

## Range expansion of white lipped foam-nest frog *Leptodactylus fragilis* on to the Caribbean slope of Costa Rica

JOHAN GATGENS-GARCÍA<sup>1,2</sup>, ALEXANDER CHAVES-SÁNCHEZ<sup>3</sup>, YORDY SOTO-UGALDE<sup>3</sup> & MARCO D. BARQUERO<sup>3\*</sup>

<sup>1</sup>Programa de Posgrado en Biología, Sistema de Estudios de Posgrado, Universidad de Costa Rica, 11501-2060, San José, Costa Rica

<sup>2</sup>Laboratorio de Patología Experimental y Comparada (LAPECOM), Escuela de Biología, Universidad de Costa Rica, 11501-2060, San José, Costa Rica

<sup>3</sup>Sede del Caribe, Universidad de Costa Rica, Limón, Costa Rica

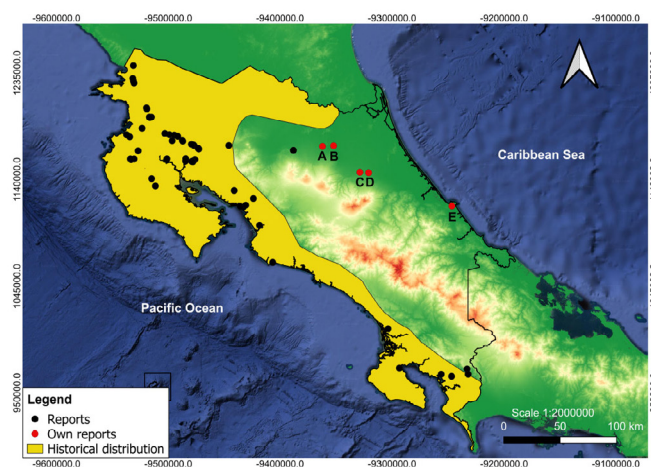
\*Corresponding author e-mail: marco.barquero\_a@ucr.ac.cr

The family Leptodactylidae contains around 233 species in 15 genera (Frost, 2023). Its species are distributed from southern Texas to South America, although some species can also be found on certain Caribbean islands (Rodríguez-Cabrera et al., 2018; AmphibiaWeb, 2023). These frogs are characterised by depositing their eggs in foam nests, which are created by the male with its hind legs during mating (Leenders, 2016). In Costa Rica, this family includes six species in two genera and they are distributed on both the Caribbean and Pacific versants (Leenders, 2016; Frost, 2023).

The white-lipped foam-nest frog, *Leptodactylus fragilis* (Brocchi, 1877), is a medium-sized, short-limbed leptodactylid with snout-vent lengths of 25–40 mm (Savage, 2002). In the past, the species was referred to as *Leptodactylus labialis*, although the valid and current name of *L. fragilis* was established by Heyer (2002). The body is covered with tubercles with a pair of dorsolateral folds and a spotted dorsum (Heyer et al., 2006; Leenders, 2016). It is distinguished from other leptodactylids by having a light stripe on the upper lip and white tubercles on the soles of the feet and lower surfaces of the tarsi (Savage, 2002; Leenders, 2016).

*Leptodactylus fragilis* can be found in natural and man-made swamps, ponds and any temporary pools during rainy periods (Savage, 2002; Leenders, 2016). This species ranges from Texas to Venezuela (Heyer et al., 2006; Mendez-Narvaez et al., 2009), and in Costa Rica was, until recently, considered to be a species restricted to the lowlands of the Pacific versant and marginally in the Northern Zone (Savage, 2002). There is only one previous report of this species on the Caribbean side of Nicaragua (Bluefields), and no previous reports for the Caribbean side of Costa Rica and west of Colón, Panama (iNaturalist, 2023).

