

NEW FROGS OF THE GENUS *ELEUTHERODACTYLUS* FROM THE EASTERN FLANK OF THE NORTHERN CORDILLERA CENTRAL OF COLOMBIA

por

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Resumen

Lynch, J. D. & J. V. Rueda-Almonacid. New frogs of the genus *Eleutherodactylus* from the eastern flank of the northern Cordillera Central of Colombia. Rev. Acad. Colomb. Cien. 22(85): 561-570, 1998. ISSN 0370-3908.

Se describen cuatro nuevas especies de *Eleutherodactylus* propias de la franja de bosques andinos comprendida entre los 1800 y 2650 m.s.n.m. en Pensilvania y Samaná, departamento de Caldas, y se registra por primera vez para la región a *E. boulengeri*. Con estos nuevos registros, el número de especies de *Eleutherodactylus* para esta pequeña área aumenta a 23. El trabajo de campo más intenso se realizó en las manchas de bosque ubicadas 6 km al SW de Florencia, Caldas, donde se encontraron 17 especies.

Palabras claves: Amphibia, Leptodactylidae, especies nuevas, taxonomía, patrón de distribución.

Abstract

Four additional species of *Eleutherodactylus* are described from the andean forests between 1800 and 2650 meters elevation in the municipios of Pensilvania and Samaná, Departamento de Caldas, on the eastern flanks of the Cordillera Central. Additionally, *E. boulengeri* is reported for the first time from the region. With these reports, 23 species of *Eleutherodactylus* are recorded from this small area. The most detailed field work was carried out in forest patches 6 km SW Florencia, Caldas, where 17 species of the genus were found sympatrically.

Key words: Amphibia, Leptodactylidae, new species, taxonomy, distribution pattern

Introduction

Previously, we (Lynch, 1997, Lynch & Rueda-A, 1997, 1998) have reported 18 species of *Eleutherodac-*

tylus from the cloud forests (bosque andino) of eastern Departamento de Caldas (municipios de Pensilvania and Samaná). To these, we add five species in this paper. The *Eleutherodactylus* fauna of the forests of Florencia (Caldas) includes the following described species with their ranges of distribution (along the Caldas transect) indicated in parentheses: *E. actinolaimus* (1850-2000),

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E. babax (1950), *E. boulengeri* (1850-1940), *E. cabrerai* (1800-2150), *E. dorsopictus* (1800-2650), *E. erythropleura* (1850-2150), *E. factiosus* (1350-2150), *E. fetosus* (1800-2650), *E. lichenoides* (2000-2600), *E. maculosus* (2000-2650), *E. mantipus* (1750-1950), *E. necopinus* (1800-2150), *E. permixtus* (2000-2600), *E. thectopternus* (1800-1950), *E. torrenticola* (1800-2650), *E. tribulosus* (1950-2450), *E. uranobates* (2000-2450), *E. velitis* (1850-2150), and *E. w-nigrum* (1950-2650). This list includes the first report of *E. boulengeri* Lynch for the region, known on the basis of only one adult and one juvenile female (ICN 32291, 41663) from El Estadero. The rarity of this species probably reflects the fact that the collections were made in the lower part of its expected distribution (Lynch, 1981).

Although some additional species remain to be described from lower strata of this transect, we provide here the descriptions of four more species from the upper part of the transect (1800-2650 m), completing the descriptive phase from the *Eleutherodactylus* of this stratum. In the lower part of the transect, one finds four described species not found at higher elevations (*E. bufoniformis*, *E. gaigei*, *E. raniformis*, and *E. taeniatus*).

Materials and Methods

Terminology and methods follow Lynch & Duellman (1997). The following abbreviations are used in species accounts: E-N (eye to nostril distance), HW (greatest width of head), IOD (interorbital distance), and SVL (snout to vent length). Means are reported as ± 1 standard error of the mean when sample sizes are adequate. All specimens identified as ICN are housed in the amphibian collection of the Instituto de Ciencias Naturales.

Accounts of Species

Eleutherodactylus helvolus sp. nov.

Holotype. ICN 41664, an adult female collected 6 January 1998 by Taran Grant (original field number, JDL 21372).

Type-locality. COLOMBIA, Departamento de Antioquia: municipio de Guatapé, vereda Santa Rita, Hacienda Montepinar, 1840-1890 m.s.n.m. 6° 18' 16" N, 75° 08' 06" W.

Paratopotype. ICN 41665, an adult male collected with the holotype by John D. Lynch.

Paratypes. ICN 41666 (adult male), 41667-68 (young and juvenile females) collected at "El Estadero", approximately 6 km SW Florencia, municipio de Samaná, Depto.

Caldas, 1800-2000 m between 9 November 1993 and 9 June 1994 by J. Vicente Rueda et al.

Etymology. Latin, meaning pale yellow, used in reference to the coloration of the concealed surfaces of the hindlimb in life.

