

First records of Johnstone's whistling frog *Eleutherodactylus johnstonei* from two departments in south-western Colombia

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Eleutherodactylus johnstonei Barbour, 1914 is a small frog that completes metamorphosis within the egg to emerge as a froglet, i.e. there is no free living tadpole. The species is native to some islands of the Lesser Antilles (Kaiser, 1997) but it has a long history of being introduced into several Caribbean islands, Bermuda, some countries in Central America, South America and even Europe (Kaiser et al., 2002; Savage, 2002; Leonhardt et al., 2019; Frost, 2020; Moravec et al., 2020). Introductions typically occur through the ornamental plant trade, with or without the deliberate help of humans (Kaiser et al., 2002; Leonhardt et al., 2019). Compared to other countries, Colombia has a long history of *E. johnstonei* introductions and consequently the species is well established there with a large number of reported populations, so that it is deserving of special attention (Leonhardt et al., 2019).

The first occurrence of this species in Colombia was in 1992, based on a single specimen collected in Barranquilla, department of Atlántico (Ruiz-Carranza et al., 1996). Subsequently, the species was reported towards the south of the country through vouchered or non-vouchered records from the departments of Santander (Bucaramanga), Valle del Cauca (Cali), Bolívar (Cartagena), Tolima (Mariquita, Ibagué) and Cundinamarca (Chinauta-Fusagasugá) (Ortega et al., 2001; Kaiser et al., 2002; Montes & Bernal, 2012; Gómez-Martínez et al., 2016). About 25 years after the first introduction, Leonhardt et al. (2019) provided the first systematic and comprehensive countrywide assessment of *E. johnstonei* in Colombia, confirming all previous records and adding records from the departments of Antioquia (Medellín) and Magdalena (Santa Marta). Here we report the presence of this species in two additional departments in south-western Colombia (Fig. 1), based on both audio-visual and voucher records. The specimens collected were euthanised with 2 % lidocaine hydrochloride, fixed in 10 % formalin, preserved in 70 % ethanol, and stored in the herpetological collection of the Museo de Historia Natural of the Universidad del Cauca, Colombia (MHNUC). To see and/or hear the frogs, view our video (BHS video, 2021).

E. johnstonei in the department of Cauca

In the peri-urban area of Santander de Quilichao on 18th

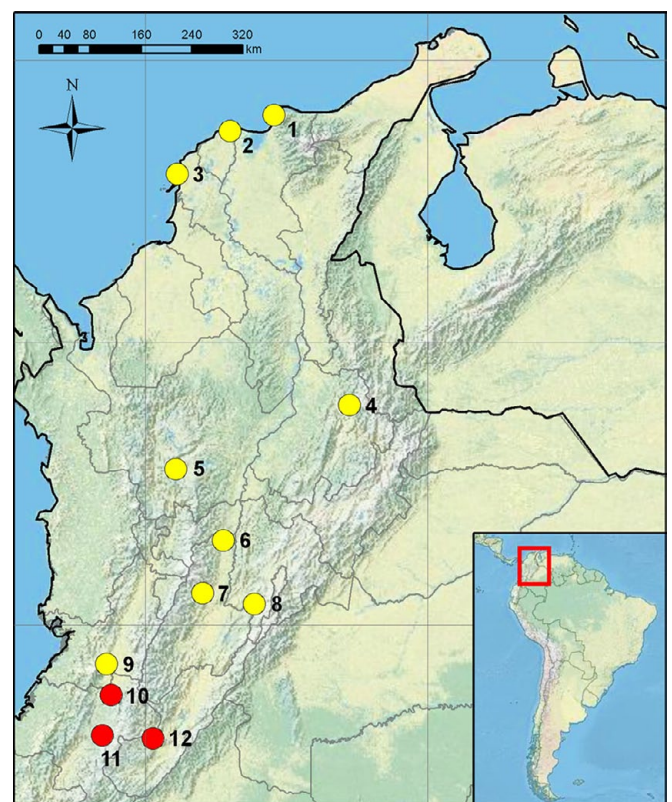


Figure 1. Distribution of *Eleutherodactylus johnstonei* in Colombia. Yellow dots indicate previous records summarised by Leonhardt et al. (2019): **1.** Santa Marta, Magdalena; **2.** Barranquilla, Atlántico; **3.** Cartagena, Bolívar; **4.** Bucaramanga, Santander; **5.** Medellín, Antioquia; **6.** Mariquita and **7.** Ibagué, Tolima; **8.** Chinauta-Fusagasugá, Cundinamarca; **9.** Cali, Valle del Cauca. Red dots indicate the new records: **10.** Santander de Quilichao and **11.** Popayán, Cauca; **12.** La Plata, Huila

December 2015 (18:25 h), some individuals were heard and one photographed in a restaurant. Then on 24th February 2018 (19:30 h), other individuals were also heard and one collected (MHNUC-He-An-1241) in a private garden in the urban area of this municipality (3° 0'37" N, 76° 28'56" W, 1061 m a.s.l.). The species was also found in the municipality of Popayán; a single individual was heard and photographed on 14th December 2019, in a street garden in the Las

Américas neighbourhood (2° 26'19" N, 76° 36'41" W, 1730 m a.s.l.). Furthermore, on 29th November 2020 (20:30 h) three individuals were heard in private gardens in the peri-urban condominium 'Sendero de Eucaliptos' (2° 29'30" N, 76° 33'29" W, 1848 m a.s.l.), one of which was collected (MHNUC-He-An-1326). *E. johnstonei* has also been heard at three other sites in Popayán not visited by us, but it was absent in seven nurseries that were visited or contacted by us.

