

FIRST RECORDS OF FIVE SPECIES OF THE GENUS *ELEUTHERODACTYLUS* DUMÉRIL AND BIBRON, 1841 (ANURA, LEPTODACTYLIDAE) FOR BOLIVIA

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ABSTRACT

Five species of the genus *Eleutherodactylus* (Anura, Leptodactylidae) are reported from Bolivia for the first time: *E. altamazonicus* from Departments Pando and La Paz; *E. carvalhoi* from Cochabamba; and *E. ockendeni*, *E. skydmainos* and *E. zimmermanae* from Pando. New departmental records are provided for other species: *E. cruralis* for Department Pando, *E. danae* for Beni and La Paz, *E. platydactylus* for Beni, *E. toftae* for Pando and La Paz and *E. ventrimarmoratus* for La Paz. Currently, 25 species of *Eleutherodactylus* are known in Bolivia. The taxonomic status of some species remains uncertain, new species are being described and others are still to be discovered. Therefore, the actual number of Bolivian *Eleutherodactylus* species is still unknown.

Key words: *Eleutherodactylus*, Bolivia, new records, Anura, Leptodactylidae

RESUMEN

Nuevas citas de *Eleutherodactylus* Duméril y Bibron, 1841 (Anura, Leptodactylidae) para Bolivia

En este trabajo se publican los primeros registros de cinco especies del género *Eleutherodactylus* (Anura, Leptodactylidae) para Bolivia: *E. altamazonicus* en los Departamentos de Pando y La Paz; *E. carvalhoi* en Cochabamba; y *E. ockendeni*, *E. skydmainos* y *E. zimmermanae* en Pando. Además, se aportan las primeras citas de *E. cruralis* para el Departamento de Pando, de *E. danae* para Beni y La Paz, de *E. platydactylus* para Beni, de *E. toftae* para Pando y La Paz y de *E. ventrimarmoratus* para La Paz. La diversidad conocida de *Eleutherodactylus* en Bolivia es de 25 especies, aunque los problemas taxonómicos sin resolver, las especies en descripción y el alto número de especies aún no citadas que se considera probable encontrar, hacen que aún desconozcamos la verdadera diversidad de este género en Bolivia.

Palabras clave: *Eleutherodactylus*, Bolivia, nuevas citas, Anura, Leptodactylidae.

Introduction

Frogs of the genus *Eleutherodactylus* occur in the Neotropical Region, where they are the most diverse genus of terrestrial vertebrates (Glaw & Köhler, 1998). Most *Eleutherodactylus* inhabit the

humid mountain forests of the Andes, but many species occupy the lowland Amazonian forest, the Cerrado open forest, the Mata Atlantica, Middle America and most Caribbean islands (Frost, 1985; 2004). Currently, nearly 700 species have been recognized (Duellman, 1993; Lynch & Duellman,

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1997; Duellman & Pramuk, 1999; AmphibiaWeb, 2004), but several new species are described every year (Glaw *et al.*, 1998).

In Bolivia, 17 species have been formally recognized by De la Riva *et al.* (2000) and 19 by Köhler (2000). These authors expected that additional species would be reported in subsequent years. During the examination of unidentified specimens of *Eleutherodactylus* deposited in three collections of Bolivia, we identified some species that had not yet been recorded for the country, or were only known from single previous records. The aim of this work is to report and comment on these specimens and provide an overview of the species diversity of the genus *Eleutherodactylus* in Bolivia.