Diagnosis. (1) Skin of dorsum smooth except for scattered, flattened, warts, that of venter areolate; no dorso-lateral folds; (2) tympanum prominent, round, 23-31 % eye length; (3) snout subovoid in dorsal view, rounded in lateral profile, short; (4) upper eyelid bearing nonconical tubercle, about as broad as IOD; no cranial crests; (5) vomerine odontophores small; (6) males with vocal slits, lacking nuptial pads; (7) first finger shorter than second, fingers bearing round disks, relatively narrow; (8) fingers lacking lateral fringes; (9) ulnar tubercles very low, forming row; (10) no tubercles on heel or tarsus; (11) two metatarsal tubercles, inner oval, about 8 times size of outer; few supernumerary plantar tubercles; (12) toes lacking lateral fringes or webbing; toe disks as large as those of fingers; fifth toe very long; (13) dorsum gray with dark brown markings; no canthal stripe; subocular black spot edged with white anteriorly; posterior surfaces of thighs very lightly pigmented, pale yellow in life; (14) adults small, two males 18.8-19.9 mm, one adult female 25.6 mm SVL.

Eleutherodactylus helvolus is thought to be the nearest relative of *E. juanchoi* from which it differs in having yellow rather than carmen flash colors on the concealed surfaces of the limbs and in lacking black hands and feet. Additionally the two can be distinguished in that the canthus rostralis is sharper in *E. juanchoi* and *E. juanchoi* has lateral keels on the digits and nonconical tubercles on the heel. Additionally, *E. helvolus* has inguinal glands, not seen in *E. juanchoi*.

Description. Head as broad as body, longer than wide; HW 37.8-38.8 % SVL in males, 37.1-40.1 % in females; snout subovoid in dorsal view, rounded in lateral profile, short, E-N 66.7-80.0 % eye length in males, 72.2-76.0 % in females; nostrils protuberant, directed dorsolaterally; canthus rostralis not sharp, concave; loreal region weakly concave, sloping abruptly to lip; lips not flared; no cranial crests; small, nonconical tubercle on posterior part of upper eyelid; upper eyelid width 76.0-87.0 % IOD in males, 70.0-105.3 % in females; supratympanic fold ill-defined; tympanum round, prominent, its length 23.3-24.0 % eye length in males, 25.8-30.6 % in two adult and subadult females, its upper edge obscured by supratympanic fold, separated from eye by its own diameter (in two juvenile females, tympanum length is 13.9-16.0 % eye

length); postrictal tubercles small; choanae round, well median of maxillary arch; vomerine odontophores median and posterior to choanae, small, elevated, separated medially by distance equal to choanal diameter, bearing 1-2 teeth per odontophore; tongue longer than wide, posterior edge with feeble notch, posterior 3/5 not adherent to floor of mouth; long vocal slits lateral to tongue; subgular vocal sac.

Dorsum smooth except for scattered, flattened warts; no dorsolateral folds; venter areolate; discoidal folds well anterior to groin; no anal sheath; prominent yellow inguinal gland; arm slender; white flecks denote low ulnar tubercles; palmar tubercle bifid, much larger than oval thenar tubercle; subarticular tubercles round, nonconical; fingers lacking lateral fringes; fingers bearing round disks (cerca 1.5 times width of digit below disk on fingers III-IV), least expanded on finger I (Fig. 1); first finger shorter than second; no nuptial pad.

No tubercles or folds on tarsus or heel; inner metatarsal tubercle twice as long as wide, cerca 8 times size of subconical outer; plantar tubercles low, basal and forming row proximal to toe IV; disks of toes as large as those of fingers, round; toes lacking lateral fringes or webbing (however, fleshy tissue encloses basal subarticular tubercle of toe V); toes IV-V fused at base (about 1/2 way between subarticular tubercles of toe V); tip of toe V reaching to distal border of distal subarticular tubercle of toe IV; heels overlapping when flexed hindlimbs held perpendicular to sagittal plane; shank 46.7-53.2 % SVL in males, 49.6-53.2 % in females.

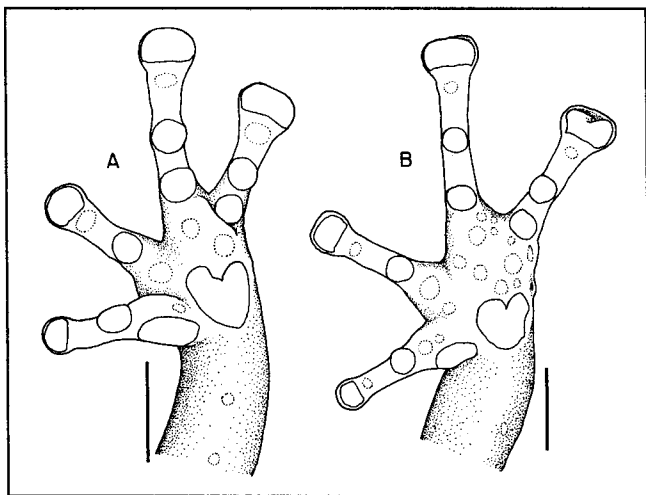


Figure 1. Hands of (A) *Eleutherodactylus helvolus* (ICN 41664) and (B) *E. parectatus* (ICN 41688). Scales equal 2 mm.

Coloration in ethanol. Dorsum gray with dark brown spots/blotches forming scapular and sacral chevrons, suprainguinal spots, interorbital bar; limb bars prominent on forearm, shanks, tarsi, broader than interspaces, slightly oblique on shank; no canthal stripe; subocular black spot edged anteriorly by white; anal triangle dark brown; groin, anterior and posterior surfaces of thighs, underside of shank bearing very light stippling of brown; 1-2 small brown spots atop thighs; ventral surfaces stippled with brown, having some tendency to form blotches.

