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# Redescriptions of Three Little-Known Eleutherodactylus from Northwestern Ecuador (Amphibia: Leptodactylidae)

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Peters (1955) published a list of herpetological type-localities in Ecuador. For most of the species of *Eleutherodactylus* named from South America, the type-locality is the only known locality at which the species has been collected. This paucity of knowledge does not reflect the rarity of species so much as it reflects the lack of collections, difficulty of identification of specimens, and failure of herpetologists to report on eleutherodactyline frogs. The species of the genus *Eleutherodactylus* are difficult to identify inasmuch as there is little in the way of useful literature on the genus in South America. Few specimens of the genus are collected by the diurnal collector except at higher elevations in the Andes where the populations of the relatively few species which occur there are very large.

In the course of field work in Ecuador by William E. Duellman, myself, and other parties from the University of Kansas, we have collected several hundreds of specimens of *Eleutherodactylus* representing nearly 75 species. More species of the genus have been named from Ecuador (49) than from any other political unit in the Americas. Of the numerous named forms, many lack precise locality data. The purpose of this paper is to record locality records and other information concerning three little-known species of the genus from northwestern Ecuador.

As noted by Peters (1960), Ecuador is made up of three obvious parts (Pacific lowlands, Andes, and Amazonian lowlands), which are not to be confused with zoogeographic units. Eleutherodactyline frogs occur in most regions of Ecuador but as yet are not known from the Guayas region. There are at least three faunal regions on the Pacific lowlands and slopes of Ecuador (1. The Guayas region; 2. The Esmeraldas region, the very wet Ecuadorian component of the Chocó which narrows to the south and is restricted to the base of the Andes; and 3. The slope region, which is found between 1000 and 3000 meters on the Pacific slopes of at least the northern two-thirds of the Ecuadorian Andes. Some members of this faunal group get into the interandean basins or valleys). Peters (1960) considered the interandean faunal unit to be

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composed of northern and southern elements. The interandean species of *Eleutherodactylus* break into two units between Gamote (Chimborazo Province) and Azogues (Cañar Province). The northern unit contains such species as *E. curtipes* and *E. unistrigatus* and extends northward at least to Popayán in Colombia. The southern element contains nearly a dozen species of *Eleutherodactylus*, most of which are unnamed, but including *E. cajamarcensis*, *E. lymani*, and *E. w-nigrum*, and also includes southern South American genera (*viz., Stenocerus* and *Telmatobius*).

*Eleutherodactylus* are rare in the central part of the Amazonian basin but are abundant along the western fringe of the basin. Too little data are available to speak of faunal units in the Amazonian lowlands of Ecuador but there appears to be a distinct faunal break at about 900 meters in the species of *Eleutherodactylus* found in the basin.

Although the literature suggests that some species of *Eleutherodactylus* occur on both sides of the Andes in Ecuador, I know of no species that occurs on both slopes of the Andes or in the lowlands of both the Pacific and Amazonian sides. Boulenger reported *E. conspicillatus* from northwestern Ecuador and from Amazonian Ecuador. He appears to have confused *E. achatinus* as well as one or two other species with *E. conspicillatus*. Parker (1934) recorded *E. latidiscus* from Zamora, Zamora-Chinchipe Province, but that species is otherwise known only from the Ecuadorian Chocó. Parker (1938) emended his identification to *E. vertebralis*, a species known only from the high Pacific slopes of the Cordillera Occidental of northern Ecuador. Parker's specimens probably represent *E. bufonius*, which is known along the base of the Andes in eastern Ecuador and is superficially similar to *E. latidiscus* and *E. vertebralis*.

Several of the species of *Eleutherodactylus* which I have collected in the Esmeraldas lowlands (the region) are apparently unnamed. The following nominal species have been collected in the vicinity of Santo Domingo de los Colorados, Pichincha Province: *E. achatinus, E. anomalus, E. areolatus, E. bufoniformis, E. latidiscus, E. longirostris,* and *E. ornatissimus.* Two other species are known from localities in the northern part of the Esmeraldas region: *E. gularis* (possibly a synonym of *E. diastema*) and *E. subsigillatus.* 

Ten nominal species of Ecuadorian *Eleutherodactylus* have no known or only indefinite type-localities. Two of these species (*E. devillei* and *E. glandulosus*) were discussed earlier. New information is available for two more species (*E. appendiculatus* and *E. ornatissimus*), both of which occur in the Esmeraldas lowlands of Ecuador.