Methods

New records were established upon the basis of the last published lists (De la Riva *et al.*, 2000; Köhler, 2000; Reichle, 2003). Specimens were collected by different naturalists (specified in each case) and deposited in three Bolivian collections: Museo de Historia Natural Noel Kempff Mercado (MNKA, Santa Cruz de la Sierra), Colección Boliviana de Fauna (CBF, La Paz) and Colección de Fauna del Centro de Biodiversidad y Genética (CBG, Cochabamba). Other institutions consulted were: Museo de Historia Natural de la Universidad Mayor de San Marcos, Lima, Perú (MHNSM, formerly MUSM) and Museo de Zoología, Universidade de São Paulo, (MZUSP). JMP identified specimens by comparing them with museum specimens, author's notes on type specimens, and original descriptions and/or redescrptions. The snout-vent length (SVL) of adult specimens was measured to the nearest 0.01 mm by a single author

(JMP) using a digital caliper. For each species we provide complete distributional information (when available) that consists of department (Fig. 1), pro-

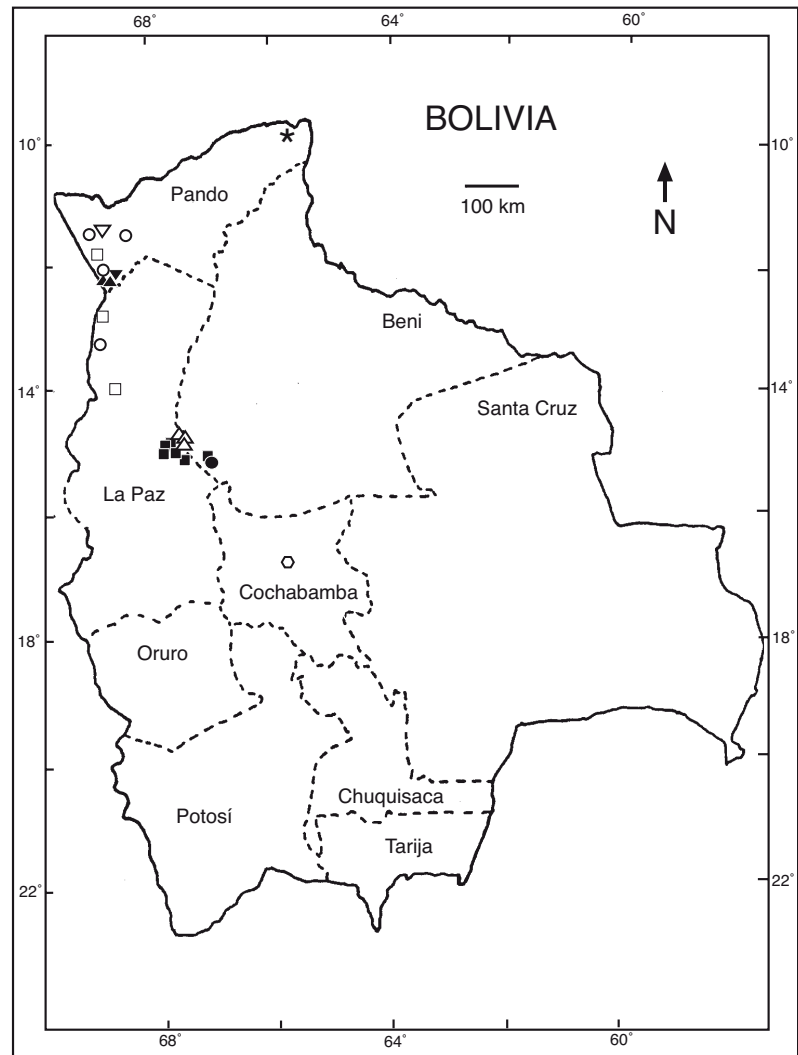


Fig. 1.— Map of Bolivia showing the Departments and new locality records for: *Eleutherodactylus altamazonicus* (white circles), *E. carvalhoi* (hexagon), *E. cruralis* (black triangles), *E. danae* (black squares), *E. ockendeni* (black inverted triangle), *E. platydactylus* (dot), *E. skydmainos* (asterisk), *E. toftae* (white squares), *E. ventrimarmoratus* (white triangles), and *E. zimmermanae* (white inverted triangle).