Coloration in life. Dorsum pale brown with dark brown marks; cream preorbital bar; venter dull cream mottled with brown; groin, concealed surfaces of thighs and shanks pale yellow; iris with touch of blue dorsally, gray ventrally, with black horizontal band.

Measurements of holotype in mm. SVL 25.6, shank 12.7, HW 9.5, head length 9.7, chord of head length 10.4, upper eyelid width 2.0, IOD 1.9, tympanum length 1.1, eye length 3.6, E-N 2.6; width of disk of finger III 1.0.

Natural history. This species remains curiously rare (as is true for *E. juanchoi* at all but one locality). The two juvenile females are peculiar in that their tympani are so small relative to other specimens. ICN 41667 is a female just becoming mature (22.2 mm SVL) whereas females 13.2-17.2 mm SVL are juveniles. The two specimens taken at the type-locality were sitting on vegetation within 0.5 m of the ground in a dense forest on a steep hillside. No calling was heard and frog activity was very low when we visited the site during the dry period of El Niño in January 1998. Limited field work at this locality by Dr. Vivian Paez in 1997 did not result in collection of this species. The specimens from El Estadero were collected during a time frame when frog activity was very pronounced but only four individuals were found in three visits; one was found on a leaf beside a stream about 1 m above the forest floor.

Referred specimen. ICN 41669, juvenile female from El Estadero.

Eleutherodactylus lemur sp. nov.

Holotype. ICN 40786, an adult male collected 10 June 1994 by Jose Vicente Rueda (original number PR 15940).

Type-locality. COLOMBIA, Departamento de Caldas, Municipio de Samaná, corregimiento de Florencia, El Estadero, ca 6 km SW Florencia, 1850-1950 m.s.n.m.

Paratopotypes. ICN 40787-88 (males), 40789-90 (females) collected 7-8 November 1993 and 10 June 1994 by J. V. Rueda et al.

Paratypes. CSJ 2321, 2328, 2613, 2620 (males), 2320, 2327, 2329-30, 2618-19 (females) collected at Antadó, Municipio de Ituango, Antioquia, 1600 m.s.n.m. 27-28 May 1989 by John Betancur & Marco Antonio Serna. ICN 40791, male from Hda. Montepinar, vereda Santa Rita, Municipio de Guatapé, Antioquia, 1860 m.s.n.m.

Etymology. Latin, meaning "ghost of the departed", used in reference to the pale coloration of the frog in life.

Diagnosis. (1) Skin of dorsum finely shagreen with scattered low tubercles, that of venter areolate; no dorsolateral folds; (2) tympanum evident, round; (3) snout acuminate in dorsal view, pointed in lateral profile, very long; (4) upper eyelid with low tubercle, narrower than IOD; no cranial crests; (5) vomerine odontophores oval; (6) males with vocal slits, no nuptial pads; (7) first finger shorter than second, outer fingers bearing round disks; (8) fingers bearing narrow lateral keels; (9) ulnar tubercles forming low series; (10) elongate conical tubercle on heel, subconical tubercles along outer edge of tarsus; low inner tarsal fold; (11) inner metatarsal tubercle oval, outer, if present, lost among numerous supernumerary plantar tubercles; (12) toes with lateral fringes, no webbing; toe disks as large as those of outer fingers; fifth toe very long; (13) dorsum cream to pale brown with indistinct pattern including dorsal X-shaped figure; venter cream with white spots; (14) adults small, males 19.3-22.7 (\bar{x} = 21.5, N = 6) mm SVL, females 24.7-27.8 (\bar{x} = 26.1, N = 6) mm SVL.

Eleutherodactylus lemur is most similar to and probably most closely related to *E. caryophyllaceus* (Barbour) but differs from it in having a prominent calcar on the heel and in having a less prominent tubercle on the upper eyelid.

Description (for proportions, see table 1). Head large, wide than body; head longer than wide; snout acuminate in dorsal view (Fig. 2), pointed in lateral profile; nostrils weakly protuberant, directed laterally with slight posterodorsal vector; canthus rostralis sharp, weakly concave; loreal region flat, sloping abruptly to lips; lips not flared; upper eyelids narrow, bearing one low tubercle near lateral margin; no cranial crests; supratympanic fold thickened, arching above tympanum; tympanum evident, round, separated from eye by 1.5 times its diameter; postrictal tubercles nonconical; choanae longer than wide, large, well median to maxillary arch; vomerine odontophores oval, median and posterior to choanae, separated by a distance equal an odontophore width, each about size of a choana, bearing slanted row of 2-3 teeth;

tongue longer than wide, posterior 3/5 not adherent to floor of mouth, posterior border notched; short vocal slits posterolateral to tongue.

Dorsum very fine shagreen except slightly coarser on upper eyelids, with scattered slightly elevated black warts; no dorsolateral folds; skin of venter coarsely areolate; discoidal folds well anterior to groin; no anal sheath; skin of upper surfaces of limbs slightly more coarse than that of dorsum; ulnar tubercles present but very low, antibrachial largest; palmar tubercle bifid, twice size of oval thenar tubercle; supernumerary tubercles numerous, small; subarticular tubercles nonconical, round; fingers bearing round disks, those of outer fingers about twice width of digit below disk, that of thumb scarcely expanded; all disks bear broad ventral pads with complete circumferential grooves; fingers bearing narrow lateral keels; similar keel along outer edge of palm and postaxial surface of finger IV; first finger shorter than second; nuptial pad not evident in males.

