

First record and notable range extension of the glass frog *Cochranella granulosa* (Taylor, 1949) (Anura, Centrolenidae) found in Ecuador

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The anuran family Centrolenidae, commonly known as glass frogs, are distributed across Central and South America. Following recent systematic updates, the family is currently comprised of 12 genera and 158 species. The genus *Cochranella* (Taylor, 1951) contains nine species found in lowland to mid-elevation forest regions of Honduras, Columbia, Ecuador, Peru, and Bolivia (McCranie, 2007; Guayasamin et al., 2009; Twomey et al., 2014; Molina-Zuluaga et al., 2017; Frost et al., 2019). *Cochranella* sp. are broadly characterised by having green bones, a lack of humeral spines, and a venter of which the superior half of the ventral parietal peritoneum is white, and the posterior half transparent (Guayasamin et al., 2009). Of 61 glass frog species currently recorded from Ecuador, three are from the genus *Cochranella* (Frost et al., 2019): *C. litoralis* (Ruiz-Carranza and Lynch, 1996), *C. mache* Guayasamin and Bonaccorso, 2004, and *C. resplendens* (Lynch and Duellman, 1973). The known distribution of a fourth, *C. granulosa* (Taylor, 1949) (found at elevations of 40-1500 m a.s.l.) stretched from the Caribbean coast

of eastern Honduras to central Panama, and on the Pacific versant from central Costa Rica to southwestern Panama (Köhler, 2001; Savage, 2002; McCranie and Wilson, 2002; McCranie, 2007; Kubicki, 2007). Here, we present the first record of *C. granulosa* in Ecuador (Fig. 1), which represents a southward range extension of ca. 950 km (Ibanez et al., 1999; Fig. 2).

On 12th February 2016 at 21:30 hours while surveying herpetofauna within the El Jardín de los Sueños private reserve, a 107 ha site located in Cotopaxi province in Ecuador (Fig. 2), we observed two glass frogs spaced ~1.5 m apart, perched atop *Heliconia* sp. L. leaves approximately 5 m above a stream (0.8416°S, 79.2006°W; 461 m a.s.l.; Fig. 1). One frog was vocalising, and both were captured for close identification. The vocalising animal was retained as a voucher specimen (permit number MAE-DNB-CM-2015-2017) and euthanised using benzocaine atomizer, fixed, preserved in 75% ethanol, and deposited in the herpetological collection of the Museo de Zoología, Universidad Tecnológica Indoamerica in Quito, Ecuador (SVL: 31.50 mm, accession: MZUTI-4811). The identification of both frogs as *C. granulosa* was verified using diagnostic characteristics described by Savage (2002), including uniform dark green dorsum, strong granulation on the upper surfaces, snout obtuse in profile, dark green bones, tympanum indistinct, white pericardium and digestive tract, without arm or leg fringes, and iris pale grey-gold. Scattered black spots (a variable characteristic; Savage, 2002; Leenders, 2016; Fig. 1) were not present on the dorsal surface of either individual. Our identification was further confirmed via molecular phylogenetic analysis using material from the voucher specimen (MZUTI-4811) (Guayasamin *pers. comm.*; to be published elsewhere).

Remarkably, despite considerable geographic distance, Ecuadorian *C. granulosa* apparently show

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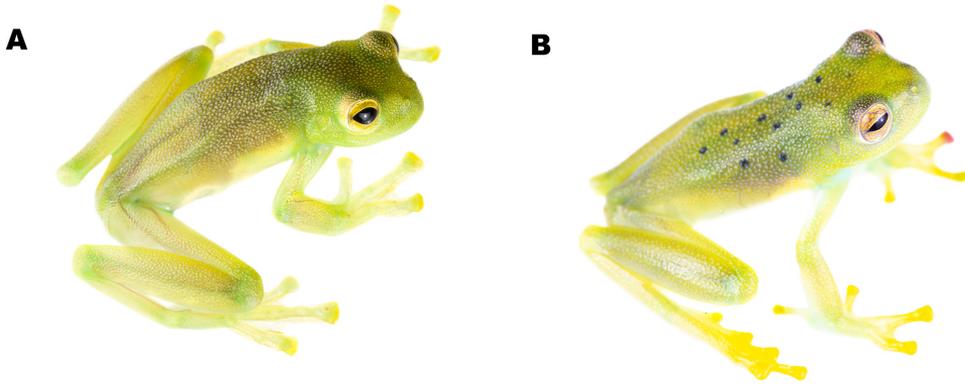


Figure 1. Specimens of *Cochranella granulosa*. A) First record of *C. granulosa* found in Ecuador, B) specimen of *C. granulosa* from Central America (Veragua, Costa Rica; black square of Figure 2). Photos by J. Culebras.

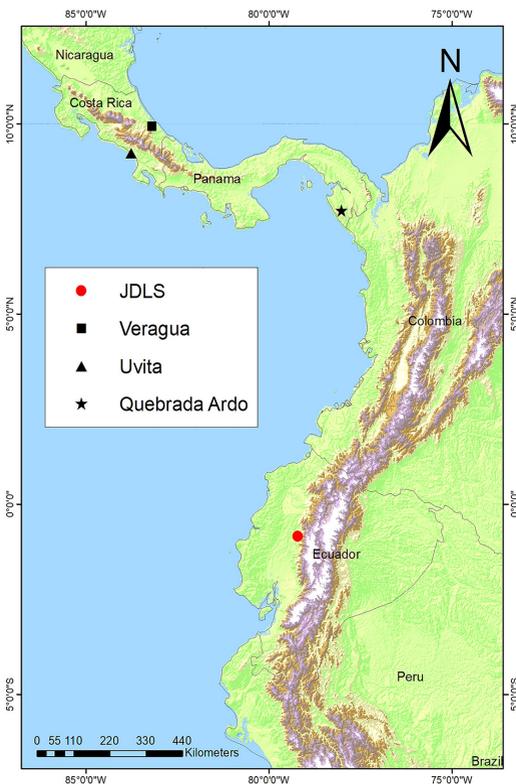


Figure 2. Map illustrating part of the geographic distribution of *Cochranella granulosa*, including localities in Costa Rica (black triangle and square) and the previously southernmost reported locality in Panama (black star). Red dot represents the new locality of this species in El Jardín de los Sueños Private Reserve, Cotopaxi, Ecuador.

limited phenotypic variation from Central American populations, with the possible exception of the variable trait of a spotted dorsal surface (Savage, 2002; Leenders, 2016). Discovering *C. granulosa* in El Jardín de los Sueños not only represents the first record in Ecuador but extends the species' distribution southward from the nearest previously reported locality in Panama, by approximately 950 km (Ibañez *et al.*, 1999). Our finding increases the number of Ecuadorian glass frog species to 62. We advocate additional surveys to better define the distribution of *C. granulosa*, as well as further work to assess the conservation status for this species in Ecuador.

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