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Research note

First record of the invasive greenhouse frog (*Eleutherodactylus planirostris*) in the Mexican Caribbean

Primer registro de la rana de invernadero invasora (*Eleutherodactylus planirostris*) en el Caribe mexicano

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Abstract. Based on morphological identification and a molecular analysis of specimens collected in the urban zone of Playa del Carmen in the state of Quintana Roo, we report the first record of the invasive greenhouse frog (*Eleutherodactylus planirostris*) in the Mexican Caribbean. The presence of *E. planirostris* in the Yucatán Peninsula suggests an urgent need for research to evaluate its invasion and ecological impacts.

Key words: new record, DNA barcodes, morphological analysis, molecular analysis, Playa del Carmen, Yucatán Peninsula.

Resumen. Con base en identificación morfológica y análisis molecular de ejemplares recolectados en la zona urbana de la ciudad de Playa del Carmen, Quintana Roo, informamos del primer registro de la rana de invernadero (*Eleutherodactylus planirostris*) en el Caribe mexicano. La presencia de *E. planirostris* en la península de Yucatán sugiere la necesidad de realizar urgentemente una investigación para evaluar su invasión y los posibles impactos ecológicos que puedan suscitarse.

Palabras clave: nuevo registro, códigos de barras de DNA, análisis morfológico, análisis molecular, Playa del Carmen, península de Yucatán.

Biological invasions are widely recognized as a significant component of human-caused global environmental change, often resulting in the loss of biological diversity and ecosystem function (Hulme, 2003). The greenhouse frog *Eleutherodactylus planirostris* has direct development (no aquatic stage) and deposits its eggs in moist soil, which facilitate human-mediated colonization (Christy et al., 2007) through transportation in potted plants (e.g. Kraus et al., 1999; Kraus and Campbell, 2002).

The greenhouse frog is native to the Caribbean islands of Cuba, Bahamas and Cayman Islands (Díaz and Cádiz, 2008; Olson et al., 2012a), but it has a wide non-native distribution in the United States, Mexico, Jamaica, Grenada, Caicos Islands, the Miskito Cays of Nicaragua, Honduras, Panama City, Panama, and the Pacific islands of Hawaii and Guam (Díaz and Cádiz, 2008; McCrane et al., 2008; Kraus, 2009; Heinicke et al., 2011; Crawford et al., 2011; Olson et al., 2012a, 2012b).

Empirical observations indicate that the greenhouse frog is a highly successful invasive species (Bomford et al., 2009). For instance, after natural and human-assisted introductions occurred in the early 1900s in Florida USA, the greenhouse frog is now found throughout the state. It is suspected that human-assisted introductions often occur by hitch-hiking on commercial nursery plants (Heinicke et al., 2011; Kraus et al., 1999) and probably this is the way the greenhouse frog arrived in Mexico. Here, we report the first record of *E. planirostris* in the Mexican Caribbean confirmed by morphological and molecular data.

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On 19 November 2010 at 14:00 h following a heavy rain, 3 small frogs were collected (field numbers JGV 303-305; 16, 20 and 21 mm snout-vent length [SVL], respectively) around a swimming pool at a condominium built in 1993 in the urban zone of Playa del Carmen, Quintana Roo, Mexico, 20°37' 52" N, 87°04' 21" W (Fig. 1). Living specimens were photographed (Fig. 2), sacrificed and preserved in 96% ethanol, and then deposited in the herpetological collection of the Museo de Zoología Alfonso L. Herrera of the Facultad de Ciencias, Universidad Nacional Autónoma de México (UNAM) with catalogue numbers MZFC 27464-27466.

After the literature review of local amphibians, photographic comparisons, and use of taxonomic keys, we identified the specimens as belonging to the genus *Eleutherodactylus*, but based on information in Lee (1996, 2000), Campbell (1998), and Köhler (2011) morphological features of the collected frogs were inconsistent with any of the 9 species native to the Yucatán Peninsula. In order to identify our specimens to the species level, we conducted a genetic analysis using sequences from the mitochondrial gen Cytochrome Oxidase Subunit I (COI) (>600 bp). Tissue samples were obtained from each specimen by toe clipping.

Molecular protocols (DNA extraction, amplification and sequencing) were conducted in the barcoding laboratory of El Colegio de la Frontera Sur (ECOSUR) following the Canadian Center of DNA Barcoding (CCDB) public protocols (http://www.dnabarcoding.ca). To corroborate and compare our genetic material, we obtained 3 additional sequences of *E. planirostris*, including 2 from Panama and 1 from Cuba (Crawford et al., 2011), and 6 sequences

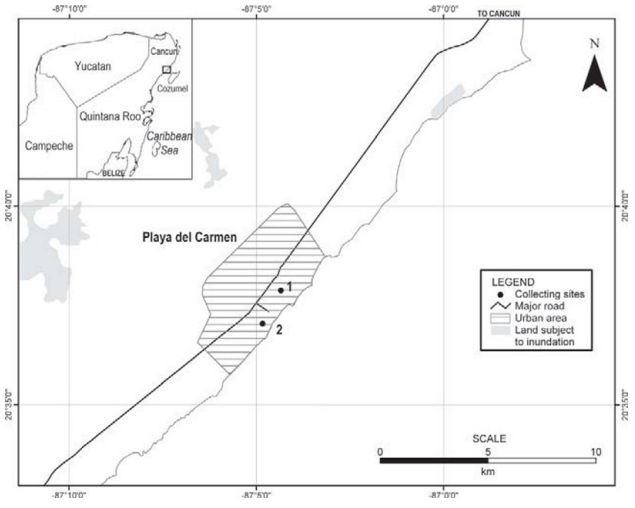

Figure 1. Collecting sites of *E. planirostris* in the urban zone of Playa del Carmen, Mexico.

Figure 2. The greenhouse frog, *Eleutherodactylus planirostris*. Specimens found in Playa del Carmen, Quintana Roo, Mexico. Vouchers MZFC 27464-66 (up to down order). Photos by H. Bahena-Basave.

of other species of *Eleutherodactylus* (*E. glamyrus, E. eileenae, E. bartonsmithi, E. principalis*, *E. mariposa* and *E. ronaldi*) (Rodríguez et al., 2010), all downloaded from the Barcode of Life Database (www.boldystems.org). A neighbor-joining (NJ) tree was reconstructed with a