Heel bearing long conical tubercle; series of low subconical tubercles along outer edge of tarsus; inner edge of tarsus bearing low fold on distal 1/6; inner metatarsal tubercle twice as long as wide; outer metatarsal tubercle difficult to see amidst areolations on plantar surface; some evidence of crenulations along outer edge of plantar surface; subarticular tubercles round, nonconical; toes bearing lateral fringes, no webbing; toe disks round, expanded, as large as those of outer fingers; tip of toe III reaching middle of penultimate subarticular tubercle of toe IV, that of V reaching to distal 1/2 of distal subarticular tubercle of toe IV; heels broadly overlapping when flexed hindlimbs held perpendicular to sagittal plane.

Variation. Frogs from the Cordillera Occidental have shorter snouts and smaller tympani in each sex (Table 1).

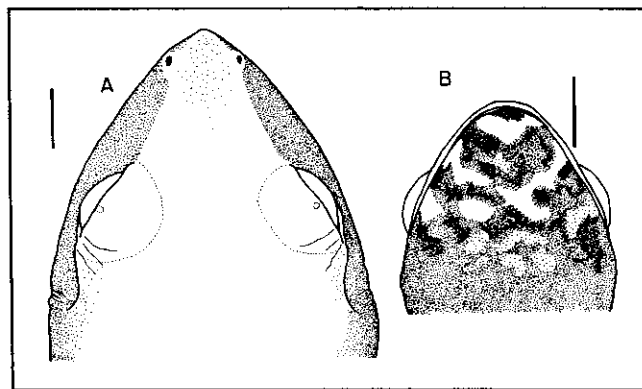


Figure 2. (A) Dorsal view of head of *Eleutherodactylus lemur* (ICN 40790) and (B) ventral view of head of *E. parectatus* (ICN 41691).

Table 1. Proportions in *Eleutherodactylus lemur*. First line reports range of values, second line the mean (sample size given in parenthesis). For females the Cordillera Occidental, the means are reported as ± 1 standard error of the mean.

	Tibia/SVL	HW/SVL	Eyelid/IOD	Tymp/eye	E-N/eye
Males C. Central	50.3-56.2	36.9-41.4	54.2-77.3	28.6-35.7	123.1-133.3
	52.9 (4)	39.4 (4)	65.8 (4)	33.1 (4)	130.5 (4)
Males C. Occidental	49.1-53.5	36.7-40.8	52.0-87.5	26.7-30.8	100.0-111.5
	51.3 (5)	38.4 (5)	68.2 (3)	28.9 (4)	105.6 (4)
Females C. Central	52.1-55.2	40.2-43.0	68.8-77.4	36.7	126.7-136.7
	54.0 (3)	41.4 (3)	73.1 (2)	36.7 (2)	131.7 (2)
Females C. Occidental	46.5-56.8	37.3-40.6	67.9-92.9	26.5-31.0	102.9-112.5
	52.1 \pm 1.5 (7)	38.8 \pm 0.4 (7)	82.4 (5)	28.7 \pm 0.6 (7)	108.2 \pm 1.3 (7)

Coloration in ethanol. Cream with fine melanophores and small black spots forming Y on snout, interorbital bar, dorsal X-shaped figure, and limb bars. Labial bars and canthal-supratympanic stripe ill-defined, formed by same small black spots. Venter cream with white spots. Some individuals have slight brown vermiculation on throat. Concealed surfaces of limbs lacking pattern (fine stipple of melanophores visible with microscope).

Coloration in life. Cream, yellow, or pale brown above with gray, black, or green spots forming dorsal markings; venter white with cream spots. Iris yellow to orange.

Measurements of holotype in mm. SVL 22.7, shank 12.3, HW 9.4, head length 9.6, chord of head length 10.4, upper eyelid width 2.0, IOD 3.2, tympanum length 1.0, eye length 2.8, E-N 3.7.

Natural history. Male *E. lemur* less than 19 mm SVL are juveniles (no vocal slits) and females 17.1-24.1 mm SVL are immature (straight, thin oviducts and only minute ovarian eggs). In two nights of collecting at Antadó (Antioquia), the late Marco Antonio Serna obtained the majority of individuals known (14) whereas material from Guatapé (Antioquia) and Samaná (Caldas) was obtained very sporadically.

Referred specimens. CSJ 2322, 2331, 2335, 2337 (Antioquia, Ituango, Antadó); MHUA 183 (Antioquia, Guatapé, Hda. Montepinar); ICN 32290 (topotype).

Eleutherodactylus parectatus sp. nov.

Holotype. ICN 9248, an adult female collected by Vicente Rueda 8-9 June 1981 (original number JDL 13202).

Type-locality. COLOMBIA, Departamento de Antioquia, Municipio de Sonsón, 8 km (by road) E Sonsón, on divide, 2780 m.s.n.m.

Paratypes. ICN 9247 (female), Antioquia, Mpio. Bello; Serranía de las Valdías, 6.6-8.1 km WSW San Felix, 2850 m.s.n.m.; ICN 41687-90 (females), 41691-93 (males), Caldas, Mpio. Pensilvania, transecto altitudinal entre Km 18, por carretera y Km 28 de la carretera Pensilvania-Arboleda, 2450-2600 m, ICN 41694-95 (males), 2000-2650 m.s.n.m.