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In view of the incomplete original description of *E. appendiculatus* (Werner, 1894), this species is redescribed below:

# Eleutherodactylus appendiculatus (Werner)

Hylodes appendiculatus Werner, 1894, Zool. Anz., 17:410. Holotype.—NMW 16507, a juvenile female from "Ecuador," collected by Schmarda. Nieden, 1923, Das Tierreich, 46:448.

Eleutherodactylus appendiculatus: Peters, 1955, Rev. Ecuat. Entomol.-Parasitol., 2:350. Gorham, 1966, Das Tierreich, 85:56.

Diagnosis. (1) skin of dorsum relatively smooth with large tubercles on eyelids, between eyes, and on limbs, that of venter coarsely areolate; no discoidal fold present; dorsolateral folds prominent; (2) tympanum visible, round, upper edge concealed, slightly more than onethird diameter of eye; (3) snout acuminate in dorsal view, acutely pointed or rounded in lateral profile with a fleshy proboscis at the tip; (4) eyelid wider than interorbital distance; no frontoparietal ridges; (5) prevomerine teeth present, 2-5 per dentigerous process, arranged in oblique rows on slightly elevated processes situated well behind choanae; (6) reproductively mature individuals not known; (7) first finger much shorter than second, tips of digits expanded into large, weakly emerginate pads; (8) fingers bearing lateral fringes; (9)ulnar tubercles present; (10) tarsus lacking folds or tubercles along inner edge, row of prominent tubercles along outer edge; (11) inner metatarsal tubercle elongate, four or five times size of elongate outer metatarsal tubercle; minute supernumerary tubercles on plantar surface; (12) toes with lateral fringes, no webbing, digital pads large, weakly emarginate; (13) dorsum pale brown blotched with brown; limbs barred, bars one-half width of interspaces; black anal patch present; posterior surface of thigh brown; venter cream reticulated with dark brown, throat dark brown; dark brown canthal stripe and labial bars; (14) two known specimens 18.5 and 22.6 mm SVL (snout-vent length).

Description. Head about as wide as or slightly narrower than body; head (without proboscis) longer than wide; head width 38.8 to 39.2 per cent SVL, 87.9 to 91.3 per cent head length (without proboscis); snout acuminate in dorsal view, acutely pointed or rounded in lateral profile, extending anterior to edge of lower lip, bearing an elongate fleshy proboscis (Fig. 1); canthus rostralis prominent, curved; loreal region concave, sloping gently to lip; lips somewhat flared; nostrils lateral, near end of snout; length of eye equal to distance between eye and nostril; interorbital distance 80.5 to 87.2 per cent width of upper eyelid; upper eyelid bearing one or two large tubercles; tympanum round, less than fully distinct, small, its diameter 33.1 to 38.0 per cent length of eye; supratympanic fold present, not large; two or three conical tubercles below and posterior to tympanum; tongue moderate-sized, oval, not notched posteriorly, posterior one-third free; choanae small, longer than wide, completely visible when roof of mouth is viewed from directly below; prevomerine dentigerous processes present, median and posterior to choanae, tear-drop shaped, separated medially, each process bearing 2–5 teeth.

Skin of dorsum smooth but bearing scattered large tubercles, *viz.*, on eyelids, between eyes, on scapular region, and dorsolateral folds; skin of venter areolate, that of throat smooth; discoidal fold not apparent; anal opening not enclosed in sheath, no tubercles about anus; shank 57.8 to 62.3 per cent SVL; forearm bearing ulnar tubercles, all relatively small; a few supernumerary tubercles present on thenar surfaces; subarticular tubercles of fingers small, round, simple; fingers bearing lateral fringes, not webbed; digital pads expanded, weakly emarginate, wider than long, each bearing a circumferential groove; first finger much shorter than second.

Tarsus bearing row of large tubercles along outer edge including a large heel tubercle; the row of outer tarsal tubercles continues onto the



Figure 1. (a) dorsal (x 4.5) and (b) lateral (x 6.2) views of head of Eleutherodactylus appendiculatus (USNM GOV 9145).

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outer edge of the fifth toe; inner surface of tarsus lacking fold or tubercles; inner metatarsal tubercle elongate, not compressed, four or five times size of elongate, somewhat conical outer metatarsal tubercle; plantar surface lacking supernumerary tubercles or with only one or two tubercles; subarticular tubercles small, round, simple; toes bearing poorly defined lateral fringes, devoid of webbing; digital pads large, like those of fingers.