Fig. 1.— Mapa de Bolivia mostrando los departamentos y las nuevas localidades para: *Eleutherodactylus altamazonicus* (círculos blancos), *E. carvalhoi* (hexágono), *E. cruralis* (triángulos negros), *E. danae* (cuadrados negros), *E. ockendeni* (triángulo invertido negro), *E. platydactylus* (círculo negro), *E. skydmainos* (asterisco), *E. toftae* (cuadrados blancos), *E. ventrimarmoratus* (triángulos blancos), and *E. zimmermanae* (triángulo invertido blanco).

vince and locality (coordinates in parentheses). For the habitat characteristics we followed De la Riva *et al.* (2000).

New records

Eleutherodactylus altamazonicus Barbour & Dunn, 1921

PANDO: Province Manuripi: Reserva Nacional de Vida Silvestre Amazónica Manuripi, Luz de América (12°07'16.6"S/68°36'37.5"W), MNKA 3637 (immature, SVL: 12.07 mm), collected on 8 June 2000 by L. Gonzáles (Fig. 2); Curichón, Reserva Nacional de Vida Silvestre Amazónica Manuripi Heath (11°46'S/68°18'W), MNKA 3878 (male, SVL: 14.13 mm), collected on 28 August 2002 by M. Guerrero; Province Nicolás Suárez: Reserva Nacional de Vida Silvestre Tahuamanu: Luz de América, Maravilla (11°24'27"S/69°01'07"W), MNKA 6879 (young female, SVL: 15.80), collected on 2 July 2002 by M. Guerrero; Province Federico Román: MNKA 6880 (adult male, SVL: 15.69) collected during 1999 by J. Cadle.

LA PAZ: Province Iturrealde: Candelaria (13°35'12.5"S/68°40'48"W), CBF 5311 (sex undetermined, SVL: 13.31 mm), collected on 23 April 2001 by C. Cortez.

These five specimens constitute the first Bolivian and the southernmost records for this species. *Eleutherodactylus altamazonicus* is known to inhabit the upper Amazon Basin from Colombia to southern Peru (Lynch, 1980). In southern Peru, it has been found at Tambopata (Doan & Arizabal, 2002) and at Cuzco Amazónico (Duellman & Salas, 1991), both near the Bolivian border, and its presence in Bolivia was previously suspected (De la Riva *et al.*, 2000). The specimens were found in the Amazonian lowland forest and Andean foothills.



Fig. 2.— *Eleutherodactylus altamazonicus* from Luz de América, Reserva Manuripi, Pando, Bolivia (LG).

Fig. 2.— *Eleutherodactylus altamazonicus* de Luz de América, Reserva Manuripi, Pando, Bolivia (LG).

Eleutherodactylus carvalhoi Lutz, 1952

COCHABAMBA: Province Chapare: El Palmar, Carrasco National Park (17°06'S, 65°34'W), CBG 332 (adult female, SVL: 20.80), CBG 334 (adult male, SVL: 15.77), CBG 335 (adult male, SVL: 15.35), collected on 15 September 1998 by R. Aguayo.

These three specimens represent the first country record and the southernmost record for this species. It is known to occur in Huánuco, Loreto, Pasco and Madre de Dios (Cocha Cashu), Peru (Rodríguez *et al.* 1993; Rodríguez and Cadle, 1990). It has also been reported from Tambopata (Doan & Arizabal, 2002), near the Bolivian border, and its presence in Bolivia was not suspected (De la Riva *et al.*, 2000). Specimens were found in the Amazonian forest at the Andean foothills.

Eleutherodactylus cruralis (Boulenger, 1902)

PANDO: Province Manuripi: Laguna Bay, Reserva Nacional de Vida Silvestre Amazónica Manuripi (11°57'20"S/68°39'32.5"W), MNKA 6120 (adult female, SVL: 30.63) and MNKA 6121 (adult female, SVL: 30.67), collected on 01 February 2002 by L. Gonzáles and J. Condori; Florida, Reserva Nacional de Vida Silvestre Amazónica Manuripi (approx. 12°10'S/68°34'W), MNKA 5086 (adult male, SVL: 21.51mm), 5122 (adult female, SVL: 26.19 mm), collected on 17-18 July 2001 by L. Gonzáles.

