

Big and nonmethamorphic *Triturus cristatus* larvae from north-western Romania

Severus-Daniel COVACIU-MARCOV^{1,*} and Alfred-Ştefan CICORT-LUCACIU¹

1. University of Oradea, Faculty of Sciences, Department of Biology; 1 Universităţii str., 410087- Oradea, Romania

* Corresponding author's address: S.D. Covaciu, Marcov: University of Oradea, Faculty of Sciences, Department of Biology;
1 Universităţii str., 410087- Oradea, Romania, E-mail: scovaciu@uoradea.ro

Abstract. In spring of the year 2007 we identified in a fountain from the north-western Romania a population of *Triturus cristatus* consisted of metamorph individuals, as well as large nonmetamorph larvae. These larvae emanate from the previous year, passing over the winter in the specified habitat, being already observed in March, before the newts lay their eggclutches of the current year. The cause of the survival of the larvae over the winter in this phase of development is probably due to the climate conditions of the previous year, characterized by a rainy summer, followed by a mild winter, which held the habitat clear from drought and frost.

Keywords: *Triturus cristatus*, larvae, metamorphos, paedomorph

The existence of newt implicates two stages: the aquatic larvae with gill breathing and the terrestrial adult with pulmonary breathing (Fuhn 1960). Usually, in Europe newts reproduce in spring when they are in the water, and then move to the terrestrial environment. The larvae grow in the water, at the beginning of the autumn they metamorphosed and pass to the terrestrial environment life (Cogălniceanu et al. 2000). However, sometimes exceptions appear, in the cases of some larvae the metamorphosis no longer takes place or it is postponed. The larvae grow in dimension, passing the winter, and sometimes they even develop sexual organs. Paedomorphs have the normal dimensions of the adult, but they have external gills. The phenomenon is largely spread at Urodels, the appearance being observed at many species (Radovanovic 1961, Dély 1967, Kalezić et al. 1990, 1994, Litvinchuk et al. 1996, Denoël et al. 2005a, Kaya et al. 2008). In Romania paedomorphosis was pointed out at one species, *Lissotriton vulgaris* (Fuhn 1960, 1963, Covaciu-Marcov & Cicort-Lucaciu 2007). There are cases in which some larvae don't grow in dimension, but they pass through winter in this stage, metamorphosing in spring (Necas et al. 1997).

In 2007 we found in a fountain from the north-west of Romania a population of *Triturus cristatus* consisting of metamorph and big sized larvae remained from the previous year. These had the the aspect and the dimensions characteristic for the *Triturus cristatus* larvae (Fuhn 1960, Cogălniceanu et al. 2000). The length of a larvae was 49mm, and the dimensions of the longest gill was 6.7mm. In the water were present gilled individuals as well as metamorph adults. Unlike the situation from

Arad county at *Lissotriton vulgaris* (Covaciu-Marcov & Cicort-Lucaciu 2007), here the gilled individuals were in majority. Nonmetamorph larvae were observed in three different dates: 28 III, 26 IV, 10 V, 4 on first date and then 3 / date, while metamorphs were only 1 or 2. Some were standing in the cracks between the rocks which compose the fountain walls, and the other where captured from the water mass by dredging. In summer we returned on two occasions at the habitat, in the VII and VIII month, but we did not find any newts. The larvae either metamorphosed or, because of the really hot and dry summer of 2007, got back in the deep and cold area of the fountain, we had just a 3 m long net.

Obviously, these larvae did have neither the size nor the pattern characteristic of the adults (Fig. 1). But the fact that the first observation was made in March obviously indicated that these emanate from the previous layed eggclutches and they survived over the winter. As well, at all the captures, therefore during one and a half month, the larvae remained at the same dimension and aspect. The survival of the larvae over winter was previously signalized as a rare phenomenon (Necas et al. 1997), but here has bigger dispersion, affecting a big number of individuals. Although they are not paedomorphs in the real meaning of the word, these are stable in size and in number. The limitation of the size of individuals is probably dictated by the reduced dimension of the habitat. It must be specified that the metamorphs can easily leave from the fountain, the wall being perforated onto more centimeters exactly at the ground level.



Figure 1. The fountain from the north-west of Romania with the studied *Triturus cristatus* population and one of the observed nonmethamorphic larvae

The population is located near Odeşti locality, Maramureş County. The region is positioned at the foothill of Măgura Codrului, at an altitude of approximate 250m. The newts occupy a fountain that is used for watering the cattles, situated on a pasture. The water was clear, next to crested newts in the fountain, individuals of *Lissotriton vulgaris* and *Bombina variegata* were found, together with rich fauna of invertebrates.