Dorsum and flanks pale brown with dark brown markings consisting of an interorbital bar, chevrons on the back, some broad flank bars, and three labial bars. The dark brown canthal stripe is not evident in the holotype, but is prominent in the other individual examined. The limbs are pale brown with narrow dark brown bars; the bars are one-half the width of the interspaces. The venter is cream and mottled and reticulated with brown. The throat is brown with darker brown and cream markings along the lips. The posterior surfaces of the thighs are dark brown and there is a black anal patch. The undersurfaces of the thigh are dark brown spotted with cream. The tarsi and ventral surfaces of the hands and feet are dark brown.

Remarks. No other species of the genus Eleutherodactylus has a fleshy proboscis. Eleutherodactylus nigrovittatus has a small fleshy knob on the nose but is otherwise entirely unlike E. appendiculatus. Werner (1894) presented a relatively brief description of the species and had no locality data except "Ecuador." A single specimen of this species is included in the Gustavo Orces-V collection (GOV) recently accessioned by the United States National Museum. This specimen was collected in Pichincha Province, Ecuador, at the Río Blanco. This locality is somewhat vague but establishes the occurrence of the species in the Esmeraldas lowlands of Ecuador. The Río Blanco is a tributary of the Río Toachi in a wet forested region.

Eleutherodactylus appendiculatus is apparently most closely related to two nominal species found in Amazonian Ecuador, E. galdi and E. margaritifer. The latter two forms may not be specifically distinct.

Specimens examined. NMW 16507, "Ecuador." USNM GOV 9145, Río Blanco, Pichincha Province, Ecuador.

Despax (1911) named Hylodes ornatissimus on the basis of a single specimen presumably from Ecuador. This species is herein redescribed on the basis of fresh material collected at Santo Domingo de los Colorados, Pichincha, Ecuador.

# Eleutherodactylus ornatissimus (Despax)

Hylodes ornatissimus Despax, 1911, Bull. Mus. Hist. Nat., Paris, 17:91, plate 3. Type-locality, Ecuador. Nieden, 1923, Das Tierreich, 46:453. Eleutherodactylus ornatissimus: Guibé, 1948, Cat. Types Amphibiens Mus. Nat. Hist., Paris, p. 29. Peters, 1955, Rev. Ecuat. Entomol.-Parasitol., 2:350. Gorham, 1966, Das Tierreich, 85:89–90.

Diagnosis. (1) skin of dorsum and limbs shagreened, that of venter areolate; discoidal fold not defined posteriorly; (2) tympanum evident externally, round, approximately one-third diameter of eye; (3) snout long, acuminate in dorsal view, rounded in lateral profile; (4) interorbital distance slightly wider than upper eyelid; no frontoparietal ridges; (5) prevomerine teeth present, situated on low dentigerous processes mesiad and posterior to choanae; (6) males with vocal slits and median subgular vocal sac; (7) first finger shorter than second; digital pads expanded, slightly broader than long; (8) fingers bearing lateral fringes; (9) no ulnar tubercles; (10) tarsus lacking tubercles; (11) inner metatarsal tubercle ovoid, four to five times size of round outer metatarsal tubercle; (12) toes bearing lateral fringes and basal webbing; toe tips expanded into pads which are much broader than long: (13) dorsum and venter pale cream (pea green in life), dorsum and limbs spotted with black, markings on dorsum tend to be arranged in stripes, a black interocular band; a dark canthal stripe continuing onto lower flanks; posterior surface on thigh bearing a few small spots; (14) males small, 19.5 to 25.0 mm SVL.

Description. Head as wide as body; head longer than wide; head width 34.1 to 37.9 (mean 36.0) per cent SVL; snout acuminate in dorsal view, rounded in lateral profile, longer than length of eye; canthus rostralis rounded but distinct, straight; loreal region flat, sloping to lip; lips not flared; nostrils lateral, much closer to tip of snout than to eye; width of eyelid 65.2 to 80.7 (mean 71.6) per cent interorbital distance; tympanum small, round, 36.0 to 43.2 (mean 38.3) per cent diameter of eye; no supratympanic fold; tongue oval, slightly notched posteriorly, free for posterior one-half; choanae small, completely visible when roof of mouth is viewed from directly below, situated near lateral edges of palate; each prevomerine dentigerous process slightly elevated, rounded, about twice as large as a choana, bearing 2–4 teeth in a transverse row, situated mesiad and posterior to choanae, widely separated medially; male with vocal slits and large, external, subgular vocal sac.

