris* paedomorphic female, together not only with fish, but with the invasive fish *Perccottus glenii*, known as a great danger for newts. This is the eighth record of paedomorphic newts in Romania, and the first in the Banat region. The habitat was an artificial channel surrounded by agricultural plain areas. The paedomorhic female's dimension, colour and cloacal shape were as in adult metamorphs. Probably in the region *P. glenii* did not yet succeed to eliminate paedomorphic or metamorphic newts. If in other areas *P. glenii* had this effect, it is hard to believe that something from south-western Romania will succeed to modify the result of this interaction.

Keywords: altered habitats, facultative paedomorphosis, invasive fish, newts.

Rezumat. În apă cu dușmanul! Un paedomorph de *Lissotriton vulgaris* (Amphibia: Salamandridae) trăind alături de peștele non-nativ *Perccottus glenii* (Pisces: Odontobutidae) în România. Pedomorfoza este un fenomen rar, cu implicații evolutive și conservative remarcabile. Tritonii pedomorfi sunt sensibili față de diferite pericole, peștii invazivi eliminând multe populații. În ciuda acestui fapt, în martie 2016 am identificat în sud-vestul României o femelă pedomorfă de *Lissotriton vulgaris*, împreună nu cu oricare pește, ci cu specia invazivă *Perccottus glenii*, cunoscută ca un mare pericol pentru tritoni. Aceasta este a opta identificare a unor tritoni pedomorfi în România, şi prima semnalare în regiunea Banatului. Habitatul a fost canal artificial, înconjurat de zone de câmpie agricole. Femela a avut dimensiunile, coloritul şi cloaca ca la adulţii metamorfi. Probabil în regiune *P. glenii* nu a reușit încă să elimine atât tritonii metamorfi cât și pe cei pedomorfi. Dacă în alte zone *P. glenii* are acest efect, este greu de crezut ca ceva din sud-vestul României va reuși să modifice rezultatul acestei interacțiuni.

Cuvinte cheie: habitate alterate, pedomorfoză facultativă, pește invaziv, tritoni.

INTRODUCTION

One of the many threats for paedomorphic newts are non-native fish introduced in their habitats (e.g. DENOËL et al., 2005a, 2016). One of the most invasive non-native fish in Europe, which colonised large areas in the eastern part of the continent, is *Perccottus glenii* Dybowski, 1877 (e.g. RESHETNIKOV, 2004, 2013). This fish has a very negative impact on newts (e.g. RESHETNIKOV & MANTEIFEL, 1997; KUZMIN, 2001; RESHETNIKOV, 2003, 2008; POPOV, 2014), but, to our best knowledge, it was not recorded beside paedomorphic newts. Although the negative impact of fish is also clear in the case of metamorphic newts (e.g. HECNAR & M'CLOSKEY, 1997; WINANDY et al., 2015; CABRERA-GUZMÁN et al., 2017; PRÉAU et al., 2017; TIBERTI, 2018), their impact upon paedomorphic newts is even greater (e.g. DENOËL & FICETOLA, 2014; WINANDY & DENOËL, 2015). Paedomorphosis was registered in many European newts (e.g. LITVINCHUK et al., 1996; DENOËL et al., 2001; CEACERO et al., 2010; GVOŽDÍK et al., 2013, PIZZUTI PICCOLI, 2013; MESTER et al., 2013; PATERSON, 2017; SOTIROPOULOS et al., 2017). In Romania, the paedomorphic newts are rare, mentioned only in *Lissotriton vulgaris* Linnaeus, 1758, in seven localities (COVACIU-MARCOV et al., 2013; STĂNESCU et al., 2014). The present paper mentions a new distribution locality for paedomorphic *L. vulgaris* in Romania.

MATERIAL AND METHODS

The paedomorphic newt habitat is situated in the Banat region in south-western Romania, near the border with Serbia, in the region of Otelec locality. This region is localized in the drainage basin of the Bega River, in the Timiș Plain (MÂNDRUȚ, 2006). The Banat plains are transformed in agricultural terrains, being more unfavourable for amphibians than other western Romanian plains (BOGDAN et al., 2013). This is also obvious in Otelec, a locality surrounded by intensively exploited agricultural areas. Wetlands are just some remnants of the original large wetlands of the area, many of the actual wet areas are drainage canals situated between agricultural terrains. The habitat in which the paedomorphic newts were encountered is an artificial canal, situated close to a road.