These are the first records for this department. This species was previously recorded for Departments Beni (Padial & Castroviejo, 2000), La Paz, Cochabamba and Santa Cruz (De la Riva *et al.*, 2000). The specimens were found in the Amazonian lowland forest.

Eleutherodactylus danae Duellman, 1978

BENI: Province Ballivián: Serranía del Pilón, Tierra Comunitaria de Origen y Reserva de la Biosfera Pilón Lajas (15°16'06"S/67°04'17"W), MNKA 4178 (juvenile), MNKA 4181 (juvenile), MNKA 4203-4205 (juvenile), MNKA 4206 (gravid female, SVL: 32.00 mm), MNKA 4207 (juvenile), collected on 19-20 July 1999 by L. Gonzáles.

LA PAZ: Province Sud Yungas: Serranía de Chepete, Tierra Comunitaria de Origen y Reserva de la Biosfera Pilón Lajas (15°05'24"S/67°31'42"W), MNKA 4743 (adult male, SVL: 30.69), collected on 24 September 1998 by L. Gonzáles; Serranía Beu, Tierra Comunitaria de Origen y Reserva de la Biosfera Pilón Lajas (15°06'36"S/67°32'33"W), MNKA 3710, MNKA 3717, MNKA 3692, MNKA 3703, MNKA 3705, MNKA 3714 (adult males, average SVL = 27.53 mm, range = 24.27-29.59 mm, n=6), collected on 16-18 September 1998 by L. Gonzáles; San Ignacio, Tierra Comunitaria de Origen y Reserva de la Biosfera Pilón Lajas (15°23'20"S/67°10'25"W), MNKA 4081-2 (juveniles), MNKA 4119-22 (juveniles), MNKA 4126-27 (juveniles), MNKA 4128 (adult male, SVL = 27.93), MNKA 4129-32 (juveniles), MNKA 4139-43 (juveniles), collected on 11-16 July 1999 by L. Gonzáles;

Quebrada Boquerón, Tierra Comunitaria de Origen y Reserva de la Biosfera Pílon Lajas (15°22'19"S/67°11'41"W), MNKA 4112-4113 (juveniles), collected on 13 July 1999 by L. Gonzáles; Boquerón, Tierra Comunitaria de Origen y Reserva de la Biosfera Pílon Lajas (15°22'37"S/67°12'04"W), CBG 844, CBG 846-853 (adult males, average SVL = 26.58, range = 25.37-27.51, n = 7), CBG 845 (adult female, SVL:31.79), CBG 853 (gravid female, SVL:37.06), collected on September 2002 by R. Aguayo.

Eleutherodactylus danae occurs from the Cosñipata Valley in Peru to Bolivia (Frost, 2004). In Bolivia, it was cited for the first time in Department Cochabamba (Köhler & Jungfer, 1995). Its presence was suspected for La Paz and Santa Cruz by De la Riva *et al.* (2000). These are the first records for Beni and La Paz. Specimens were found in the humid montane forest and the Amazonian lowland forest from about 200 to 1400 m.

Eleutherodactylus ockendeni (Boulenger, 1912)

PANDO: Province Manuripi: Florida, Reserva Nacional de Vida Silvestre Amazónica Manuripi (Aprox. 12°10'S/68°34'W), MNKA 5111 (adult male, SVL: 17.94 mm), collected on 17 July 2001 by L. Gonzáles, M. Guerrero and G. Calderón,

This is the first country record and southernmost record for this species. *Eleutherodactylus ockendeni* is a lowland species occurring from Colombia to Peru, in the Upper Amazon Basin (Lynch, 1980). It has been found at Tambopata (Doan & Arizábal, 2002) and at Cuzco Amazónico (Duellman & Salas, 1991), both near the Bolivian border. Its presence in Bolivia was previously suspected (De la Riva *et al.*, 2000). In Bolivia, a single specimen was found in the Amazonian lowland forest.

