Nota

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Injured *Salvator merianae* (Teiidae) regenerates six tails in central Argentina

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ABSTRACT
Some lizards have the ability of partially regenerate many tissues like nerve cells, part of the mandible, and parts of the limbs; and most of them can regenerate the tail. Tail autotomy followed by tail regeneration is a strategy widely used in lizards to escape from predators. In some cases tail breaks but it does not detaches completely from the body, leading to a regenerated tail with multiple tips. Here we report a young individual of *Salvator merianae* from central Argentina that presented six regenerated tails growing from a major injury in its tail.

Lizards are able of regenerate many tissues. Some studies reported regeneration of axons (McLean and Vickaryous, 2011; Zika, 1969), partial regeneration of the lower mandibular arch (Werber, 1905) and of limbs (Bellairs and Bryant, 1985), and have a noteworthy ability to regenerate the tail (Alibardi, 2009). Tail autotomy followed by tail regeneration is a strategy widely used in lizards to escape from predators (Vitt and Caldwell, 2009). In response to a predatory stimulus, tails are voluntarily detached by the individual at an specific fracture plane in vertebrae. Tail detachment is facilitated by autotomy septa that pass through the musculature, and mechanisms for rapidly closing off blood vessels. After tail loss, tail stubs heal rapidly and regeneration begins (Bateman and Fleming, 2009; Vitt and Caldwell, 2009). In the process of tail regeneration vertebrae do not regenerate, and they are replaced by a cartilaginous rod (Alibardi, 2009).

Shedding the tail has costs and benefits for lizards. While it is a strategy to avoid predation (but see Downes and Shine, 2001), it may affect several aspects of lizard ecology like reproduction (Dial and Fitzpatrick, 1981; Martin and Salvador, 1993), intraspecific signaling (Fox *et al*., 1990), habitat use (Martín and Salvador, 1992), and moving patterns (Martin and Avery, 1998).

In some cases the tail breaks but it does not detaches completely from the body, leading to a regenerated tail with two or even three tips (a trifurcated tail) (Pheasey *et al*., 2014). Tail bifurcation has been reported for many lizard families like Gymnophtalmidae (Pheasey *et al*., 2014), Scincidae (Hickman, 1960), Tropiduridae (Martins *et al*., 2013; Passos *et al*., 2014), Lacertidae (Renet, 2013), Agamidae (Ananjeva and Danov, 1991), Teiidae (Gogliath *et al*., 2012), and Gekkonidae (Ali, 1948).

In this note we report an exceptional case of a young individual (SVL: 301 mm) of *Salvator merianae* Linnaeus, 1758 from central Argentina with six regenerated tails. The specimen was found in the city of Córdoba (31°19'S, 64°15'W) in January 2014. It presented evidence of a severe injury that extended dorsally through the entire length of the tail. Injury appeared to be inflicted with a sharp object that cut off the tissue. Normal scalation pattern was severely altered in the damaged area, and had the aspect of a dry wound, rather than a regenerated tissue due to its darkish coloration. Regenerated tails of different size arise at six different points. Most of the tails arise perpendicularly to the axis of the original tail (Fig. 1). One of the tails (numbered 4 in Fig. 1) bends abruptly after its origin at an angle of 90º. At the end of the tail, two regenerated tails grew from the last vertebrae (Fig. 1). An x-ray image showing origin points of each regenerated tail can be seen in Fig. 2. Autotomy planes within vertebrae can be recognized in the image (Fig. 2).

