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A concolor morph recorded in the *Podarcis ionicus* species complex (Sauria, Lacertidae) from Albania

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Many lacertid lizards are known for their great intraspecific variation, especially in patterns and coloration. This variation has often led to the description of many subspecies or morphs, which is reflected in inconsistent taxonomy when these subspecies are put into a molecular phylogenetic framework. As a good example we can provide two lacertid species, *Podarcis melisellensis* (Braun, 1877) and *P. siculus* (Rafinesque-Schmaltz, 1810), the first with 19 and the second with 52 described subspecies (Sindaco and Jeremčenko, 2008). This quantity of names is striking given the genetics results presented by Podnar et al. (2005, 2014). These results suggest that many of these subspecies are not valid.

Colour variability and aberrations are quite common in reptiles (e.g. melanism) and they have been suggested to be related with certain evolutionary and/or ecological advantages (thermoregulation, crypsis, type of the habitat where they occur; e.g. Rosenblum, 2006; Sacchi et al., 2012; Gabirot et al., 2014). One of the known aberrations is the concolor morph in lacertid lizards, especially in several *Podarcis* species. Individuals with this aberration are uniformly coloured, markedly differing in having no dark or light, or virtually any, dorsal markings (Arnold et al., 2007). Such coloured individuals have been recorded in some populations of *P. carbonelli* Pérez-Mellado, 1981, *P. bocagei* (Seoane, 1884), *P. erhardii* (Bedriaga, 1876), *P. filfolensis* (Bedriaga, 1876), the *P. hispanicus* (Steindachner, 1870) group, *P. liolepis* (Boulenger, 1905), *P. melisellensis*, *P. muralis* (Laurenti, 1768), *P. siculus, P. tiliguerta* (Gmelin, 1789) and *P. waglerianus* Gistel, 1868 (Kramer, 1941; Sá-Sousa and Harris, 2002; Bruschi et al., 2006; Lo Cascio and Pasta, 2006; Arnold et al., 2007; Hauser, 2009; Galán and Vázquez, 2010; Van der Berg, 2011). In *P. melisellensis* and *P. siculus*, concolor individuals are homozygous for the recessive allele that causes this condition (Kramer, 1941). Similar morphs have been recorded also in *Dalmatolacerta*, *Darevskia*, *Dinarolacerta*, *Iberolacerta*, *Lacerta*, *Scelaris* or *Zootoca* (Arribas, 2001). As there is certain absence of melanin in melanophores, this aberration could be classified as a case of hypomelanism.

The *Podarcis ionicus* species complex is a member of the *Podarcis tauricus* subgroup, a complex of species with a very broad range recently divided by Psonis et al. (2017). They occur from Crimea to the western and southern Balkans and western Turkey (Sindaco and Jeremčenko, 2008). The coloration of these lizards shows a high degree of seasonal variability and matches its surrounding environment. The basic colour is bright green in spring and early summer and changes to olive and brown towards autumn. There are dark spots and blotches and green or brown stripes on the flanks. The anterior green dorsal area is usually less extensive in females, which also have more pronounced dorsolateral stripes (Valakos et al., 2008). The concolor morph (= *olivacea* or *olivicolor*; Lehrs, 1902; Schreiber, 1912) has been recorded frequently in Crimean populations of *P. tauricus* (Lehrs, 1902; Kabisch, 1986; Kukushkin and Doronin, 2013) and was described there as the aberration *cineracea* (Szczerbak, 1960). The concolor morph is also known from southern parts of the Balkans (Schreiber, 1912; Biserkov, 2007; Valakos et al., 2008).

To find out approximate frequency of this coloration, we used observation data (125 individuals) from the Balcanica, an on-line mapping project of amphibians and reptiles in the Balkans (http://balcanica.info; Balej and Jablonski 2006–2016) and our own observations. From 2013 to 2016, we observed and examined or photographed colouration of 87 individuals of *P. tauricus*/*ionicus* (35 males and 52 females; 82 adults, 4 subadults and one juvenile) in the Balkan Peninsula (Albania, Bulgaria, Greece, Republic of Macedonia,