Eleutherodactylus platydactylus (Boulenger, 1903)

BENI: Province Ballivián: Serranía del Pílon, Tierra Comunitaria de Origen y Reserva de la Biosfera Pílon Lajas (15°16'06"S/67°04'17"W), MNKA 4156-7, MNKA 4177, MNKA 4187-4198 (all immature; largest specimen, MNKA 4190, SVL: 18.49 mm), collected on 19 July 1999 by L. Gonzáles.

This is the most common species in the Andean Humid Forest of Bolivia. It has been recorded in the departments of Cochabamba, La Paz, and Santa Cruz (De la Riva *et al.*, 2000). The only previous record from Beni was the holotype of *E. bocker-manni* Donoso-Barros (a junior synonym of *E. platydactylus*), purportedly from Rurrenabaque, although this locality is doubtful (see De la Riva, 1987). These 15 specimens from humid montane forest constitute the first confirmed departmental record.



Fig. 3.— *Eleutherodactylus skydmainos* from Río Negro, Pando, Bolivia (LG).

Fig. 3.— *Eleutherodactylus skydmainos* de Río Negro, Pando, Bolivia (LG).

Eleutherodactylus skydmainos Flores & Rodríguez, 1997

PANDO: Province Federico Román: Río Negro (9°50'S/65°39'W), MNKA 6911 (an adult female, SVL: 31.09 mm), MNKA 6912 (subadult female, SVL: 23.75 mm), collected on 5-8 November 2002 by L. Gonzáles and M. Guerrero (Fig. 3).

This is the first country record of this species and it extends the species' known distributional range 700 km airline northeastward. This species was recently described from specimens found in localities in the upper Amazon Basin of Peru. The nearest records to Bolivia are: Cocha Cashu, Manu National Park and the west bank of Tambopata River, Zona Reservada Tambopata-Candamo (Flores & Rodríguez, 1997). The presence of this species in Bolivia was previously suspected by De la Riva *et al.* (2000). The specimens were collected in the Amazonian lowland forest.

Eleutherodactylus toftae Duellman, 1978

PANDO: Province Manuripi: Campamento Malecón, Reserva Nacional de Vida Silvestre Amazónica Manuripi (11°56'S/68°49'W), MNKA 6041, MNKA 6068 (adult females, SVL: 25.32 mm, 24.97 mm respectively), collected on 23-26 January 2002 by L. Gonzáles & J. Condori; Nueva América, Reserva Nacional de Vida Silvestre Amazónica Manuripi, MNKA 6082 (adult female, SVL: 24.19 mm), collected on 29 January 2002 by L. Gonzáles & J. Condori.

LA PAZ: Province Iturrealde: Pampas del Heath, Madidi National Park (13°01'S/68°50'W), CBF 4485 (adult female, SVL:24.22), collected on 20 April 1997 by F. Guerra, E. Pérez and J. Pérez; Serranía de Tequeje (approx. 13°50'S/68°05'W), CBF 5098-5099 (gravid females, SVL: 24.49 mm and 24.97 mm respectively), CBF 5100-5102 (three juveniles), CBF 5103 (adult male, SVL: 16.23).

Table 1.— Species of *Eleutherodactylus* recorded in Bolivia with their distribution by Departments. LP: La Paz; CO: Cochabamba; SC: Santa Cruz; BE: Beni; PA: Pando; CH: Chuquisaca; TA: Tarija.Tabla 1.— Especies de *Eleutherodactylus* registradas en Bolivia, con su distribución por departamentos. LP: La Paz; CO: Cochabamba; SC: Santa Cruz; BE: Beni; PA: Pando; CH: Chuquisaca; TA: Tarija.