Etymology. Latin, meaning grown-up or mature; used in reference to our waiting 18 years for adequate materials with which to describe the species.

Diagnosis. (1) Skin of dorsum finely shagreen, that of venter areolate; dorsolateral folds to level of sacrum; (2) tympanum round, $\frac{1}{4}$ to $\frac{2}{5}$ eye length; (3) snout subacuminate in dorsal view, rounded in lateral profile, short; (4) upper eyelid bearing short conical tubercle, narrower than IOD; no cranial crests; (5) vomerine odontophores oval, low, rarely evident in males; (6) males with vocal slits, subgular vocal sac, lacking nuptial pads; (7) first finger shorter than second, outer fingers with round disks; (8) no lateral fringes on fingers; (9) series

of subconical ulnar tubercles; (10) subconical tubercles on heel, outer edge of tarsus; short inner tarsal fold; (11) two metatarsal tubercles, inner oval, about 4 times size of outer; numerous supernumerary plantar tubercles; (12) toes with round disks, smaller than those of outer fingers; toes lacking lateral fringes, webbing; fifth toe very long; (13) females brown with little evidence of pattern; males pale brown with darker brown markings; chin bearing brown bands, separated by cream in males; (14) adults small, five males 14.2-16.0 (\bar{x} = 15.0, N = 5) mm SVL, five females 22.5-27.0 (\bar{x} = 24.7, N = 5) mm SVL.

Eleutherodactylus parectatus is similar to *E. uranobates* but is readily distinguished because it lacks nuptial pads and lateral fringes on the digits. Males of the two are most likely to be confused based on the arrangements of tubercles and the color patterns whereas female *E. parectatus* are very distinctive owing to the near absence of a color pattern.

Description (Proportions based on five males and six females). Head narrower than body, as wide as long; HW 36.6-39.4 (\bar{x} = 37.7) % SVL in males, 36.8-40.4 (\bar{x} = 38.2) % in females; snout subacuminate in dorsal view, rounded in lateral profile, short, E-N 68.0-73.7 (\bar{x} = 71.8) % eye length in males, 79.4-93.9 (\bar{x} = 85.5) % in females; nostrils weakly protuberant, directed laterally; canthus rostralis not sharp, weakly concave; loreal region concave, sloping to lips; lips not flared; upper eyelid bearing short conical tubercle on posterior half (terminis of dorsolateral fold); upper eyelid width 76.5-81.2 (\bar{x} = 80.0) % IOD in males, 64.3-91.7 (\bar{x} = 81.0) % in females; no cranial crests; supratympanic fold obsolete, evident only above tympanum; tympanum round, its length 26.3-42.1 (\bar{x} = 31.4) % eye length in males, 28.0-41.4 (\bar{x} = 36.2) % in females, superficial, separated from eye by distance equal its own length; two subconical postrectal tubercles; row of subconical tubercles along edge of low lip; choanae small, round, well medial of maxillary arch; vomerine odontophores scarcely evident in males, in females median and posterior to choanae, oval, separated medially by distance equal width of an odontophore, bearing 2-3 teeth in slanted row; tongue longer than wide to nearly round, posterior 2/5 not adherent to floor of mouth, posterior edge not notched; vocal slits short, posterolateral to tongue.

Skin of dorsum finely shagreen with dorsolateral (or paravertebral) folds extending from eye to region of sacrum; folds bearing subconical tubercles; lateral to dorsolateral folds, skin of flanks bears numerous subconical tubercles but none in inguinal region; upper

surfaces of limbs with scattered subconical warts; side of head bearing flattened warts just anterior to tympanum and in loreal region; skin of venter areolate (somewhat more coarse on throat); discoidal folds well anterior to groin; no anal sheath; pair of enlarged subanal warts; three subconical ulnar tubercles; palmar tubercle bifid, much larger than oval thenar tubercle; palm covered with low supernumerary tubercles; subarticular tubercles round, nonconical; fingers slender (lacking lateral fringes or keels), bearing round disks (Fig. 1); disk of thumb not expanded in males, expanded but markedly smaller than other disks in females; outer fingers bear disks larger than tympanum; ventral pad, broader than long, on all disks; first finger shorter than second; thumb of males swollen, lacking nuptial pad.

Subconical tubercle on heel, two subconical tubercles along outer margin of tarsus; inner edge of tarsus bearing short distal fold (1/5 length of tarsus); inner metatarsal tubercle twice as long as wide, about four times size of subconical outer metatarsal tubercle; entire plantar surface covered with low supernumerary tubercles; basal subarticular tubercles round, nonconical, distal tubercles of toes III-IV longer than wide; toes lack lateral fringes (at best, faint keels present) and webbing; disks of toes expanded, smaller than those of outer fingers, round, with broad ventral pads; tip of toe V reaches to middle or proximal third of distal subarticular tubercle of toe IV, tip of III reaches to distal border of penultimate subarticular tubercle of toe IV; heels broadly overlapping when flexed hindlimbs perpendicular to sagittal plane; shank 49.3-53.8 (\bar{x} = 51.1) % SVL in males, 49.2-55.5 (\bar{x} = 53.2) % in females.

Coloration in ethanol. Females: dark brown with diffuse black mottling dorsally; facial markings, limb bars and anal triangle scarcely distinguishable; ventral surfaces dark brown with nearly black V-shaped marks on anterior part of chin. Males: facial markings, interorbital triangle, scapular and sacral chevrons brown on paler brown ground color; dorsolateral folds cream; venter dirty cream with brown mottling; throat darker brown with even darker V-shaped marks separated by cream areas (Fig. 2); limb bars narrower than interspaces, oblique on shanks.