Skin of dorsum and limbs shagreened, that of venter and posteroventral surfaces of thighs areolate; discoidal fold poorly defined posteriorly; anal opening unmodified; shank 47.3 to 50.3 (mean 48.7) per cent SVL; forearm lacking row of ulnar tubercles; two palmar tubercles, median and outer fused; subarticular tubercles round, simple, moderatesized; numerous thenar supernumerary tubercles, most very small; fingers bearing distinct lateral fringes; digital tips expanded into pads which are wider than long and each pad bears a circumferential groove; first finger shorter than second.

Tarsus lacking tubercles; inner metatarsal tubercle ovoid, three to four times size of round outer metatarsal tubercle; plantar surface bearing numerous small supernumerary tubercles, none distinct; subarticular tubercles simple, round, moderate-sized; toes distinctly fringed and bearing basal webbing (Fig. 2); digital tips expanded into pads which are broader than long and bear a circumferential groove.

In preservative, dorsum, limbs, and venter pale cream, yellow-white wash on dorsum; bearing three black stripes, usually interrupted, sometimes with lateral extensions (Fig. 3); black bar about vent; interorbital bar usually present; black canthal stripes; upper lip bearing few indistinct black spots; limbs with narrow black bars one-half width of interspaces; posterior surface of thigh colorless or with few small black spots; canthal streak continuing posterior to eye as a flank stripe, ending behind level of sacrum; lower lip edged with diffuse black markings.

In life dorsum and limbs were pale pea green with black markings; the posterior surface of the thighs and the venter were pale green, and



Figure 2. (a) foot of Eleutherodactylus ornatissimus, KU 119745, (b) hand of E. ornatissimus, KU 119745, (c) hand of E. areolatus, KU 119484, and (d) foot of E. areolatus, KU 117490. All x 4.7.

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the vocal sac was yellow. The hands and feet had an orange wash. The iris was green with a faint bronze wash and was finely reticulated with black.

*Remarks.* Six specimens of this species were collected at night near Santo Domingo de los Colorados in early August 1968. Five of the specimens were sitting on vertical elephant ear leaves two to three meters



Figure 3. Eleutherodactylus ornatissimus (top, KU 119744, 22.9 mm SVL) and E. areolatus (botton, KU 117491, 28.8 mm SVL). From kodachromes by the author.

above the ground at the edge of a forest. The other specimen was found on a *Heliconia* leaf in a banana grove. All individuals collected were males but none was heard to call. The vocal sac was distended in two of the individuals.

Eleutherodactylus ornatissimus can be confused with no other Ecuadorian frog known to me. At present, I have no idea of the relationships of the species. Several of the species reported by Despax (1911) were collected in the vicinity of Santo Domingo (= Santo Domingo de los Colorados, Pichincha). It seems likely that the type of *E. ornatissimus* was also collected there but no advantage is gained by restriction of the type-locality.

Specimens examined. ECUADOR, Pichincha: Santo Domingo de los Colorados, 600 m., KU 119744-48, 119749 (cleared and stained, skeleton).

Boulenger (1898) named Syrrhophus areolatus on the basis of one specimen from Cachabé (= San Javier de Cochabí, Esmeraldas) and two from Chimbo (= Puente del Chimbo, Guayas). No additional speciments of the species have been reported, although Lynch (1968) commented on the generic position of the species and transferred it to *Eleutherodactylus*. Small specimens, like those available to Boulenger have minute prevomerine dentigerous processes and the teeth usually are not visible. In larger specimens, the processes and teeth are clearly visible.

# Eleutherodactylus areolatus (Boulenger)

Syrrhopus areolatus Boulenger, 1898, Proc. Zool. Soc. London, 1898:122, pl. 14, fig. 3 [Type-localities.—Cachabé (= San Javier de Cochabí, Esmeraldas) and Chimbo (= Puente del Chimbo, Guayas), Ecuador].

Syrrhophus areolatus: Nieden, 1923, Das Tierreich, 46:402. Gorham, 1966, Ibid., 85:163.

Syrrhophus areolata: Peters, 1955, Rev. Ecuat. Entomol.-Parasitol., 2:339.

Eleutherodactylus areolatus: Lynch, 1968, Herpetologica, 24:291-92.