Species of <i>Eleutherodactylus</i>	Departments						
	LP	CO	SC	BE	PA	CH	TA
<i>E. ashkapara</i>	-	X	-	-	-	-	-
<i>E. altamazonicus</i>	X	-	-	-	X	-	-
<i>E. bisignatus</i>	X	-	-	-	-	-	-
<i>E. carvalhoi</i>	-	X	-	-	-	-	-
<i>E. cruralis</i>	X	X	X	X	X	-	-
<i>E. danae</i>	X	X	-	X	-	-	-
<i>E. discoidalis</i>	-	X	X	-	-	X	X
<i>E. cf. dundeei</i>	-	-	X	-	-	-	-
<i>E. fenestratus</i>	X	X	X	X	X	-	-
<i>E. fraudator</i>	-	X	X	-	-	-	-
<i>E. ibischi</i>	-	-	X	-	-	-	-
<i>E. llojsintuta</i>	-	X	X	-	-	-	-
<i>E. mercedesae</i>	X	X	-	-	-	-	-
<i>E. ockendeni</i>	-	-	-	-	X	-	-
<i>E. olivaceus</i>	-	X	X	-	-	-	-
<i>E. cf. peruvianus</i>	X	X	X	-	-	-	-
<i>E. platydactylus</i>	X	X	X	X	-	-	-
<i>E. pluvicanorus</i>	-	X	X	-	-	-	-
<i>E. rhabdolaemus</i>	X	X	X	-	-	-	-
<i>E. samaipatae</i>	-	-	X	-	-	-	X
<i>E. skydmainos</i>	-	-	-	-	X	-	-
<i>E. toftae</i>	X	X	-	-	X	-	-
<i>E. ventrimarmoratus</i>	X	-	-	-	X	-	-
<i>E. zimmermanae</i>	-	-	-	-	X	-	-
<i>E. zongoensis</i>	X	-	-	-	-	-	-

These are the first departmental records for *E. toftae* Duellman, 1978 in Pando and La Paz. This species inhabits the peri-Andean forests from southern Peru to central Bolivia (Frost, 2004). In Bolivia, it had only been recorded in Cochabamba (De la Riva et al., 2000). The specimens reported herein were adult, and they were found in the Amazonian lowland forest.

***Eleutherodactylus ventrimarmoratus* (Boulenger, 1912)**

LA PAZ: Province Larecaja: Serranía de Muchanes, Tierra Comunitaria de Origen y Reserva de la Biosfera Pílon Lajas (15°08'31"S/67°33'01"W), MNKA 3689 (adult male, SVL: 19.31 mm), collected on 15 September 1998 by L. Gonzáles; Serranía de Chepete, Tierra Comunitaria de Origen y Reserva de la Biosfera Pílon Lajas (15°02'24"S/67°31'42"W), MNKA

3742 (adult female, SVL: 37.20 mm), collected on 24 September 1998 by L. Gonzáles; Boquerón, Tierra Comunitaria de Origen y Reserva de la Biosfera Pílon Lajas (15°22'37"S, 67°12'4"W), CBG 775 (adult female, SVL: 40.00 mm), CBG 776 (adult male, SVL: 22.45), CBG 777 (juvenile, SVL: 18.44), collected on 21 September 2002 by R. Aguayo.

This is the first departmental record and the southernmost record for this species. It is known to inhabit the cloud forests in northern Ecuador and the rainforests from northern Ecuador to southern Peru, adjacent to Bolivia, and western Brazil (Frost, 2004). In Bolivia it has been recently cited in Pando, and is suspected to occur in Depts. La Paz and Beni (De la Riva et al., 2000). The specimens were found in humid montane forest.

Eleutherodactylus zimmermanae Heyer & Hardy, 1991

PANDO: Province Manuripi: San Sebastián, Tahuamanu Biological Station (11°24'27"S/69°01'07"W), CBF 2537 (adult female, SVL: 25.68 mm), CBF 2539 (adult male, SVL: 17.40 mm), collected on 16-18 October 1999 by S. Reichle and J. Cadle.