Here we present new reports and localities for *L. fragilis* on the Caribbean versant of Costa Rica (Fig. 1). The first record was in 2019 from Villa Hermosa, Limón (9.976448° N, -83.064387° W, 54 m a.s.l.). The next records were in 2020 from Puerto Viejo, Sarapiquí, Heredia (10.453169° N, -84.010525° W, 41 m a.s.l.), in 2022 from Guápiles, Limón (10.243905° N, -83.799177° W, 185 m a.s.l. and 10.24034° N,

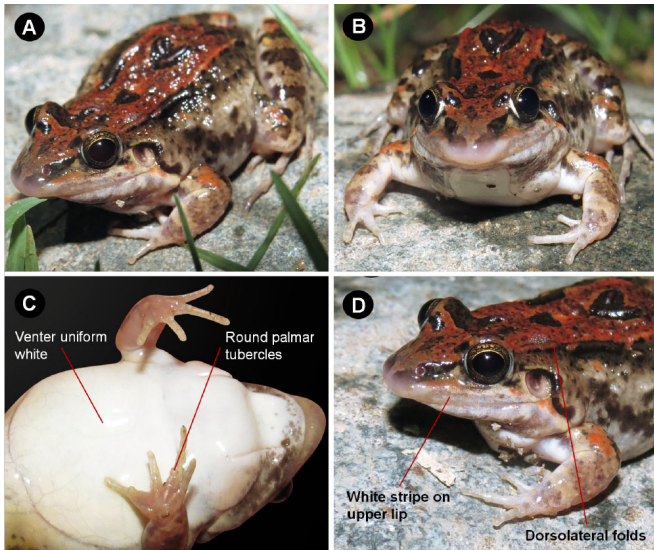


**Figure 1.** Historical distribution of *Leptodactylus fragilis* on mostly the Pacific versant of Costa Rica and reports of range expansion onto the Caribbean versant. The black dots represent the reports from the database and the red dots are own reports. **A & B** correspond to the reports in Chilamate and Puerto Viejo, Sarapiquí, **C & D** in Guápiles, Limón, and **E** in Villa Hermosa, Limón.

-83.729173° W, 140 m a.s.l.), and in 2023 from Chilamate, Sarapiquí, Heredia (10.2653° N, -84.0558° W, 99 m a.s.l.). These frogs were detected by their vocalisation and the species was later confirmed using species diagnostic traits.

All observations took place in open areas with temporary pools and small water bodies and disturbed by human activity, in the same habitat as the variable foam-nest frog *Leptodactylus melanonotus*. We were able to distinguish *L. fragilis* (Fig. 2) from the *L. melanonotus* in the field using the following traits: 1) vocalisation, 2) a light longitudinal stripe on the posterior surface of the thighs only present in *L. fragilis* (Savage, 2002), 3) colouration of the venter (mottled with dark pigment in *L. melanonotus* and uniform white to cream in *L. fragilis*, Fig. 2C), and 4) a white stripe on the upper lip only present in *L. fragilis* (Fig. 2D) (Leenders, 2016).

Several factors have likely contributed to the range expansion of *L. fragilis* on the Caribbean versant of Costa Rica, one of which would be alterations of habitat that



**Figure 2.** An adult male *Leptodactylus fragilis* caught at Villa Hermosa, Limón, Costa Rica – **A.** & **B.** Frontal views, **C.** & **D.** Specific traits to identify the species

include changes in land use patterns and deforestation. The lowlands of the Caribbean side of Costa Rica have experienced an expansion of urbanisation and agriculture during the past three decades (Segovia-Fuentes, 2018). *Leptodactylus fragilis* is quite adaptable and able to use disturbed areas such as plantations and roadside ditches (Leenders, 2016). Thus, human settlements and cultivated fields could have facilitated the colonisation of new areas across the Caribbean versant.

The range expansion of *L. fragilis* onto the Caribbean side of Costa Rica has ecological implications such as competition with *L. melanonotus*, since both species use similar water bodies (Savage, 2002; Leenders, 2016). Additionally, the arrival of *L. fragilis* might alter the predator-prey relationships within the ecosystems. Therefore, monitoring the spread of the species and population dynamics will enhance our understanding of the factors influencing range expansions and the consequences for amphibian populations and ecosystems.

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