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Herpetology

Records of tail bifurcation in rainbow lizards *Agama agama* (Linnaeus, 1758) in Umudike, Nigeria

Levi N Onyenweaku, Augustine U Ezealor, Kingsley U Maxwell*

Department of Forestry and Environmental Management, Michael Okpara University of Agriculture, Umudike, Nigeria
**doctoritiba@yahoo.com*

Abstract

This paper reports sightings of rainbow lizards *Agama agama* with bifurcated tails in a community in Umudike, Nigeria. Five individuals (two males and three females) were sighted within one month at different occasions within approximately 1 km radius in a semi-urban habitat with high human activity. We consider this to be an unusual aberration among lizard populations in the tropical forest ecosystem in Nigeria. Hence, we believe that there could be a genetic or environmental connotation to the high frequency of occurrence of this aberration within the locality.

The lizard taxa is generally characterised by the possession of relatively long tails compared to their body sizes which aid them to perform various functions such as displays in courtship, defence against attack of other lizards, balancing their body, storing fats, climbing, stabilizing their body and escaping from predators (Vitt et al. 1977). Also associated with lizards is the ability to shed part of their tails when faced with imminent threat of predation, and to regrow another tail thereafter (Zamora-Camacho et al. 2015). The efficacy of self-detachment of tail, often referred to as caudal autotomy (Gilbert et al. 2013) is easily seen when an attempt is made to catch lizards by grabbing their tails (Arnold 1984).

Individuals or some species of lizards may also develop uncommon tail structures as part of their anti-predatory strategy (Bateman & Fleming 2009). Ananjeva & Danov (1991) and Clause & Capaldi (2006) posited that caudal autotomy could also occur as a result of fracture in the caudal vertebrae or as a response to certain environmental or individual issues, which may be species-specific or individual-specific. Tail loss creates impediments in the movement, reproduction and other physiological performances of individuals (Zamora-Camacho et al. 2015). As a result, individuals may regenerate their lost tails in such situations, and very often, the regenerated tails are made of strong cartilaginous materials, such that individuals may not shed them after the regrowth (Zani 1996, Alibardi 2009). For many African agamids, the regenerated tails are usually short, compared to the originally lost tails (Wagner et al. 2009) even when the need for longer tails may persist. All these point to the fact that certain anatomical processes in lizards may enhance the outgrowth and development of another tail, leading to a bifurcation (Dudek & Ekner-Grzyb, 2014).

Tail bifurcation is an uncommon morphological occurrence in lizards (Lynn 1950; Martins et al. 2013; Koleska et al. 2017, Henle & Grimm-Seyfarth 2020), and has been reported in different families including Agamidae (Ananjeva & Danov 1991). Chandra & Mukherjee (1980) recorded the occurrence of this phenomenon in *Agama tuberculata* in India. We are, however, not aware of any records of this uncommon feature among agamids of the Afrotropical region, and particularly in Nigeria.

This note reports regular sightings of this aberrant morphological feature in a common agamid species of the Afrotropics.

The observations were made at Umuariaga Community in Umudike (5°28'N; 7°32'E), in humid tropical forests in eastern Nigeria. Umudike is the host community of two agricultural institutions, which has caused the area to become semi-urban, creating a preferred habitat for rainbow lizards. In July 2018, we sighted a rainbow lizard with a bifurcated tail in an area of intense human habitation within the community. The area was then frequently surveyed, twice a week for a month. Observations were made on the sighted individuals from a distance and photographs were taken.

A total of five rainbow lizards (two males and three females) with bifurcated tails were sighted in the area during the survey month (Figure 1). From observations, the 'replacement tails' looked somewhat longer than the 'autotomous tails' (as described by Gilbert et al. 2013) in some individuals.

Presently, any statement on the scientific reason(s) for this unusual morphological aberration recorded among rainbow lizards in this area can at best be guesswork. The biological explanation for the occurrence of these anomalies in the caudal appendages of agamids may be any of a multiplicity of biological phenomena that come in various scientific appellations such as regeneration, autotomy, genetic mutation, etc. Furthermore, the sighting of five different individuals (two males and three females) with similar morphological features within the same locality is noteworthy. Chances are that such features may be an existing trait within members of this species in the locality. Further studies are therefore required to ascertain the possible genetic or environmental factors responsible for this ostensibly high frequency of tail bifurcation within a relatively small area of the community where these observations were made. It is also worth the while to investigate whether this morphological feature confers any advantages or disadvantages on the individuals that possess them.

