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Tail bifurcation in Chinese blue-tailed skink *Plestiodon chinensis* (Gray, 1839)

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Abstract

Caudal autotomy is a strategy widely used in lizards to avoid predation. In some cases, tail breaks but it does not detach completely from the body, leading to a regenerated tail with multiple tips. In this note, we reported two tail bifurcation individuals of *Plestiodon chinensis* found on a farm. The X-rays showed that the branches of these two individuals are not ossified, but form cartilage behind the fracture surface of the tail. The present findings will provide information for studying tail regeneration abnormalities in lizards.

Observation

Caudal autotomy is an anti-predator strategy, commonly as a decoy used in lizards to increase the likelihood of survival in risk situations (Boozalis et al. 2012, Gilbert et al. 2013). In response to a predatory stimulus, tails are voluntarily detached by the individual at a specific fracture plane in vertebrae. After a tail loss, tail stubs heal rapidly and regeneration begins (Pillai et al. 2013, Alibardi 2021, Degan et al. 2021). In some cases, the tail breaks but it does not detach completely from the body, leading to a regenerated tail with two or even three tips (Barr et al. 2020, Onyenweaku et al. 2023).

P. chinensis is a medium-sized skink (adult snout-vent length >88 mm) mainly found in southern China and Vietnam (Shen et al. 2017, Ma et al. 2019). This species has the skill to break its tail (Lu et al. 2012) but lacks records of abnormal tail regeneration. Here we make the first report of tail regeneration abnormalities in *P. chinensis*.

During a lizard survey on 23 April 2023 at a farm in Yihuang (116° 13'N, 27°28'E), Fuzhou, China, we observed two adult males with bifurcated tail among 400 *P. chinensis* collected (Figure 1). In one of the two individuals (weight =41.34 g, snout-vent length =126.21 mm),

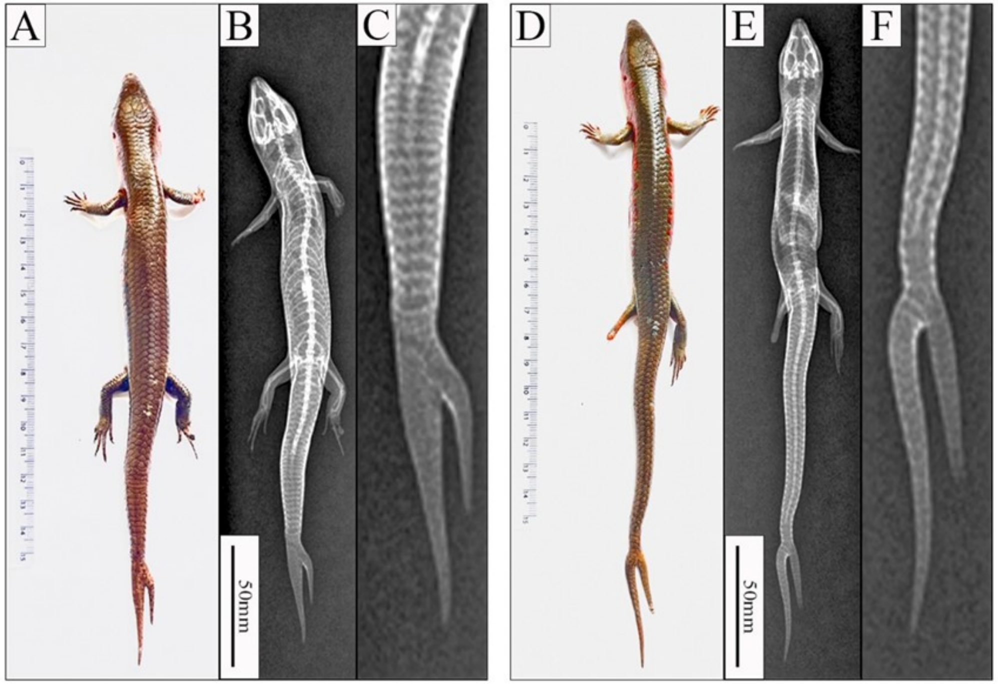

Figure 1: Caudal bifurcation in two adult male *P. chinensis* (A and D). Dorsal X-rays of two individuals (B and E) and details of their bifurcated tails (C and F). Note that these regenerated tails lack vertebrae.

regeneration of the tail occurred at 23.66 mm posterior to the cloaca and bifurcated horizontally at 71.60 mm posterior to the cloaca (30.78 mm on the left and 17.24 mm on the right). In the other individual (weight =41.34 g, nostril length =126.21 mm), regeneration of the tail occurred at 84.95 mm posterior to the cloaca and bifurcated horizontally at 91.34 mm posterior to the cloaca (left side =40.54 mm, right side =20.54 mm). In addition, both individuals suffered severe limb damage (broken toes or amputation). In the presence of adequate food and the absence of predators, limb disability and tail deformity may be due to intraspecific aggression or sexual aggression during mating (Iverson et al. 2004, Pérez-Buitrago et al. 2010).

Additionally, we obtained dorsal radiographs (Figure 1). The X-rays of both individuals showed vertebrae before the fracture plane and cartilage after the fracture plane in the tail. Previous studies reported that vertebrae do not regenerate during tail regeneration but are replaced by cartilage (Alibardi & Lovicu 2010, Boozalis et al. 2012, Alibardi 2021). The cartilage of their nascent tails would result in tail regeneration not occurring after the next tail break (Zani 1996, Clause & Capaldi 2006). However, in the two individuals observed here the fracture surface was 47.94 mm and 6.39 mm before the tail bifurcation point (Figure 1C and 1F). We therefore suggest that these forks come from a second process of caudal autotomy (with prior regeneration of cartilage) where a semi-rupture of the cartilaginous tail promotes a second tail with cartilage. Other explanations are also possible.

Researchers have evaluated the costs of tail loss in lizards (Bateman & Fleming 2009), but no studies are available in the literature about the costs of abnormal tail regeneration. Future studies need to deepen the knowledge about the energetic cost of tail regeneration in multiple tails. Furthermore, morphometrics and population incidence are included, as well as the use of experimental manipulations to quantify their effects on key adaptive behaviors to increase our understanding of the ecological effects of abnormal tail regeneration and its impact on lizard survival.

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