# AN ADULT MALE *BASILISCUS PLUMIFRONS* COPE, 1875 WITHOUT AN ARM SURVIVES IN THE TROPICAL RAIN FOREST OF COSTA RICA

## UN MACHO ADULTO DE *BASILISCUS PLUMIFRONS* COPE, 1875 SIN UN BRAZO SOBREVIVE EN EL BOSQUE TROPICAL DE COSTA RICA

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**Resumen.—** El basilisco verde *(Basiliscus plumifrons)* es una lagartija centroamericana de moderado tamaño que habita desde Honduras hasta Panamá. La especie es principalmente arborícola, pero también percha en troncos, rocas y arbustos. Esta lagartija se alimenta de invertebrados, vertebrados pequeños, flores y frutas. El 23 de junio de 2019 a las 0932 h, en el Parque Nacional Cahuita en el Caribe de Costa Rica, observamos un basilisco verde que no tenía su extremidad delantera izquierda. El individuo solo tenía un pequeño muñón bien cicatrizado. En esta nota reportamos este caso y discutimos algunas implicaciones relacionadas a la pérdida y regeneración de apéndices en reptiles.

**Palabras clave.—** manco, anomalía, cicatrices, extremidades, lagartijas.

**Abstract.—** The Green Basilisk *(Basiliscus plumifrons)* is a moderate-sized Central American lizard that is distributed from Honduras to Panama. The species is mainly arboreal, although it also perches on trunks, rocks and bushes. This lizard feeds on invertebrates, small vertebrates, flowers and fruits. On 23 June 2019 at 0932 a.m., at Cahuita National Park in the Caribbean of Costa Rica, we observed a Green Basilisk that did not have its left front limb. The individual had only one small, scarred rod like appendage. In this note we report this case and discuss some implications related to appendage loss and regeneration in reptiles.

**Keywords.—** one-armed, anomaly, limbs, lizards, scarring.

Morphological deformities such as osteological malformations of several types and anomalies are found in natural populations of reptiles in several areas of the planet (e.g. Raynaud, 1990; Norval et al., 2009; Cortada et al., 2017; Kolenda et al., 2017; Christopoulos & Pafilis, 2020). Among them are appendage loss that reptiles are not able to regenerate. The possible causes of appendage loss or anomalies vary depending of the type of each one of these. There are many reports on tail loss and regeneration of this, or tail anomalies on lizards. Less common are limb malformations or limb loss. Appendage regeneration in reptiles is usually restricted to the replacement of the tail, basically in lizards that can self-amputate it (autotomy) as a defensive behavior (Clause & Capaldi, 2006; Cortada et al., 2017). Some of these lizards can regrow the tail after amputation but they fail to achieve a functional restoration of lost limbs (Alibardi, 2017 a). Basically there are not cases of limb regeneration in lizards (Galis et al., 2003). Amputation without regeneration is far more common in these reptiles (Cortada et al., 2017). Lizards cannot regenerate limbs because they are intolerant to embryonic antigens, including those of newly reformed embryonic cells after wounding and healing, so consequently they are biologically unfit to regenerate limbs (Alibardi, 2017 b). However, limb regeneration in lizards is to some extent possible in experimental conditions, especially regarding stylo- and zeugopodium (Alibardi, 2017 b; Kolenda et al., 2017).

The Green Basilisk *(Basiliscus plumifrons* Cope, 1875) is a medium size lizard with a standard length in adult males of 122 to 250 mm, and 146 to 174 mm for females (Savage, 2002). Males can exceed 900 mm in total length (Leenders, 2019), although its tail may constitute 72 to 75% of total length (Savage, 2002). This lizard is widely distributed in the humid lowlands on the Caribbean versant from eastern Honduras to western Panama, and the Golfo Dulce region of Pacific southwestern Costa Rica

and adjacent Panama (Savage, 2002). It is found from sea level to 780 m elevation (Leenders, 2019). This lizard feeds on invertebrates and vertebrates, but it also consumes flowers and fruits (Savage, 2000). Adults are largely arboreal (McCranie, 2018), they are adept climbers, and often are found high up in trees (Leenders, 2019). The Green Basilisk generally perches on logs, rocks, and bushes, and it is often found along river banks (Leenders, 2019). This is a fairly common species in many parts of its range and there are several studies about its biology, yet nothing has been published regarding limb anomalies in *B. plumifrons*. We report here a case of a Green Basilisk without an arm by unknown causes.

The basilisk was observed in a well-preserved tropical forest in the Cahuita National Park, Limón Province, Costa Rica (9°43'03" N; 82°49'09" W), and at an elevation of about 26 m. This locality is within Humid Tropical Forest (Holdridge, 1967). We found the lizard while conducting a fieldtrip with a group of students on 23 June 2019 at 0932 h. The lizard had a severely defective left forelimb. It looks like a short, rod-like appendage, just a section of stylopodium, without any zeugopodium or autopodium (Fig. 1). Its scalation was basically normal, and based on this, it seemed the arm was amputated and then the remain healed without any inconvenience. The male is an adult observed while perched on vegetation about 4 m above ground in a flooded area.

**Figura 1.** Individuo macho de basilisco verde *(Basiliscus plumifrons)* sin el brazo izquierdo en el Parque Nacional Cahuita, Costa Rica. Foto: José M. Mora

**Figure 1.** Green basilisk *(Basiliscus plumifrons)* male without the left forelimb at Cahuita National Park, Costa Rica. Photo: José M. Mora.

Unfortunately, the cause of the amputation or deformity in this basilisk is unknown. The area where it was observed is a mature forest, well preserved, covered by pristine vegetation, where many other species of lizards are found. The appendage looks stiff but it is unknown if it is used for body support during locomotion, or any other activity, even that it looks as supported by bone. Despite the anomaly, the observed basilisk looks in good health and its condition did not hinder its mobility, it escaped fast when we approached. While the etiology of this anomaly is unknown, it does not seem to be any ontogenic malformation or related to environmental origin. It is known that chemicals may cause numerous anomalies in developing lizard embryos (Raynaud, 1990).

The absence of at least some parts of the limb is denominated ectomely, especially when the parts are the most distal ones (Kolenda et al., 2017). If the whole limb is absent it is called amely, or hemimely if the limbs, especially their distal parts, are defective, and meromely if only the digits are missing (Kolenda et al., 2017). Thus, the condition of this basilisk can be classified as amely. While we cannot be certain about the cause of the observed anomaly, there was not any regeneration of the appendage, even that some kind of regeneration has been observed in lizards (Alibardi, 2017 b). Although it is unclear what caused this condition, it seems more related to predation attempts or something similar, not to any developmental anomaly. We think this because of the scarring that can be appreciated on figure 1. Limb amputation in this basilisk was most likely suffered when it was still a juvenile and it could have been due to an episode of conspecific aggression. Regeneration is limited in lizards because the amniotes evolved an efficient body that when injures occurred they tend to rapidly isolate the microbial invasion through scarring (Ferguson & O'Kane, 2004; Alibardi 2017c). It seemed that the limb lost by this basilisk did not decrease its mobility because after our observation it moved agilely on the branches and run out of sight without a problem.

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