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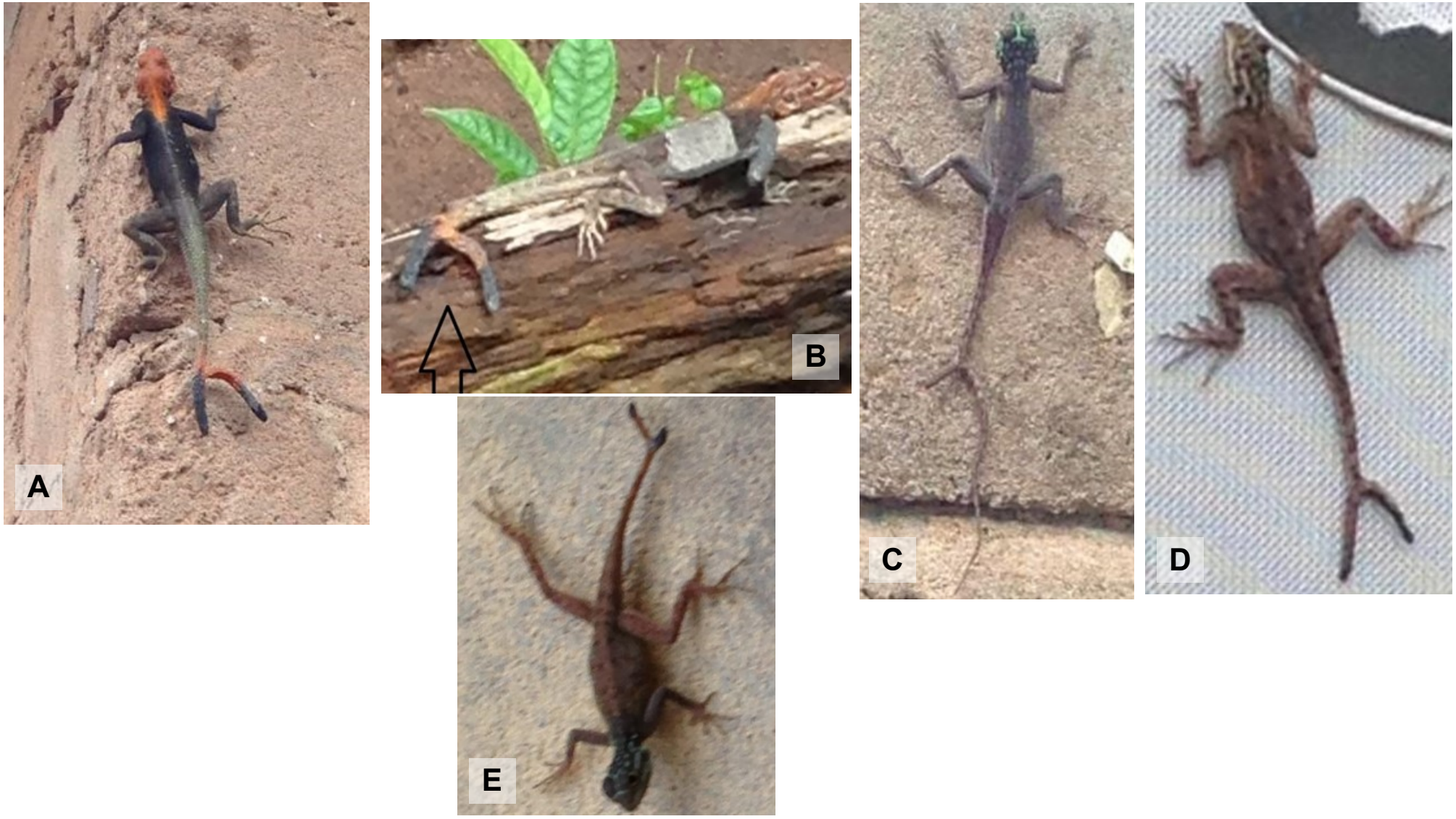

Figure 1: Males (A, B) and females (C, D, E) of rainbow lizards *Agama agama* with bifurcated tails. All the sightings were recorded within an area of about 1 km radius in Umuariaga Community, Umudike, in eastern Nigeria. The replacement tail of one the females (C) is distinctively long, suggesting that in some individuals, replacement tails may have the potency to grow to the length of the originally lost tails. One of the male lizards (B) is undergoing moult.

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