

First report of polymelia in *Epidalea calamita*

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RESUMEN: En abril de 2022 se encontró una hembra de sapo corredor (*Epidalea calamita*) con polimelia en la Sierra de Guadarrama (Comunidad de Madrid, España), durante un muestreo diurno. La malformación consistía en la presencia de una extremidad adicional, aparentemente ossificada pero no funcional, en posición ventral. Esta observación constituye el primer caso de polimelia documentado en la especie.

Amphibians are the most threatened group of vertebrates, with many species showing negative trends at the global scale (Wake & Koo, 2018). Concern about the health of amphibian populations has promoted studies focusing on potential stressors, with morphological malformations emerging as a significant threat due to their potential ecological and demographic consequences. These deformities directly affect individual fitness (Møller, 1997; Mira-Jover *et al.*, in press), increasing predation risk and mortality, which may eventually have an impact on population dynamics. Morphological malformations usually occur with a basal prevalence rate around 2-5% in natural amphibian populations (Johnson *et al.*, 2010), but when their incidence exceeds this threshold they can become a potential risk for population viability. One noteworthy malformation is polymelia, the occurrence of extra limbs (Meteyer, 2000), which together with polydactyly (the presence of extra fingers), represent the most frequently reported malformations in amphibians worldwide (Blaustein & Johnson, 2003). In the Iberian Peninsula, there has been a recent increase in reports of morphological deformities in amphibians, including among others polymelia

and polydactyly (Galán, 2011; Martínez-Silvestre *et al.*, 2014; Zamora-Camacho, 2016; Laurentino *et al.*, 2016; Espasandín, 2018; Poch & Carné, 2021).

Here we describe a case of polymelia in an adult female natterjack toad, *Epidalea calamita* (Laurenti, 1768), observed during a diurnal field survey on April 7th, 2022. The individual was found near an ephemeral pond in Puerto de Canencia (Sierra de Guadarrama, Madrid: 40°52'18.5"N / 3°45'22.8"W) and exhibited an extra limb located in the lower-central part of the abdomen (Figure 1). The extra limb was apparently ossified but less robust, thinner and shorter than the typical hind limbs, and presented four small toes. The hind limbs were normal in appearance and function, whereas the extra limb was non-functional, lacking mobility and not contributing to locomotion. Morphological malformations are usually associated with lower survival rates; however, based on its size (> 5 cm) this individual had successfully reached sexual maturity. Similar malformations have been previously documented in several urodele (Martínez-Silvestre *et al.*, 2014; Zamora-Camacho, 2016; Duque-Amado *et al.*, 2020; Poch & Carné, 2021) and anuran species (Barragán-Ramírez & Navarrete-Heredia, 2011; Oser *et*



Figure 1: Adult female *Epidalea calamita* with an extra hind limb in the lower central part of the abdomen. a) Dorsal and b) ventral view.

Figura 1: Hembra adulta de *Epidalea calamita* con una extremidad posterior extra en la parte baja del abdomen. Vistas a) dorsal y b) ventral.

al., 2023), but to the best of our knowledge this observation represents the first record of poly-melia in *E. calamita*.

Several factors have been associated with the development of morphological deformities, including genetic mutations, environmental factors like UV radiation and extreme temperatures, or chemical pollutants (Ankley *et al.*, 2002; Blaustein & Johnson, 2003; Ankley *et al.*, 2004; Velo-Antón *et al.*, 2011). Parasite infections, specifically the trematode *Ribeiroia* spp., have also been associated with limb malformations (including extra limbs and missing hindlimbs) in several anuran populations in North America (Johnson *et al.*, 2002). These factors may act independently or synergically, triggering developmental responses causing malfor-

mations. In our particular case, we can only speculate about the underlying causes of this phenomenon and its prevalence at the population level, since we did not perform detailed studies using CT-SCAN or other methods and the area was sampled only once. The site where the observation was recorded comprises montane meadows (1524 masl) where UV radiation could represent a stressing factor, and is surrounded by managed pine plantations possibly treated with pesticides. Further studies should assess the frequency of morphological deformities in the populations of *E. calamita* and other syntopic amphibian species, and conduct physicochemical and parasitological surveys to assess the possible roles of these factors in their dynamics.

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