Researchers have evaluated the costs of tail loss in lizards (summarized in Bateman and Fleming, 2009), but no studies are available in literature about the costs of abnormal tail regeneration. Extreme cases like the one reported here are extremely rare and probably have higher associated costs. Metabo-

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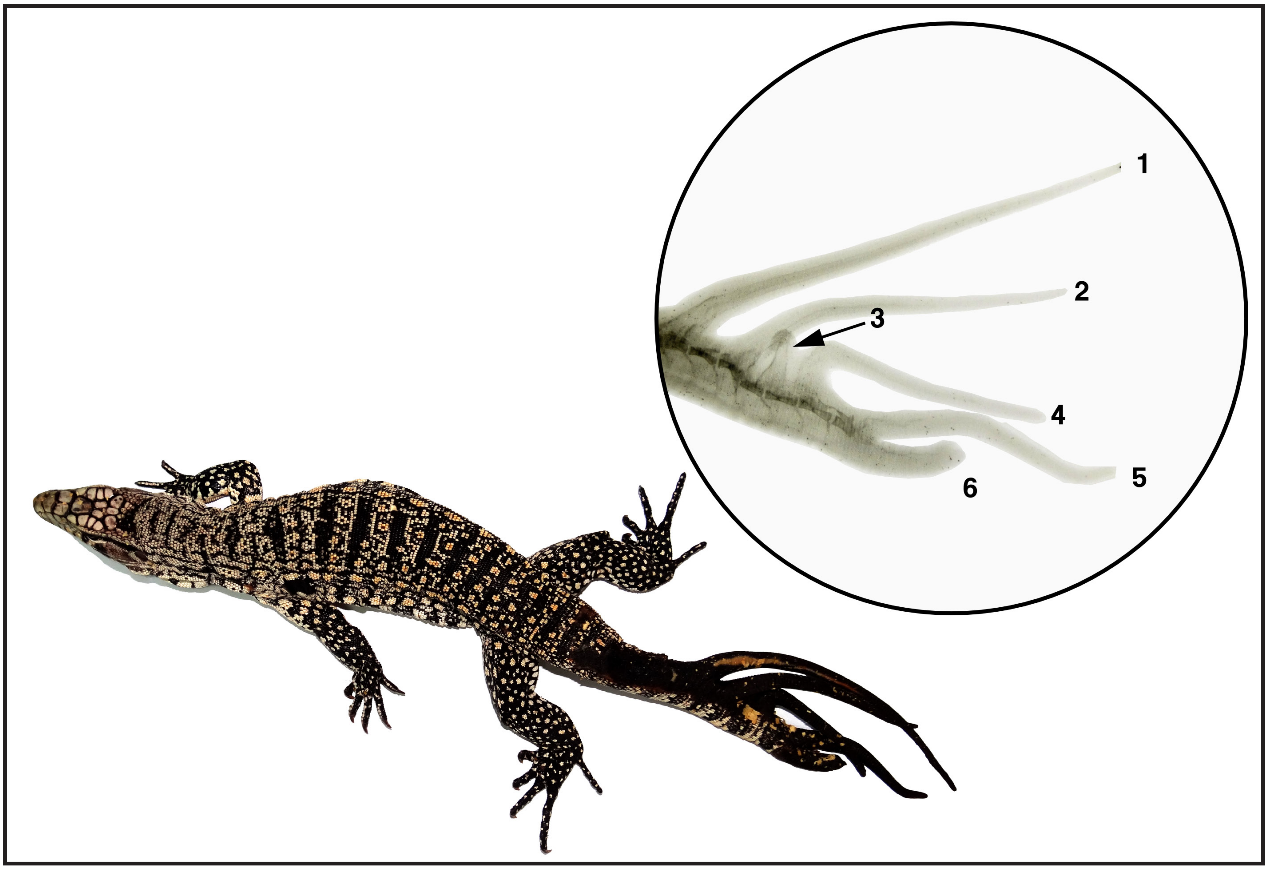

Figure 1. Specimen of *S. merianae* presenting six regenerated tails. Note the wound (black area) extending dorsally along the tail.

lic costs of multiple tails, and how fat reserves are distributed and allocated in multiple regenerated tails are interesting questions to be answered in future studies.