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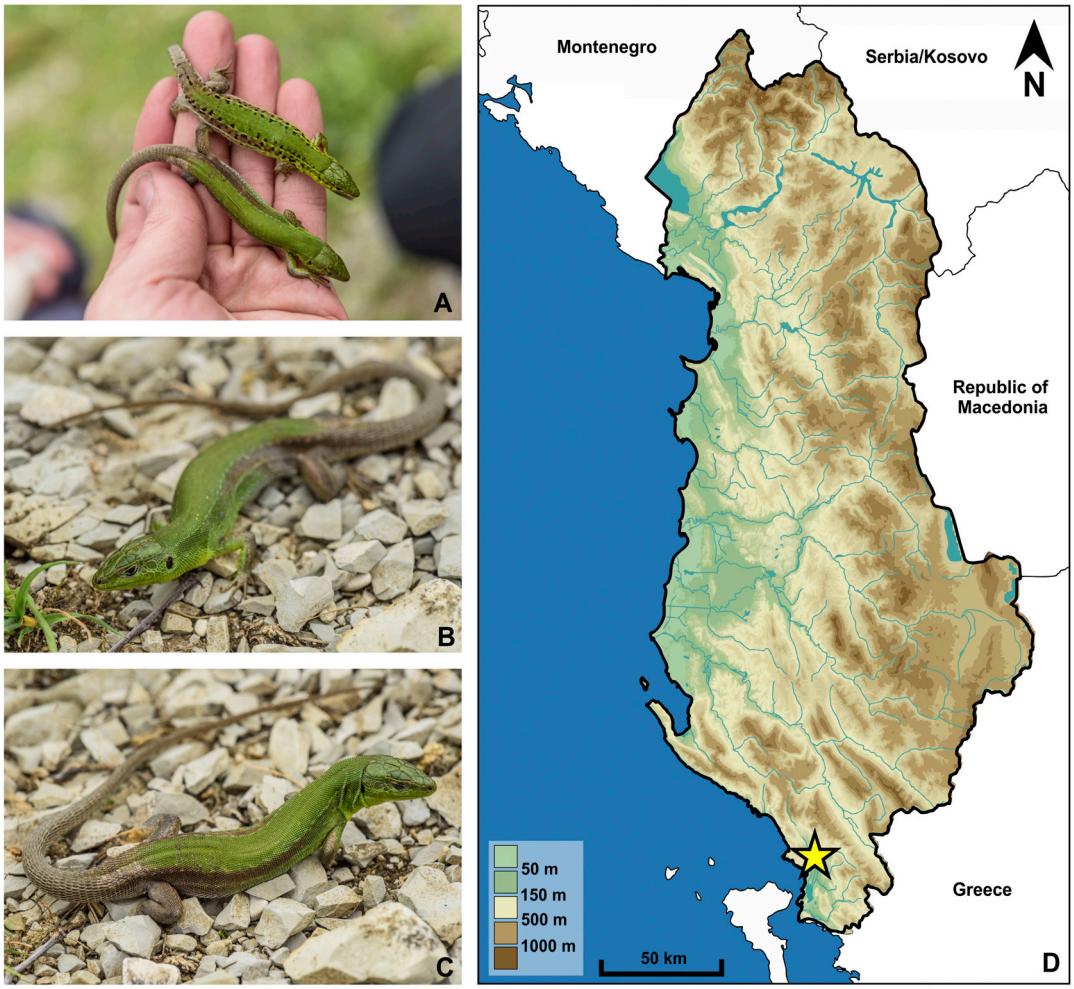

Figure 1. The recorded individual of the *Podarcis ionicus* species complex exhibiting the concolor morph. A – The concolor individual (bottom) in comparison with normally coloured specimen (top) of the *P. ionicus* species complex from the same locality; B, C – Overall view on the individual; D – The position of the locality Bregas within Albania where the individual was recorded (yellow star).

Serbia/Kosovo). An overall dataset includes 212 individuals, only three of them (1.42%) showed concolor morph (one from Albania, two from southern and western Greece). The remaining individuals were normally coloured. Overall, 37 individuals were from the territory of Albania (the concolor morph representing 2.7% of the individuals observed in this country). All individuals were left at the localities where they were observed. Only the aberrant individual from Albania was collected and is available in a collection of Department of Zoology, Comenius University in Bratislava under voucher number 3801 (Figs. 1A-C). The specimen was a female, captured on the 28th of April 2016, near Bregas village (39.899°N, 20.009°E; 84 m a. s. l.; Fig. 1D) in southern Albania. The snout-vent length (SVL) of the specimen was 60 mm, head length (HL) 12 mm and tail length (TL) 122 mm. The coloration of the specimen was brightly green dorsally from the head to the beginning of the tail and laterally to the first half of the body. The sides of the body were light brown separated from the dorsal side by a thin, dotted, white line (Fig. 1B,C). Black dots typical for the species (Figs. 1A) were completely absent. The ventral part of the body was white without any colour pattern.

The tail was light orange ventrally and brown dorsally. According to genetic results presented by Psonis et al. (2017), the locality belongs to the area of the *P. ionicus* species complex (see Fig. 1D).

The individual was found during a cloudy day without rain in a typically Mediterranean habitat with rocks and low vegetation. Other recorded reptilian species at the locality were *Testudo hermanni* Gmelin, 1789 and *Xerotyphlops vermicularis* (Merrem, 1820). One normally coloured individual (female) of the *P. ionicus* species complex (Fig. 1A) was also found at the locality. To the best of our knowledge, no other records of this morph are known from the territory of Albania, although Schreiber (1912) presented the aberration *olivicolor* from the nearby island of Corfu and several other Ionian Islands.

Various aberrant forms may sometimes occur sympatrically and/or syntopically with normally coloured populations. As reported by Arnold et al. (2007), the incidence of concolor morphs may vary greatly in different populations of the same species (from being absent in some and predominant in others), and appears to be commonest in relatively hot, dry localities. This is in accordance with our observation, as well as with those of Kukushkin and Doronin (2013) who reported that this colour morph inhabits the hottest and driest areas of the Crimean Peninsula. The concolor morph (= *cineracea* in Kukushkin and Doronin, 2013) is relatively common in some localities of the southern coast of the Crimea but has been recorded very rarely in the warmest southwestern foothills (the territory of Sevastopol). Interestingly, this colour morph has not been recorded in other regions of the Crimea despite the species is very abundant there. This morph is completely absent on the Taurian Steppe. Kukushkin and Doronin (2013) use this case as an example of Gloger's rule, but they report that the frequency is almost independent on elevation and more likely it is determined by the geochemical composition of rocks. Individuals of *P. tauricus*/*ionicus* with this type of colour pattern have been observed mainly in the southern parts of the range (Lehrs, 1902; Kabisch, 1986). Within the area of distribution of these species, and according to available data, individuals without the spotted pattern are known from north-eastern and north-western Greece, Bulgaria and the Crimea, and have not been recorded in the cooler Central- and Eastern-European parts of the range (i.e. Serbia, Romania, Hungary and the continental part of Ukraine; Biserkov, 2007; Valakos et al., 2008; Kukushkin, pers. comm.).

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