The paedomorphic female was captured with a round net with a long metallic handle. Because we did not expect such discovery, we did not have an aquarium, so the newt was photographed in a small bucket. After being photographed, the paedomorph was released in its habitat, like the other amphibians. We did not measure it because of its fragility. Its size was given relatively, reporting its dimensions to the recipient where it was photographed.

RESULTS

On 13 March 2016 we identified a *L. vulgaris* paedomorphic female south from Otelec (Fig. 1). It was encountered in an artificial canal, close to a road. South, it continues with a network of ditches situated near roads and agricultural fields, and north with a larger channel, of at least four metres width and one meter depth, diverged from the Bega River. In the place where the newt was identified, the channel has one meter width with 80 cm deep water, with steep edges, and concrete wall near the road (Fig. 2). The water has rich aquatic vegetation.

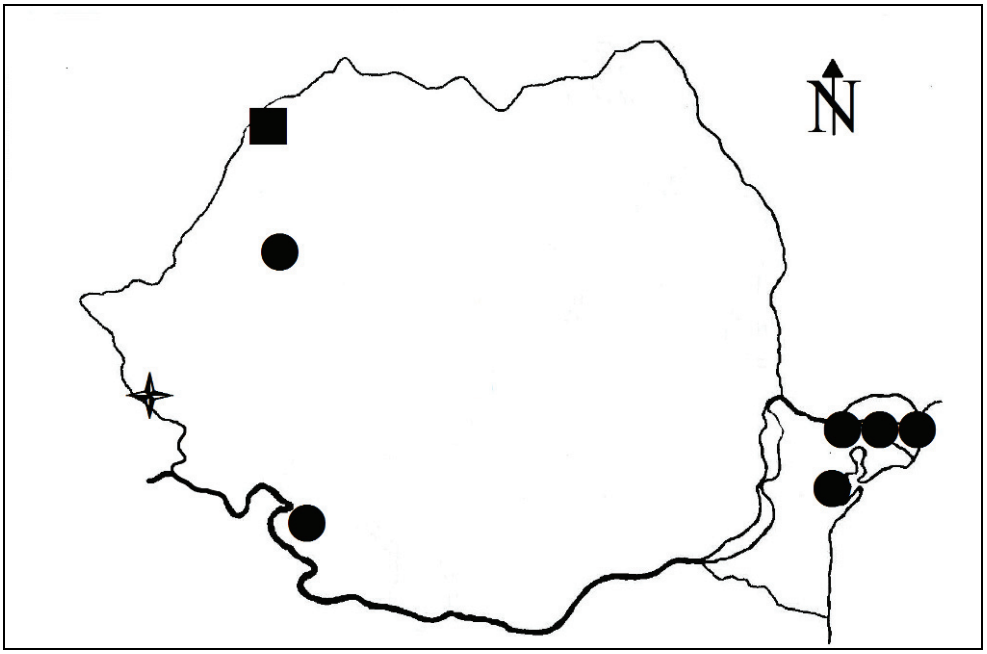

Figure 1. *L. vulgaris* paedomorphs` distribution in Romania (●- previous records mentioned in Stănescu et al., 2014, ■ - previous record in Covaciu-Marcov *et al.* 2013, + - new record at Otelec).

Figure 2. The *Lissotriton vulgaris* paedomorph`s habitat from Otelec (original).

Beside the paedomorphic *L. vulgaris* female, we also captured *L. vulgaris* metamorphs (7 males and 9 females), *Bombina bombina* (Linnaeus, 1761) and *Pelophylax ridibundus* (Pallas, 1771) individuals. Among fish we captured seven *P. glenii*, and some *Carassius gibelio* (Bloch, 1782) individuals. Reporting it to the dimensions of the recipient in which the paedomorph female was photographed, it had a total length of approximately 7.5 cm, with more than 5 mm length guilds (Fig. 3).

Figure 3. The paedomorphic *L. vulgaris* female from Otelec.