Coloration in life. Brown above with darker brown markings (hardly visible in females); venter brown in females with scattered white tubercles, cream mottled with brown in males; posterior surfaces of thighs dark brown, with rose cast; throat barred with dark brown outline by dull cream; iris gray-brown to chocolate.

Measurements of holotype in mm. SVL 24.7, shank 13.7, HW 9.3, head length 9.3, chord of head length 10.0, upper eyelid width 1.8, IOD 2.8, tympanum 1.2, eye length 3.0, E-N 2.5.

Natural history. *Eleutherodactylus parectatus* is a rare frog. Single specimens were found during our explorations of the "paramo" de Sonsón and the Serranía Las Valdías in 1981 and in several trips to the forests in the Florencia region, the species was found only at higher sites. A female 20.4 mm SVL shows evidence of oviductal convolutions but has only small ovarian eggs and another (vr 4919) is a juvenile female 19.2 mm SVL.

Distribution. The failure of collectors to find this species in the vicinity of El Estadero suggests to us that the species occupies an elevational stratum above that site. Using the records for which we have precise altitudinal data, we place the species in the 2450-2850 m stratum of the forests in the northern part of the Cordillera Central. As such, its distribution is discontinuous.

Referred specimens. ICN vr 4919. Depto. Caldas, Pensilvania, Km 24 carretera Pensilvania-Arbolela, sitio Puerto Suárez, 2000-2150 m.s.n.m.

Remarks. Our initial impression is that this species is a member of the *E. leptolophus* group as identified by Lynch (1991). As such, it is sympatric with two other species of the group (*E. maculosus* and *E. uranobates*).

Eleutherodactylus suetus sp. nov.

Holotype. ICN 41726, an adult female, one of a series collected by J. Vicente Rueda and others 9 June 1994 (original field number VR 4500).

Type-locality. COLOMBIA, Departamento de Caldas, municipio de Samaná, corregimiento de Florencia, sitio El Estadero, 1850-1950 m.s.n.m. (approximately 6 km SE Florencia).

Paratopotypes. Males, ICN 41702-14 (6-11 Nov., 1993), 41723-25, 41727-35, 41747 (June 1994), females, ICN 41698, 41715 (Nov. 1993), 41722, 41736-40 (June 1994).

Paratype. ICN 10002 (female), Departamento de Antioquia, municipio de Sonsón, 8 km E (by road) Sonsón, 2780 m.s.n.m.

Etymology. Latin, *suetus*, meaning customary. This small frog matches the expectations of most herpetologists that frogs of the genus *Eleutherodactylus* are small drab brown frogs.

Diagnosis. (1) Skin of dorsum finely shagreen, that of venter areolate; dorsolateral folds poorly developed; (2) tympanum round, its length 18-41% eye length; (3) snout round in dorsal view, rounded in lateral profile, short; (4) upper eyelid narrower than IOD, bearing low tubercles; no cranial crests; (5) vomerine odontophores low, usually not visible in males; (6) males with vocal slits, nuptial pads; (7) first finger shorter than second, fingers bearing expanded, round disks; (8) fingers bearing lateral keels; (9) ulnar tubercles low; (10) nonconical tubercles on heel, outer edge of tarsus, inner edge of tarsus; (11) two metatarsal tubercles, inner oval, ca 6 times size of subconical outer; numerous supernumerary plantar tubercles; (12) toes bearing lateral keels, no webbing; toe disks as large as those of fingers; fifth toe very long; (13) dorsum pale brown with darker markings; venter brown; posterior surfaces of thighs brown; (14) adults small, males 13.9-18.2 (\bar{x} = 16.5 \pm 0.2, N = 26) mm SVL, females 20.7-23.0 (\bar{x} = 21.9 \pm 0.3, N = 9) mm SVL.

Eleutherodactylus suetus is smaller than all other species of the group except *E. incomptus* and *E. ptochus*. It differs from each of these in having smaller digital disks. It differs from *E. ptochus* in having the disk of the thumb expanded, low dorsolateral folds, ulnar and outer tarsal tubercles, lateral keels on the fingers, and uniform brown posterior surfaces of the thighs (flecked with cream in *E. ptochus*). In life, the two differ by iris color (yellowish in *E. ptochus*, brown in *E. suetus*).

Description (proportions based on 19 males and 11 females). Head as wide as body in males, wider than body in gravid females; head slightly longer than wide; HW 34.8-39.8 (\bar{x} = 37.1 \pm 0.3) % SVL in males, 37.3-40.6 (\bar{x} = 38.8 \pm 0.3) % in females; snout round in dorsal view, rounded in lateral profile, short, E-N 65.4-86.4 (\bar{x} = 75.8 \pm 1.1) % eye length in males, 65.6-92.3 (\bar{x} = 80.5 \pm 2.1) % in females; nostrils weakly protuberant, directed dorsolaterally; canthus rostralis rounded but evident, concave; loreal region concave, sloping abruptly to lips; lips not flared; upper eyelid bearing on small tubercles, upper eyelid width 75.0-100.0 (\bar{x} = 88.2 \pm 1.6) % IOD in males, 78.3-100.0 (\bar{x} = 89.4 \pm 2.4) % in females; no cranial crests; supratympanic fold low; tympanum round, its length 18.2-33.3 (\bar{x} = 27.4 \pm 1.1) % eye length in males, 26.1-40.6 (\bar{x} = 34.0 \pm 1.1) % in females, separated from eye by distance equal its length; postrictal tubercles nonconical; choanae round, well median of maxillary arch; vomerine odontophores median and posterior to choanae, very low, each bearing a clump of 3-4 teeth, about size of a choana, seldom visible in males; tongue longer than wide, bearing a shallow notch on its

posterior edge, posterior 2/5 not adherent to floor of mouth; short vocal slits posterolateral to tongue.

