REPTILES & AMPHIBIANS

Anophthalmia in Palmate Newts (*Lissotriton helveticus*) in Galicia (Northwestern Spain)

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Morphological anomalies are well known in amphibians (e.g., Laurentino et al. 2016; Henle and Dubois 2017) and reptiles (e.g., Cordero-Rivera et al. 2008). Anomalies in amphibians can have multiple causes, including sublethal injuries caused by predators (Bowerman et al. 2010), pollution (Henle and Dubois 2017), habitat quality (Soto-Rojas et al. 2017), UV radiation (Ankley et al. 2002), or parasitism (Johnson and Lunde 2005).

On 15 December 2019, we encountered a female Palmate Newt (*Lissotriton helveticus*) on the edge of a road in A Illa de Arousa (Pontevedra; UTM 29T NH10) with anophthalmia. The left orbital socket was present but the eye was absent (Fig. 1). On 6 March 2020, we encountered another female Palmate Newt in Xinzo de Limia (Ourense; UTM 29T PG05) that also had a left orbital socket and was missing the eye (Fig. 2).

Additional individuals at both sites, including those encountered during subsequent sampling periods, lacked morphological anomalies. In both cases, the presence of the orbital socket seems to indicate that the cause of the anophthalmia was not attributable to a developmental anomaly. However, Brassaloti and Bertoluci (2018) documented bilateral anophthalmia in a Blacksmith Treefrog (*Boana faber*) in which no optic nerves were present, indicating abnormal development. Nevertheless, we believe that the most likely cause in both instances was a sublethal injury caused by a predator (Bowerman et al. 2010).

Anophthalmia is rare in amphibians (Szkudlarek 2020). Laurentino et al. (2016) noted that anophthalmia was the least common deformity in their study of an amphibian community in the Serra da Estrela in Portugal. Vershinin and Berzin (2018) reported a 0.1% percentage of anophthalmia in Northern Smooth Newts (*L. vulgaris*) in the Urals. The prevalence of anophthalmia was estimated at 0.036% in one population of Common European Toads (*Bufo bufo*) (Wolf 1994) and at 0.07% and 0.15% in two populations of Wood Frogs (*Lithobates sylvaticus*) (Eaton et al. 2004). In their review, Henle and Dubois (2017) listed 159 cases of anophthalmia in 55 species, of which only eight were urodeles. One possible explanation for the rarity of anophthalmia in salamanders could be their considerable capacity for regeneration; for example, Eguchi et al. (2011) demonstrated that lenses

Fig. 1. Palmate Newts (*Lissotriton helveticus*) with anophthalmia from A Illa de Arousa (Pontevedra) (left), and Xinzo de Limia (Ourense) (right), Spain. Photographs by Moises Asensi-Cabirta (left) and César Ayres (right).

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removed from eyes of Japanese Fire-bellied Newts (*Cynops pyrrhogaster*) were regenerated multiple times over periods as long as 18 years.

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