First report of partial leucism in the poison frog *Epipedobates anthonyi* (Anura: Dendrobatidae) in El Oro, Ecuador

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**ABSTRACT**

The poison frog *Epipedobates anthonyi* is a species of the Dendrobatidae family distributed in a restricted area in Ecuador and Peru; it has high chromatic variation in Ecuadorian populations. An individual with partial leucism was registered in the Province of El Oro-Ecuador. It is the first case formally reported from this species and in the country. This note describes the record and presents photographs to compare a leucistic individual with one with the normal coloration of the area.

**RESUMEN**

La rana venenosa *Epipedobates anthonyi* es una especie de la familia Dendrobatidae, distribuida en un área restringida en Ecuador y Perú, tiene un alto grado de variación cromática en las poblaciones ecuatorianas. Un individuo con leucismo parcial fue registrado en la provincia de El Oro-Ecuador, este es el primer caso reportado formalmente para esta especie y para el país. En esta nota se describe el registro y se presentan fotografías para comparar el individuo leucístico con uno con coloración normal del área.

Several types of coloration abnormalities have been reported in amphibians worldwide, which are caused by alterations in pigment cells [1–5]. The most common coloration abnormalities are: leucism, known as the lack of pigmentation in the whole body (only eyes retain normal coloration); and albinism, which is the lack of pigmentation, including the whole body and the eyes [6,7]. Another chromatic abnormality less reported in amphibians is piebaldism, which is the presence of depigmented blotches along the body [8,9]. These definitions, as stated above, have been mostly applied to mammals, because it is the taxa with the highest frequency of known cases [6,7]. In amphibians, however, possibly because it is a phenomenon that has not been studied as much, differences are observed in the definitions of some authors. For example, Carneiro de Lima Moraes and Kaefer [10] said that leucism could be a partial or total depigmentation of the body, except the eyes, and it differs from piebaldism, but Neff et al. [11] and Thomas and Follum [3] use the term “partial leucism” which is synonymous with piebaldism. Considering the terminology used in the articles mentioned above, the case reported in this note, is an amphibian with partial leucism or piebaldism, due to it has a partial depigmentation of the body and its eyes keep normal coloration. To my knowledge, this is the first report of coloration abnormality for *Epipedobates anthonyi* and the first report of the same kind for amphibians in Ecuador.

The epibatidine poison frog *Epipedobates anthonyi* (Noble, 1921) belongs to the family Dendrobatidae, it has alkaloids in the skin and generally apomictic coloration [12,13]. This species is found in southwestern Ecuador and northwestern Peru [14–16], occurring inside forests, crops, disturbed areas [17] and grassland. High variation in coloration has been observed within and between populations in Ecuador. Individuals from El Oro province have dorsal patterns of coloration with brown and red tones and light-colored (cream and turquoise) dorsal midlines and dorsolateral lines [16].

On an expedition carried out in May 2019, 16 km west of the city of Santa Rosa in El Oro province (−3.46110° S/79.811591° W) (Figure 1), an individual of *Epipedobates anthonyi* with partial leucism was registered. The individual was found at 11h30 a.m., at the edge of a secondary forest with abundant leaf litter, near a stream and bordering extensive grassland. The leucistic amphibian had depigmentation on most of the dorsum and venter; only the eyes and some blotches retained normal coloration (Figure 2). The specimen was sacrificed with lidocaine, fixed in 10% formalin and preserved in 70% ethanol. It was deposited in the Museo de
Zoología, Universidad San Francisco de Quito (ZSFQ) in Quito, Ecuador, with code ZSFQ 4080.

The coloration patterns are very important traits for individuals in the wild, because it may affect individual fitness [18]. Diurnal species of Dendrobatidae family depend on aposematic or cryptic coloration to avoid visually oriented diurnal predators [19–21]. *Epipedobates anthonyi* has both types of coloration in the province of El Oro [16,17]. In some cases, depigmentation could be harmful for survival because it increases conspicuousness in cryptic coloration and causes loss of warning signs of aposematic coloration, which would lead to a higher predation risk [22,23]. On the other hand, local predators could be reluctant to attack unknown prey (neophobia) [19–21]; that is why probably the leucistic individual reported here had not been predated until adulthood. However, this kind of chromatic abnormality may affect its congener’s relationships, for instance, mate choice and make reproduction more difficult [24]. Therefore, it is necessary to carry out studies on amphibians with a lack of pigmentation in the wild, in order to understand the ecological implications of these phenomena.

Some studies suggest that the presence of chromatic abnormalities in wildlife in their natural habitat could be caused by inbreeding or some kind of contamination in the environment [22,25–27]. *Epipedobates anthonyi* occurs in forest and grassland habitats, but also shows high adaptation to a large variety of habitats, being abundant in all of them [17]. Thus, in the location where the leucistic individual appeared, *E. anthonyi* is a common species, during two hours of sampling, approximately twenty individuals were observed. Therefore, inbreeding might not be an important factor for leucism in this case. Furthermore, a visible source of nearby contamination was not observed. Consequently, this could be a case of a pigment abnormality that occurs naturally but rarely in the wild as Mitchell and Church [28] suggest.

![Figure 1. Map of Ecuador showing the location (red triangle) where the leucistic individual of *Epipedobates anthonyi* was registered.](image-url)
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Figure 2. Photographs of (a) dorsal, (b) ventral and (c) dorsolateral views of leucistic individual and (d) dorsal, (e) ventral and (f) dorsolateral views of normal/common individual. Photographs by David Brito-Zapata.
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