Skin of dorsum finely shagreen, with scattered low tubercles (snout, shoulders, above pelvis) in males, nearly smooth in females; dorsolateral folds indicated as low fold evident only along midbody; skin of venter areolate; discoidal folds evident, well anterior to groin; no anal sheath or perianal tubercles; ulnar tubercles low, forming row, antebrachial largest; palmar tubercle bifid, much larger than oval thenar tubercle; supernumerary palmar tubercles numerous; subarticular tubercles round, nonconical; fingers bearing lateral keels and round disks; disks present on all fingers but smallest on inner fingers (Fig. 3); first finger shorter than second; males have a white nuptial pad on each thumb.

Nonconical tubercle on heel and series along outer edge of tarsus; inner edge of tarsus bearing one tubercle on distal 1/6 of tarsus; inner metatarsal tubercle 2.5 times as long as wide, about six times size of subconical outer metatarsal tubercle; supernumerary plantar tubercles numerous, most prominent at bases of toes; subarticular tubercles round, nonconical; toes bearing lateral keels but no webbing; tip of toe V reaches to distal edge of distal subarticular tubercle of toe IV, that of toe III to distal edge of penultimate subarticular tubercle of toe IV; heels broadly overlapping when flexed hindlimbs held perpendicular to sagittal plane; shank 47.5-54.0 (\bar{x} = 49.8 \pm 0.4) % SVL in males, 47.3-55.3 (\bar{x} = 49.9 \pm 0.7) % in females.

Coloration in ethanol. Dorsum cream, pale brown, or gray with little evidence of slightly darker dorsal pat-

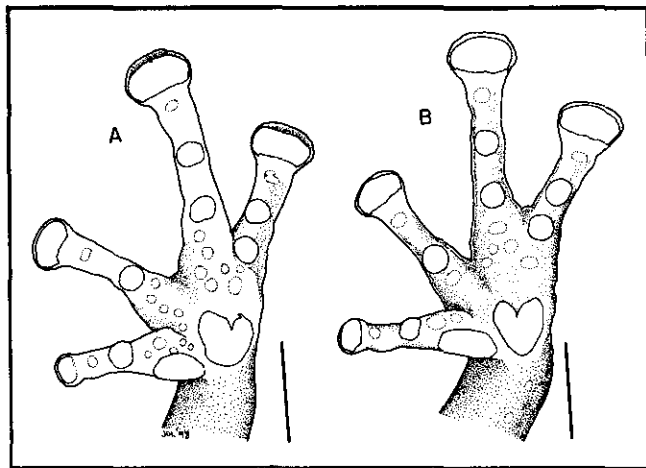


Figure 3. (A) Hands of *Eleutherodactylus ptochus* (ICN 39780) and (B) *E. suetus* sp. nov. (ICN 41737). Scales equal 2 mm.

tern (interorbital bar, occipital W, sacral chevron, suprainguinal spots); flanks barred with with pale to darker brown; limb bars oblique on shanks, slightly narrower than interspaces; brown markings on face (two subocular spots, supratympanic blotch, black spot at anterior corner of eye); posterior surfaces of thighs brown; anal triangle dark brown, bordered above by cream line; venter brown.

Coloration in life. Dorsum pale reddish-brown with dark brown markings; limb bars very dark brown to black; anal triangle black; ventral surfaces pale gray; iris brown with reddish horizontal stripe (J. V. Rueda fieldnotes, 6 November 1993).

Measurements of holotype in mm. SVL 22.5, shank 11.2, HW 8.8, head length 8.8, chord of head length 9.2, upper eyelid width 2.5, IOD 2.5, tympanum 1.3, eye length 3.2, E-N 2.1, width of disk of finger III 1.1.

Natural history. These frogs were found at night, perched atop leaves 0.3-1.0 meters above the forest floor. The holotype was found in amplexus with ICN 41725, a male 16.6 mm SVL. A single juvenile male (ICN 41749) was found (13.2 mm SVL) whereas juvenile females (straight, thin oviducts) are 14.1-17.0 mm SVL.

Referred specimens (juveniles). Topotypes. ICN 41699-701, 41716-21, 41741-46, 41749. Caldas, Pensilvania, transecto altitudinal desde Km 18 hacia Km 28 de la carretera Pensilvania - Arboleda, 2000-2650 m.s.n.m, ICN 41748.

Remarks. Only limited pattern polymorphism is observed in this species. Fifteen individuals (ten males and five females) have broad cream dorsolateral bands. There may be a male bias to this pattern (27 males and 27 females are available).

Although we cannot point to concrete characters to support our opinion, we think that *E. suetus* is the sister species of the recently described *E. ptochus* (Lynch, 1998) from the Cordillera Occidental.

