REPTILES & AMPHIBIANS

Egg Entanglement in a Mallorcan Midwife Toad (*Alytes muletensis*) Causes Amputation of the Metatarsals and Phalanges in a Captive Male

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The Mallorcan Midwife Toad (*Alytes muletensis*) is one of six congeners, all of which occur in western and southern Europe and northern Africa (Speybroeck et al. 2016; Dufresnes and Martinez-Solano 2020). Midwife toads are small (typically <55 mm total length) terrestrial anurans that exhibit a unique reproductive strategy wherein males carry strings of eggs on their hindlimbs (K.D. Wells 2007). The smallest and most slender species, the Mallorcan Midwife Toad (to 45 mm total length), has a restricted natural range in the eastern Sierra de Tramuntana Mountains of northwestern Mallorca, where they live in deep limestone gorges (E. Wells et al. 2015; Speybroeck et al. 2016).

Causes of limb deformities in wild toads include ectromelia, a malformation in which some or all of the lower portions of the limb are missing (Meteyer 2000). One cause of metatarsal and phalangeal loss in amphibians is predation (Ballengee and Sessions 2009). Predators too small to prey on anurans may consume only parts of them, with the frog surviving such encounters, albeit deformed (Ballengee and Sessions 2009). For example, hindlimbs of European Common Toad (*Bufo bufo*) larvae are particularly at risk from dragonflies and, given their abundance in the preferred habitats of toads, could be a major cause of toad deformities (Ballengee and Sessions 2009). Environmental contamination also can cause limb deformities (Ouellet et al. 1997). In general, hindlimbs are particularly vulnerable, as they are exposed to a considerable degree early in metamorphosis (Stopper et al. 2002). However, in male Mallorcan Midwife Toads, especially in captivity, a more likely cause of amputation is egg entanglement.

During a routine inspection in May 2022, a captive male *A. muletensis* was observed carrying eggs, with swelling present in the right hindlimb distal to the egg string (Fig. 1). The egg string was cut and removed in order to relieve the swelling. Later inspections found localized necrosis, but in the absence of any signs of infection, treatment was thought to be unnecessary. During June 2022, the distal portion became disarticulated and was shed. General mobility appeared unimpaired, and in July 2022 the toad was observed carrying another clutch of eggs.

Visual observation of the animal indicated that the tibia and fibula were extant and appeared complete, but metatarsals and phalanges were no longer present. This injury was diagnosed as amputation caused mechanically by egg-string restriction. To avoid future cases of amputation via egg entanglement, captive male Mallorcan Midwife Toads should be monitored regularly (E. Wells et al. 2015). If any swelling of the toad's leg is detected, the egg string should be removed swiftly to avoid necrosis.

Although multiple causes have been suggested for amphibian limb malformations (e.g., injury, parasitic infections, environmental contamination, excess UV light, and

Figure 1. A captive male Mallorcan Midwife Toad (*Alytes muletensis*; ref B2M4) prior to egg entanglement in April 2020 (left) and the right hindlimb following leg entanglement in October 2022 (right). Photographs by Caleb Leeke.

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inbreeding; Loeffler et al. 2001; Williams et al. 2008), the limb in this case was previously intact and entire, clearly indicating that this amputation was a direct result of injury by egg entanglement, and not any congenital or developmental factor. The condition of the limb after healing was at least superficially similar to deformities seen by Goodman et al. (2022) in Common Midwife Toads (*A. obstetricans*), some of which also affected hindlimbs of males.

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