This is the first country record and the southernmost record for the species, which is known to occur in the lower Amazon Basin of Colombia and Brazil (Heyer & Hardy, 1991). The nearest records are from Acre, in Estrada Rio Branco-Abuná and from Santa Cruz da Serra and Alto Paraiso, Rondônia (Heyer & Hardy, 1991). The specimens were found in the Amazonian lowland forest.

Discussion

Our knowledge of the diversity of Bolivian *Eleutherodactylus* has changed dramatically since De la Riva's (1990) preliminary list of seven species was published (six recognized species and one of doubtful taxonomic status). Subsequently, in a synopsis of the genus in Bolivia, De la Riva (1993) recognized eight species and considered two doubtful: *E. andicola* (Boettger, 1891) and *E. bockermanni* Donoso-Barros, 1970. The status of the first of these species continues to be uncertain and, most likely, it is not an *Eleutherodactylus* (see Lynch & McDiarmid, 1987). The second was synonymized with *E. platydactylus* by De la Riva (1997). Subsequently, with further fieldwork conducted in poorly known areas, more species were added to the list, and 17 species were formally recognized by De la Riva *et al.* (2000). The same year, Köhler (2000) recognized 19 species for the country. He added a new country record (*E. dun-deei* Heyer and Muñoz, 1999), resurrected a synonym [*E. bisignatus* (Werner, 1899)], pointed out a new species under description (later described as *E. ibischi* by Reichle *et al.*, 2001), and deleted one from the list [*E. peruvianus* (Melin, 1941)]. These criteria were followed by Reichle (2003). In summary, with the species herein reported, the current number of *Eleutherodactylus* in Bolivia stands at 25 species (see Table 1). Nevertheless, the taxonomic status of some species remains uncertain, several new species are being described and many others are still expected to be found (De la Riva *et al.*, 2000). Therefore, the actual number of species is still far from being known.

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Appendix.— Other specimens examined.**Apéndice.**— Otros especímenes examinados.

Eleutherodactylus acuminatus. PERU: Department Amazonas: Pagua, Caroil, Cordillera del Cóndor (MHNSM 582).

Eleutherodactylus altamazonicus. PERU: Department Madre de Dios: Cocha Cashu, Manu National Park (MHNSM 9143-9147); Tambopata (MHNSM 7352).

Eleutherodactylus carvalhoi. PERU: Department Loreto: Estirón, Río Ampiyacu (MZUSP 23090-23091); Madre de Dios: Cocha Cashu, Manu National Park (MHNSM 2077, MHNSM 3864, MHNSM 9202, MHNSM 10073-5).

Eleutherodactylus danae. PERU: Department Cuzco: 2.5 Km WSW Santa Isabel (MHNSM 13957, paratype).

Eleutherodactylus lacrimosus. ECUADOR: Department Pastaza: Puyo (MZUSP 54621-54624). PERU: Department Pasco: Oxapampa, Castilla Forest (MHNSM 11184-5); Department Ucayali: Parque Humboldt (MZUSP 11274).

Eleutherodactylus ockendeni. PERU: Department. Madre de Dios: Cocha Cashu, Manu National Park (MHNSM 3863, MHNSM 9064, MHNSM 9269-9272, MHNSM 15507); La Colpa-Tambopata (MHNSM 14009). BRAZIL: Department Amazonas: Reserva Ducke (MZUSP 58669).

Eleutherodactylus olivaceus. BOLIVIA: Department Cochabamba: road from Paracti to El Palmar (CBF 3329, holotype).

Eleutherodactylus skydmainos. PERU: Department Madre de Dios: Cocha Cashu, Manu National Park. (MHNSM 1930-1932, MHNSM 3850-3859, MHNSM 9090-9091, MHNSM 9095-9101, paratypes).

Eleutherodactylus zimmermanae. BRAZIL: Department Amazonas: Reserva INPA-WWF (MZUSP 64539-64541, type specimens).