E. johnstonei in the department of Huila

In late March 2020, the species was initially heard at night in the Las Quintas neighbourhood, municipality of La Plata. Subsequently, several individuals were heard (> 5 calling males) or observed in each of at least seven locations in the municipality, among two plant nurseries, the cemetery and private gardens of urban and peri-urban areas, always associated with ornamental plants. One individual was collected (MHNUC-HE-An-1325, Fig. 2) on 25th September 2020 (20:31 h) at Finca La Praderia, vereda Panorama (2° 24'27" N, 75° 52'55" W, 960 m a.s.l.). Information provided by some property owners suggests that the species has been established in La Plata at least since late 2018, and in two independent cases it appeared after they brought ornamental plants from Cali; whereas both plant nurseries visited by us receive all their plants exclusively from larger nurseries in Chinauta-Fusagasugá, Cundinamarca, where the species is not abundant (Leonhardt et al., 2019). However, both the property owners and ourselves have noticed a rapid proliferation of these frogs inside the plant nurseries at La Plata (> 20 calling males), from where the species appears to have been transported as evidenced by the complaints of some clients who later heard the frogs in their gardens.

Species identification

In mainland Colombia, no frog species other than *E. johnstonei* is strictly associated with gardens in urban and peri-urban areas, and the species can be detected easily by its distinctive two-note calls where the second note is higher and longer than the first (Kaiser, 1992). In addition, the species can be identified according to the descriptions and keys provided by Savage (2002) and Köhler (2011). All three specimens collected showed the diagnostic characteristics described by the aforementioned authors, some of which can be appreciated in Figure 2.

The records of *E. johnstonei* presented here are the first from the departments of Cauca and Huila, extending its distribution more than 100 km (in a straight line) from Cali, making them the southernmost locality records in Colombia. The species presumably arrived in Cauca from populations in Cali (Valle del Cauca) due to the proximity and high commercial flow between these departments; whereas in Huila it was introduced independently from Cali and Cundinamarca. The species continues to show a discontinuous distribution pattern in Colombia (Fig. 1) so that its presence in these additional departments is more likely related to passive movements mediated by humans rather than natural dispersal as suggested by Leonhardt et al. (2019).

The presence of *E. johnstonei* at 1848 m (Popayán, Cauca) confirms its ability to live at high altitudes, surpassing the previous highest records from Venezuela (Mérida, up to 1400

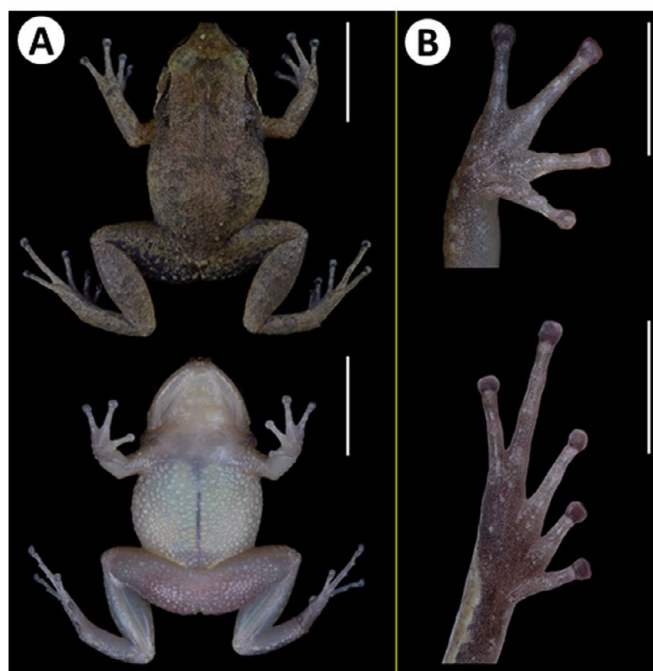


Figure 2. Specimen of *Eleutherodactylus johnstonei* from La Plata, Huila (MHNUC-He-An-1325) - **A.** Dorsal (upper) and ventral (lower) views, **B.** Ventral views of right hand (upper) and right foot (lower). Scale bars - A. = 10 mm, B. = 5 mm

m) and Colombia (Fusagasugá, 1717 m) (Kaiser et al., 2002; Leonhardt et al., 2019). However, the population appears to increase only slowly at such altitude in Popayán (<5 calling males per site), and similarly in Fusagasugá abundance is low (Leonhardt et al., 2019).

In the places where we found *E. johnstonei*, most of the property owners were not bothered by the frogs' calls; some owners even felt comfortable and sufficiently used to the calls that they would regularly water their gardens to hear 'their little frog'. However, this attitude was not universal. One owner in the Las Americas neighbourhood, Popayán, Cauca expressed annoyance with the species' call. At La Plata, two clients of the plant nurseries were annoyed by the calls and one property owner, who had initially felt comfortable a few months earlier, was no longer sympathetic due to the subsequent proliferation of these frogs in his garden (> 30 individuals heard/observed).

According to the testimony of a person from Popayán, who has the species in his garden, these frogs are offered along with the sale of ornamental plants in at least one nursery in Cali. This amounts to intentional distribution of an alien species which is of questionable legality. We confirmed this bad practice which had been reported initially in Bucaramanga (Ortega et al., 2001).

We believe that the current distribution of *E. johnstonei* in Colombia is underestimated and that it will continue to grow due to increases in the ornamental plant trade, the intentional dispersal by some nurseries, and to a lack of control measures by the government. Although the species does not currently appear to represent a threat to native fauna in Colombia, economic and mental health effects on people related to the noise pollution generated by the frog's calls have been predicted (Gómez-Martínez et al., 2016;

Leonhardt et al., 2019). Faced with this, we agree with the proposals of the aforementioned authors for the need to have intensive systematic monitoring of this species in Colombia as well as to implement control measures and management techniques in nurseries and gardens.

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