

## Further Evidence of Phenotypic Plasticity in the Sand Lizard: The “erythronotus” colour morph in the Pontic Sand Lizard (*Lacerta agilis euxinica*)

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**Abstract:** The sand lizard (*Lacerta agilis*, Linnaeus 1758) has one of the widest distribution ranges of the palearctic species. *L. a. euxinica* has an isolated distribution, being present only in the Danube Delta and some vicinal locations from the Black Sea coast in Romania. During several expeditions in the Danube Delta, we have observed *L. a. euxinica* specimens with the “erythronotus” colour morph in two locations. One is near the town of Sulina and one is near the village of Sfântu Gheorghe. From the latter location, we observed two “erythronotus” specimens in July 2008, representing 10% of the total observed sample (n = 20). Future, thorough studies on the “erythronotus” colour morph of the sand lizard will hopefully shed more light on its possible taxonomical or adaptive values.

**Key words:** lizards, colour polymorphism, taxonomy, Danube Delta, Romania

The sand lizard (*Lacerta agilis*, Linnaeus 1758) has one of the widest distribution ranges of the palearctic species (Kalyabina et al. 2001). It can be found from the British Isles in the West to North-Western China and Lake Baikal (Fuhn & Vancea 1961; Bischoff 1988).

In this range, the sand lizard presents an impressive phenotypical and genetical variability (Fuhn & Vancea 1961; Borcea 1975; Olsson 2003, 2004; Olsson & Silverin 1997; Kalyabina et al. 2001; Chirikova et al. 2001). Thus, 12 subspecies and varieties have been described for this species, many of them being later synonymized (Darevsky et al. 1976). In present, only 10 subspecies are considered to be valid (*L. a. exigua*, *L. a. argus*, *L. a. agilis*, *L. a. bosnica*, *L. a. brevicaudata*, *L. a. chersonensis*, *L. a. boemica*, *L. a. grusinica*, *L. a. tauridica* and *L. a. ioriensis*) (Bischoff 1988; Kalyabina et al. 2004). From these, *L. a. argus* has a questionable status and some authors consider that the morpho-logical and genetic differences between it and *L. a. agilis* are insignificant (Rahmel 1988; Kalyabina et al. 2001). The sand lizard inhabits numerous types of habitats, being a euri-topic species which can be observed from open steppes to forests and wetlands (Susan & Spellerberg 1983; Nemes et al. 2006). In Romania, *L. agilis* can be found on the edges of roads, forest margins,

pastures and steppic areas (Fuhn & Vancea 1961, Borcea 1975; Iftime 2005; Covaciu-Marcov et al. 2008; Strugariu et al. 2008; Gherghel et al. 2008) and is represented by two widely accepted valid subspecies: *L. a. agilis* is present in-side the Carpathian mountain chain, reaching altitudes of 2.500 m in the Bucegi Mountains (Fuhn & Vancea 1961) preferring a cooler, moister climate (Fuhn & Vancea 1961; Borcea 1975); *L. a. chersonensis* is present in the regions of Moldavia (Eastern Romania), Muntenia and Oltenia (southern Romania), being present up to the superior limit of the Sub Carpathians.

The third subspecies from Romania is one which requires further revision: *Lacerta agilis euxinica* was described by Fuhn, Vancea (1964) and is considered by some authors to be a synonym of *L. a. chersonensis* (Bischoff 1988) while others (e.g. Torok 1999) considers it a valid subspecies.

The authors of the present note share the latter opinion. The phenotypical plasticity of *L. agilis* has allowed it to have numerous colour morphs, such as “erythronotus” (Fitzinger) or “immaculata” (Durigen).

The “erythronotus” mutation has been previously reported in the subspecies *L. a. agilis* (e.g. Călinescu 1931; Fuhn & Vancea 1961; Maslak 2000), *L. a. chersonensis* (Fuhn & Vancea 1961;

Borcea 1975; Strugariu et al. 2006; Strugariu & Gherghel 2008; Iftime et al. 2008), *L. a. bosnica* (Schweiger 2008), *L. a. turidica* (Kalyabina et al. 2004) and *L. a. euxinica* (Fuhn & Vancea 1964). In the case of *L. a. agilis*, the frequency of this morph is higher, reaching up to 20% in some populations (Borczyk 2001). The frequency of this morph is also high in the contact zones between *L. a. agilis* and *L. a. chersonensis*, reaching 15% of some populations (Gherghel & Strugariu, unpublished data).

*L. a. euxinica* has an isolated distribution, being present only in the Danube Delta and some vicinal locations from the Black Sea coast in Romania (Torok 1999; Covaciu-Marcov et al. 2006).

During several expeditions in the Danube Delta, we have observed *L. a. euxinica* specimens with the “erythronotus” colour morph in two locations. One is near the town of Sulina and one is near the village of Sfântu Gheorghe. From the former location, one male specimen was found in July 2003.

This specimen was not collected or photographed. From the latter location, we observed two “erythronotus” specimens in July 2008, representing 10% of the total observed sample (n = 20). The sand lizard population of this latter location is numerous but dispersed, occurring in habitats covered by *Juncus maritimus*, *Salix* sp., *Euphorbia* sp. and other halophilous and psamophilous species. The pontic sand lizard population from Sfântu Gheorghe cohabitates with two other reptile species: *Eremias arguta deserti* and *Vipera ursinii* and with one amphibian species: *Pelobates fuscus*. In the ponds from the immediate vicinity, species such as *Pelophylax ridibundus*, *P. kl. esculentus*, *Bombina bombina*, *Emys orbicularis* and *Natrix natrix* could be observed.

As with many colour forms encountered in polymorphic animal populations (e.g. melanism), the “erythronotus” or red-back variety of the sand lizard could play an important role in avoiding predation via crypsis (Olsson 1993), thermoregulation (Castilla et al. 1999) or sexual selection (Roulin & Bize 2006; Price 2006).

Thus, different colour morphs have been usually attributed different adaptive values. Also, in some reptile taxa, the higher frequency of a certain colour morphs in certain populations have received taxonomical value (e.g. melanism in

*Vipera nikolskii* – Vedmerja et al. 1986; Zinenko et al. 2010; high frequencies of “erythronotus” variety in *Lacerta agilis* “argus” – Bischoff 1988). However, given the fact that such colour forms seem to appear independently in different, distant or isolated populations and in different evolutionary lineages, it is most likely that such criteria have no, or very little, taxonomic value.

Furthermore, studies carried out polymorphic sea-kraits have failed in finding any adaptive significance for melanism in the populations (Lorion et al. 2008). Future, thorough studies on the “erythronotus” colour morph of the sand lizard will hopefully shed more light on its possible taxonomical or adaptive values.

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