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Record of a *Lacerta agilis* Linnaeus, 1758 with *erythronotus* colour morph and tail bifurcation

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Lacerta agilis Linnaeus, 1758, also known as the Sand Lizard, is a lacertid lizard species adapted to continental climate and it is found throughout most of northern, central and eastern Europe, central Asia to north-western China (Agasyan et al., 2010; Andres et al., 2014; Speybroeck et al., 2016). Species is a highly polymorphic, with ten subspecies generally recognized (Andres et al., 2014). It occurs at altitudes up to 2500 m, occupying habitats ranging from grasslands, shrublands, and forests to artificial, urban habitats (Agasyan et al., 2010).

In this paper we present an interesting case of a *L. agilis* individual with a distinct colour morph and malformation. During a field research in May 2018, around 12:00 CET, in Kupres Polje (eastern Bosnia and Herzegovina), one female gravid individual of *L. agilis* was caught with a combined *erythronotus* colouration mutation and tail bifurcation (Fig. 1). The individual was found in a grassland area at an altitude of 1231 m (coordinates: 43.97; 17.21). The temperature was around 20°C and the weather was partially cloudy. The individual was approximately 62 mm long (SVL). The main tail length was 67 mm, while the autotomized tail was 35 mm long. The caught individual did not have any additional visible injuries and it was in a good nutritional condition. After taking a picture of it, it was released in the same spot it had been caught in. Two other individuals (66%) of the same species were observed in the nearby area, all without a bifurcated tail or *erythronotus* colouration.

Bifurcated tails in lizards occur as a result of the lizard's tail being only partially broken off – not enough for it to come off entirely, but enough for a new tail to start growing from the breaking point. Although a part of a common anti-predatory strategy among lizards, it does not have to occur solely due to predators, but can be a result of intraspecific aggression and competition (Pola & Koleska, 2017). It is considered to be a frequent malformation among lizards and is recorded within the families Agamidae (e.g. Ananjeva & Danov, 1991; Ofori et al., 2018), Anguidae (e.g. Conzendey et al., 2013), Gekkonidae (e.g. Kumbar et al., 2011), Gymnothalmidae (e.g. Pheasey et al., 2014), Iguanidae (e.g. Mata-Silva et al., 2013), Lacertidae (e.g. Dudek & Ekner-Grzyb, 2014), Mabuyidae (e.g. Vrcibradic & Niemeyer, 2013), Scincidae (e.g. Mitchell et al., 2012; Vergilov & Natchev, 2017), Teiidae (e.g. Cordes & Walker, 2013; Pelegrin & Leão, 2016), and Tropiduridae (e.g. Martins et al., 2013; Passos et al., 2014). Within the family Lacertidae, it has been recorded in *Acanthodactylus aegyptius* (Stark et al., 2018), *Algyroides nigropunctatus* (Jablonski & Koleska, 2015), *Lacerta viridis* (Stojanov et al., 2011), *Ophisops elegans* (Tamar et al., 2013), *Podarcis erhardii* (Brock et al., 2014), *Podarcis muralis* (Pola & Koleska, 2017), *Teira dugesii* (Koleska et al., 2017), and *Zootoca vivipara* (Dudek & Ekner-Grzyb, 2014). Specifically, in *L. agilis*, it has been recorded in Poland (Dudek & Ekner-Grzyb, 2014). To our knowledge, this is second record of tail bifurcation in *L. agilis* so far. Even though it is difficult to conclude the cause of tail bifurcation, we consider it to be a result of unsuccessful predatory or aggressive behaviour of males during mating.

The *erythronotus* mutation (known also as copper-backed colouration morph) appears often in various parts of the global map of the *L. agilis* distribution, with growing frequency in East Europe and eastern Central Europe (Bischoff, 1984). It is commonly found in the lowlands morph of *L. agilis argus* Laurenti, 1768 (Arnold & Ovenden, 2002). It differs from the standard colouration type by a rather bright, copper-red band, the width of the pileus, stretching from the neck downwards along the tail. As a rule, *erythronotus* individuals lack spots, but these can still appear occasionally (Bedriaga,

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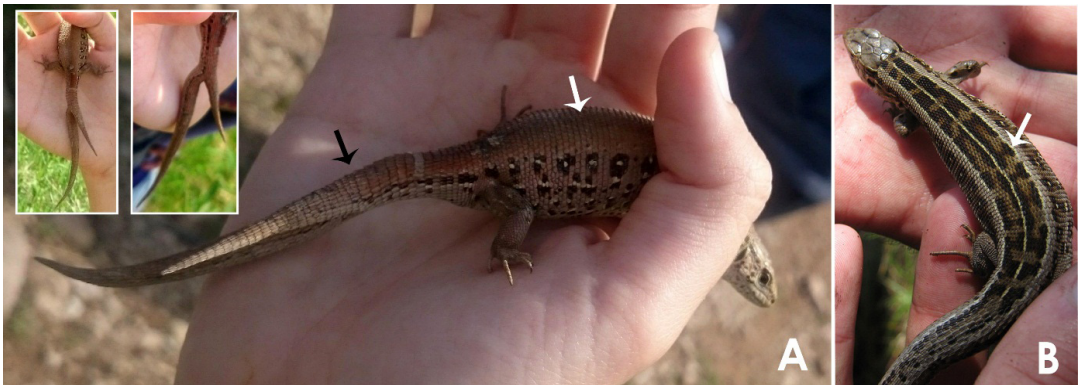

Figure 1. The *erythronotus* colouration mutation accompanied with tail bifurcation in a *Lacerta agilis* (A) compared to a „normal" individual (B); both individuals are gravid females; white arrows show different dorsal colourations and black arrows shows the tail's breaking point

1886). According to Bischoff (1984), the *erythronotus* occurs as a dominant mutation in a simple Mendelian genetic inheritance model, whereas the individuals with black spots on a copper line as background represent heterozygotic hybrids between normal coloured and copper-coloured individuals. Occurring in both sexes, the *eryhtronotus* colouration has so far been recorded in the following West Balkans countries: Slovenia (Vogrin, 1999), Croatia (Jelić, 2010; Vilaj & Dvorski, 2014; Cesarec & Zadravec, 2018) in *L. agilis argus*, Montenegro (Schweiger, 2008), and Bosnia and Herzegovina (B&H) in *L. agilis bosnica* Schreiber, 1912 (Burić & Jelić, 2011). The first *erythronotus* morph was mentioned as „*Lacerta agilis* var. *erythronota*" by Werner (1898), describing the specimen found in B&H. Several specimens were recorded by Veith (1991) in 1925, among others, he mentioned one „nearly" *erythronotus* male. In the 21st century, there were two new records, one on Mt. Zelengora in eastern B&H (Burić & Jelić, 2011) and second one recorded between Mts. Visočica and Treskavica in central B&H (Zimić, 2015). The individual found in Kupres Polje (western B&H) once again proves that *erythronotus* morphs are common in this area, especially in B&H.

To our knowledge, this is the first record of a *L. agilis* individual with the combined traits of the *erythronotus* colouration mutation accompanied by tail bifurcation.

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