The identification of the a *Triturus cristatus* nonmetamorphs larvae in western Romania in the same year in which in the western part of the country was signaled optional paedomorphosis at *Lissotriton vulgaris* seems to confirm the previous point of view concerning their appearance (Covaciu-Marcov & Cicort-

Lucaciu 2007). Thus, the appearance of these was put on the conditions of specific year 2006, characterized by a very rainy summer which stopped the drying of the aquatic habitat, followed by a mild winter which prevented the freezing (Covaciu-Marcov & Cicort-Lucaciu 2007).

It is known the paedomorphosis appears if the aquatic conditions of the environment are more favorable than those of the terrestrial environment (Whiteman 1994), and the drying of the puddles is one of the most important factors which triggers the metamorphosis (Denoël 2003). The appearance of this phenomenon caused by the favorable characteristics of the year 2006 is sustained by that fact that from 2000 our herpetology

team captured thousands of newts from western Romania and however neither observed a paedomorph or a nonmetamorph larvae, and now in the same year the phenomenon was recorded at two species. At the favorable conditions category we can add the characteristics of the fountain. Thus, in there are no other predators except for the *Triturus cristatus* metamorphs and the trophic base is rich (frequent Gamaridae, Nematocera larvae, Heteroptera, etc). The absence of the predators and the rich food are known to favourize the delay of the metamorphosis and the appearance of the paedomorphs (Denoël & Poncin 2001, Denoël et al. 2001). These dates confirm that the optional paedomorphosis is triggered by certain factors from the environment, being possible because of the plasticity and the possibility of the distinct evolution of the newts (Denoël et al. 2005).

References

- Cogălniceanu, D., Aioanei, F., Bogdan, M. (2000): Amfibienii din România, Determinator. Ed. Ars Docendi, Bucharest. [in Romanian].
- Covaciu-Marcov, S.D, Cicort-Lucaciu, A.Ş. (2007): Notes on the presence of facultative paedomorphosis in the smooth newt *Lissotriton vulgaris* (Linnaeus, 1758) in western Romania. North Western Journal of Zoology 3 (1): 53-57.
- Denoël, M. (2003): How do paedomorphic newts cope with lake drying? Ecography 26: 405-410.
- Denoël, M., Poncin, P. (2001): The effect of food on growth and metamorphosis of paedomorphs in *Triturus alpestris apuanus*. Archiv für Hydrobiologie 152: 661-670.
- Denoël, M., Duguet, R., Džukić G., Kalezić, M., Mazzotti S. (2001): Biogeography and ecology of paedomorphosis in *Triturus alpestris* (Amphibia, Caudata). Journal of Biogeography 28: 1271-1280.
- Denoël, M., Joly, P., Whiteman, H. H. (2005): Evolutionary ecology of facultative paedomorphosis in newts and salamanders. Biological Reviews 80: 663-671.
- Dély, O. G. (1967): Neuere Angaben zur Kenntnis des neotenischen Teichmolches (*Triturus vulgaris* L.). Acta Zoologica Academiae Scientiarum Hungaricae 13 (3/4): 253-270.
- Fuhn, I. (1960): "Fauna R.P.R.", vol. XIV, fascicola I, Amphibia. Editura Academiei R.P.R., Bucharest. [in Romanian].
- Fuhn, I. (1963): Sur un nouveau cas de néoténie en masse du triton vulgaire (*Triturus v. vulgaris* L.). Acta Societas Zoologicae Bohemicae 27 (1): 62-69. [in French].
- Kalezić, M. L., Džukić G., Tvrtković N. (1990): Newts (*Triturus*, Salamandridae, Urodela) of the Bukovica and Ravni Kotari regiond (Yugoslavia). Spixiana 13 (3): 329-338.
- Kalezić, M. L., Cvetković, D., Džorovic A., Džukić G. (1994): Paedomorphosis and differences in life-history traits of two neighboring crested newt (*Triturus carnifex*) populations. Herpetological Journal 4: 151-158.
- Kaya, U., Sayim, F., Başkale, E., Cevik, I. E. (2008): Paedomorphosis in the banded newt, *Triturus vittatus* (Jenyns, 1835). Belgian Journal of Zoology: 138 (2): 196-197.
- Litvinchuk, S. N., Rudyk, A. M., Borkin L. J. (1996): Observation of paedomorphic newts (*Triturus vulgaris*) from the former Soviet union. Russian Journal of Herpetology 3 (1): 39-48.
- Nečas, P., Modrý, D., Zavadil, V. (1997): Czech Recent and Fossil Amphibians and Reptiles. Ed. Chimaira, 1-94.
- Radovanovic, M. (1961): Neue Fundorte neotenischer Bermalche in Jugoslawien. Zoologischer Anzeiger 166 (5-6): 206-218.
- Whiteman H. H. (1994): Evolution of facultative paedomorphosis in salamanders. Quarterly Review of Biology 69: 205-221.

Submitted: 14 January 2009
/ Accepted: 11 April 2009

Published Online: 28 April 2009