DISCUSSION

The record at Otelec is the eighth in Romania (COVACIU-MARCOV et al., 2013; STĂNESCU et al., 2014). The habitat is artificial as in the case of many paedomorphic populations (e.g. COVACIU-MARCOV et al., 2011a; GVOŽDÍK et al., 2013; PIZZUTI PICCOLI, 2013; SOTIROPOULOS et al., 2017). At Otelec, the fact that the paedomorph was present beside fish is unusual, because the negative impact of fish on newts (e.g. HECNAR & M'CLOSKEY, 1997; WINANDY et al., 2015; CABRERA-GUZMÁN et al., 2017; PRÉAU et al., 2017; TIBERTI, 2018). Although in Romania paedomorphs were encountered in other cases beside fish (GHERGHEL et al., 2010; COVACIU-MARCOV et al*.,* 2011a; STĂNESCU et al., 2014), paedomorph and metamorph newts are present at Otelec alongside the fish *P. glenii*. This is a real danger for newts and other amphibians (MANTEIFEL, 1997; KUZMIN, 2001; e.g. RESHETNIKOV et al., 2002; RESHETNIKOV, 2003, 2008; POPOV, 2014). Generally the appearance of paedomorphosis is difficult to explain (e.g. WHITEMAN, 1994; DENOËL et al., 2001, 2005b), especially at Otelec, where the paedomorph newt was present beside an invasive fish, which is known to negatively affect the newts (e.g. KUZMIN, 2001; RESHETNIKOV, 2003, 2008; POPOV, 2014). Probably the time was not yet enough for *P. glenii* to eliminate both newt morphs, because it reached the region recently (COPILAȘ-CIOCIANU & PÂRVULESCU, 2011; COVACIU-MARCOV et al., 2011b, 2017). It is also possible that the rich aquatic vegetation favour newts, like in other cases (e.g. JOLY et al., 2001; HARTEL et al*.,* 2007). The coexistence between paedomorphic newts and fish was previously considered possible because of the aquatic vegetation (e.g. COVACIU-MARCOV et al., 2011a; STĂNESCU et al., 2014; KIZIL et al., 2016). But in his turn *P. glenii* also use the sectors with aquatic vegetation (e.g. RESHETNIKOV, 2008; RESHETNIKOV & CHIBILEV, 2009; RECHULICZ et al., 2015) and can feed with smooth newts (RESHETNIKOV & MANTEIFEL, 1997; RESHETNIKOV, 2008; TELCEAN & CICORT-LUCACIU, 2016).

The appearance of paedomorphosis has multiple possible explanations (e.g. WHITEMAN, 1994; DENOËL et al., 2001, 2005b; DENOËL & FICETOLA, 2014). In Romania was considered that a mild winter could favor the phenomenon (COVACIU-MARCOV & CICORT-LUCACIU, 2007; GHERGHEL et al*.,* 2010). The captured paedomorph had the dimensions and the colour of an adult metamorph female; the cloacae external morphology was like at adult females, this being the most reliable differential character between overwintering larvae and paedomorphs (DENOËL, 2017). At least the larger channel is too deep to freeze to the bottom in normal winters, and the Banat region has warmer climate than many regions in Romania (MÂNDRUȚ, 2006). It is possible that the paedomorph lives in this deep channel, and has accidentally reached the narrow and shallow sector. Possibly in this large part of the channel the paedomorphs avoided the contact with *P. glenii*, because they manage better in the water mass, where they feed, compared with metamorphs (e.g. DENOËL & JOLY, 2001; LEJEUNE et al., 2018), while *P. glenii* prefers the vegetation near the banks (e.g. RESHETNIKOV, 2008; RESHETNIKOV & CHIBILEV, 2009; POPOV, 2014; RECHULICZ et al*.,* 2015).

At Otelec the habitat is surrounded by strongly altered areas, the newts being deprived of terrestrial habitats, which is a general situation in Banat plains (BOGDAN et al., 2013). Terrestrial habitat alteration was previously indicated as a possible cause for paedomorphosis in Romania (e.g. COVACIU-MARCOV et al., 2011a). Probably in this case the change of their terrestrial habitat in agricultural terrains keeps the newts in the water where *P. glenii* is waiting for them. It is difficult to believe that if in other cases *P. glenii* negatively affected metamorphic newts

(RESHETNIKOV & MANTEIFEL, 1997; e.g. KUZMIN, 2001; RESHETNIKOV, 2003, 2008; POPOV, 2014), in south-western Romania this interaction will not take place. Large *P. glenii* individuals consumed newts even in Romania, and their food composition is similar (TELCEAN & CICORT-LUCACIU, 2016). Consequently, it is possible that the paedomorphic newt is both the first and the last mention in the region. At Otelec the phenomenon was probably caused by a combination between favorable climatic conditions and terrestrial habitats that became unfavorable to metamorphs, but it will be definitively abolished from the region by the negative effect of the invasive fish on newts.

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