Discussion

The "eastern Caldas" transect covers an altitudinal range from 620 to 2650 m and includes records of 27 described species of *Eleutherodactylus* (and four additional species currently without names). Such a level of diversity is comparable to the very rich faunas of the Pacific lowlands and adjacent highlands (Lynch, 1998, Lynch & Duellman, 1997) in spite of the poor contribution of the lowlands of the Middle Magdalena (four spe-

cies). The difficulty in finding suitable habitat (and frogs) in the lower reaches of the transect causes us to be circumspect in claiming that we have done sufficient sampling of the transect. At least one other highland species, *E. piceus* (Lynch et al., 1996) is expected based on its occurrence to the north and south of the transect.

The Caldas transect is best contrasted with those from the Cordillera Occidental in part because we think we have identified a series of sister species shared by these two areas: *E. deinops* and *E. torrenticola*; Pacific versant species of the *E. diaphonus* group (*E. albericoi*, *E. diaphonus*, *E. diogenes*) and *E. lichenoides*; *E. juanchoi* and *E. helvolus*; and *E. ptochus* and *E. suetus*. The fifth pair of elements of this pattern (*E. ruizi* and *E. necopinus*) is more diffuse because *E. necopinus* is widely distributed across the northern part of the Cordillera Central. To these putative pairs of sister species, one might also add the wide-spread taxa shared by the Cordillera Occidental and the northern part of the Cordillera Central (*E. babax*, *E. cabrerai*, *E. erythropleura*, *E. mantipus*, and *E. thectopternus*) although such wide-spread taxa are not biogeographically informative (except in phenetic biogeography).

Using the approach of Lynch & Duellman (1997:172), the fauna of the Caldas transect is peculiar in two ways: (1) it is exceptionally rich in comparison with the entire Amazonian flanks of the Andes of Ecuador and (2) the species poverty below 1800 m. The poverty below 1800 meters may reflect nothing less than the impact of the *zona cafetera* upon a once even richer biota (Fig. 4). Unfortunately, the *zona cafetera* has been the equivalent of an ecological association for much longer than there have been biologists investigating the small vertebrate fauna of the Colombian Andes and we will never know what has been lost. We surmise that the cleaning activity of *cafetales* has rendered reproductive activity moot for organisms that depend on a nearly permanently moist leaf litter (such as frogs of the genus *Eleutherodactylus*).

Acknowledgments

Brian Bock, John Estrada, Taran Grant, and Vivian Paez accompanied JDL in the field in January 1998. During various trips to the forests in the Pensilvania-Samaná region, JVR was aided by Cesar Barbosa, Alirio Fajardo, Humberto Piñeros, Favio Quevedo, Juan Renjifo, and Nicolas Rueda during fieldwork. Dr. Jorge Hernández and Señor Segundo Zuluaga provided logistic support to JVR. Material was loaned by Alberto Zamudio (Colegio San Jose) and Vivian Paez permitted JDL to study material in

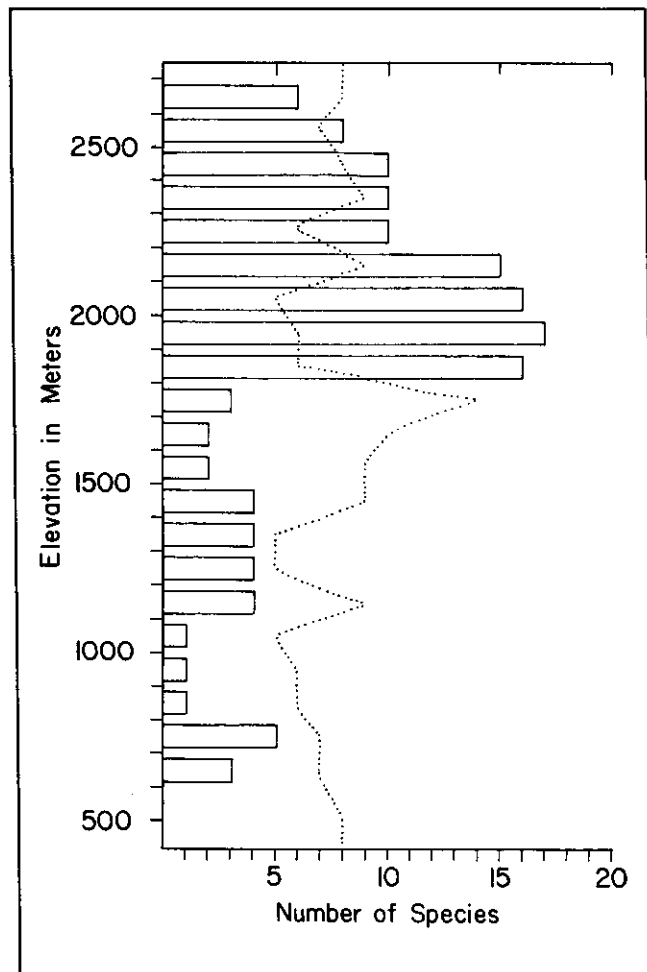


Figure 4. Number of species of *Eleutherodactylus* at 100-m increments along the transect in eastern Departamento de Caldas (open bars) contrasted with the number of species for a transect (Guamaní-Santa Cecilia) on the eastern slopes of the Andes in Ecuador (dotted lines).

her care (Museo Herpetologico Universidad de Antioquia, MHUA).

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