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Tail bifurcation in a Brown Anole, *Anolis sagrei* (Duméril & Bibron, 1837)

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Many lizards across several families utilize caudal autotomy, the ability to deliberately severe off the tail, to escape predation (Bateman and Fleming 2009). The detached tail will often continue to wriggle vigorously, distracting predators and giving the lizard a chance to escape (Clause and Capaldi 2006). Specific sections along the tail either on the vertebra (intravertebral) or in between the vertebrae (intervertebral), called breakage planes, enable the fracture and subsequent severing of the tail (Arnold 1984). After successful autotomy, the lizard regenerates its tail within a few weeks (Clause and Capaldi 2006).

The regrown tail usually replaces the autotomized tail; however, sometimes there are complications. Indeed, there are frequent sightings of bifurcated tails in lizards (Hayes et al. 2012, Cordes and Walker 2013, Tamar et al. 2013, Kolenda et al. 2017, Koleska et al. 2017), with occasional instances of trifurcation or more (Koleska and Jablonski 2015, Passos et al. 2016, Pelegrin and Leao 2016, Koleska and Jablonski 2018). These abnormalities likely result from incomplete autotomy, where the tail doesn't fully detach but breaks enough to still spur tail regrowth (Lynn 1950).

Even though anoles are arguably the most comprehensively studied reptilian family, and there are several studies on caudal autotomy in this taxon (e.g. Kasier and Mushinsky 1994, Gillis et al. 2013, Tyler et al. 2016), there is currently only a single published description of tail furcation in anoles (Monsisbay and Olcha 2016).

Here, we report on another observation of tail bifurcation in the *Anolis* family and the first for the species *Anolis sagrei*. The Brown Anole (*An. sagrei*) is a member of the family Dactyloidae. It is native to Cuba and The Bahamas, where it is found on nearly all islands (Henderson and Powell 2009), and has been introduced to other Caribbean nations, the United States and Taiwan (Norval et al. 2002, Kolbe et al. 2004).

On 21 September 2019 at 1342 h one of the authors found an *A. sagrei* with two tails perched on the upper branch of a small shrub in southern Eleuthera (24.771736°N, -76.267104°W, WGS84; Fig. 1). The bifurcation was close to the base of the tail with the

Figure 1. *Anolis sagrei* with a tail bifurcation close to the base of the tail. The regenerated tail (white arrow) was nearly twice the length of the original severely damaged tail.

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second tail appearing to have grown above the original tail. The regenerated tail was twice the length of the original tail, which appeared to have been severely damaged, presumably due to a previous predation attempt. Unlike previous observations of tail furcations in lizards, where the regrown tail generally branches off from the original tail (e.g. Passos et al. 2016, Pelegrin and Leao 2016, Pola and Koleska 2017), in this instance the regrown tail completely displaced the original tail. Internally, regenerated tails appear to be less intricately structured, with vertebrae and highly organised muscles in the original tail replaced by rigid cartilage and loosely connected muscle bundles, which together might result in limited functionality in regrown tails (Fisher et al. 2012).

Another interesting observation was that this individual was particularly easy to capture and did not attempt to escape. The lack of avoidance could be explained by the anole being stunned due to stress at the time of capture. Alternatively, it could be that multiple tails infer higher energetic costs than a single tail. In turn, this could negatively affect the individual's activity patterns or ability to avoid predators. Nevertheless, the growth of the second, regrown, tail suggests that the individual was able to survive for at least several weeks and thus must have also been able to avoid predators over this time. Yet, the potential negative effects of multiple tails in lizards currently remain unknown, as previous studies have only addressed the costs and fitness impacts associated with caudal autotomy and tail regrowth of single tails (Bateman and Fleming 2009). To understand how partial rather than complete caudal autotomy occurs, more comprehensive physiological examinations of the breakage planes and signals triggering caudal autotomy are needed. Furthermore, testing lizards with tail furcations in predator avoidance experiments or endurance exercises will shed light on the energetic costs and potential fitness impacts of tail furcations in these individuals.

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