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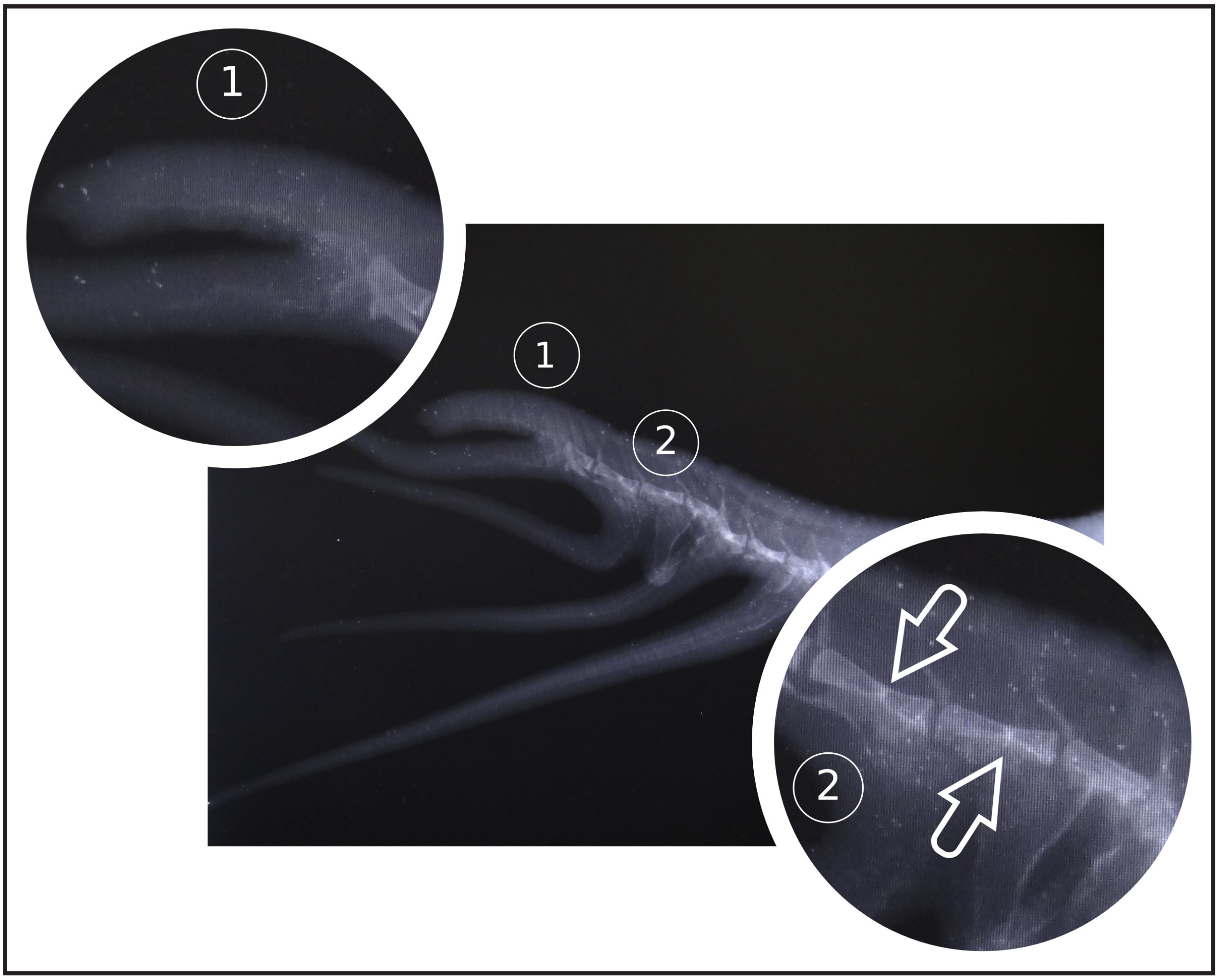

Figure 2. X-Ray image of the hexafurcated tail. Enlarged area 1 indicates a bifurcated regeneration produced in a single breakage point. Arrows in enlarged area 2 shows autotomy plans within the vertebrae.

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