Diagnosis. (1) skin areolate, discoidal fold prominent; (2) tympanum poorly defined externally, about one-third diameter of eye; (3) snout short, subacuminate in dorsal view, truncate in lateral profile; (4) upper eyelid as wide as interorbital space; (5) prevomerine teeth present, situated in oblique rows on dentigerous processes lying mesiad and posteriad to choanae; (6) males with vocal slits and large, external, subgular vocal sac; (7) first finger slightly shorter than second, digital tips expanded into round pads, each pad bearing circumferential groove, outer three fingers bear distal papillae (Fig. 2); (8) fingers broad, not fringed; distal subarticular tubercles of outer fingers and toes bifid; (9) forearm lacking row of ulnar tubercles; (10) tarsus lacking tubercles or folds; (11) inner metatarsal tubercle large, ovoid, not compressed, about three times size of flattened, ovoid outer metatarsal tubercle; plantar surface lacking defined tubercles; (12) toes not fringed, lacking webbing, bearing round distal pads, each with circumferential groove, and second, third, and fourth bearing distal papillae; distal subarticular tubercles broad, nearly bifid; (13) venter white, dorsum cream or brown, if cream, spotted or reticulated with reddish brown, posterior surface of thigh colorless; (14) adults small, males 21.5 to 26.9, females 26.4 to 31.1 mm SVL.

Description. Head as broad as or broader than body, considerably wider than long; head width 38.4 to 42.2 (mean 40.2) per cent SVL; snout subacuminate in dorsal view, truncate in lateral profile; canthus rostralis sharp, concave; loreal region concave, gently sloping to lip; lips not flared; nostrils lateral, near tip of snout; length of eye slightly less than length of snout; interorbital space as broad as or slightly narrower than width of eyelid, width of eyelid 97.9 to 127.4 (mean 105.5) per cent interorbital distance; tympanum round, poorly defined externally, its upper and posterior edges usually partly concealed, 28.5 to 42.8 (mean 36.8) per cent length of eye; superatympanic fold absent; tongue large, ovoid, weakly notched posteriorly, posterior one-half to two-thirds free; choanae relatively small, situated laterally, completely visible when roof of mouth is viewed from directly below; prevomerine dentigerous processes present, low, usually not obvious except in large specimens, situated mesiad and slightly posteriad to choanae, each bearing 2-4 teeth; males with relatively short vocal slits and large, external, subgular vocal sac.

Skin of dorsum and venter areolate (Fig. 3), that of throat less areolate than that of rest of body; discoidal fold prominent; anal opening not modified; shank 46.3 to 53.8 (mean 48.1) per cent SVL; ulnar tubercles not distinguishable; median and outer palmar tubercles broken up into flat supernumerary thenar tubercles (Fig. 2); subarticular tubercles moderate-sized, distal subarticular tubercles of third and fourth fingers bifid; fingers lacking lateral fringes or webbing; digital tips expanded into round pads, those of outer fingers largest, each bearing circumferential groove; pads of outer fingers bear terminal papillae; first finger slightly shorter than second.

Tarsus and heel devoid of tubercles; inner metatarsal tubercle large, ovoid, not compressed, three to four times as large as round to ovoid outer metatarsal tubercle; plantar surface areolate, lacking defined supernumerary tubercles; subarticular tubercles of toes like those of fingers, distal tubercles bifid; digital tips expanded, bearing circumferential groove, second, third, and fourth toes bearing distal papillae; toes lacking webbing or lateral fringes (Fig. 2).

Dorsum cream with or without pale metallic green wash and spotted or reticulated with reddish brown or uniform reddish brown; posterior surfaces of thighs and ventral surfaces colorless or pale cream; limbs spotted with reddish-brown or not; inner digits colorless, outer digits pale cream to reddish-brown.

The coloration of living individuals is complex owing to prominent metachrosis. The coloration of one individual can change so as to cover the spectrum of color variation of the species. The dorsum and limbs are uniform creamy yellow, the flanks pale yellow, the venter and posterior surfaces of thighs white, and the hands and feet pale orange. The throat of males is faintly washed with yellow. The ground color changes through pale reddish-bronze to light reddish-brown. Accompanying this change, the hands and feet change from pale orange to yellow. The dorsum is usually spotted with reddish-brown although frogs in the lightest color phase (uniform creamy yellow) may lack spots. Both the tops and bottoms of the hands and feet are pale orange to yellow and this color does not grade into the color of the forearm or tarsus. The iris is apparently black.

*Remarks.* I collected specimens of this species in banana groves and in dense forest near Santo Domingo de los Colorados, Ecuador, on the nights of March 5, July 31, and August 2–4, 1968. No specimens were heard to call. All were perched on small herbaceous plants, elephant ear leaves, *Heliconia* leaves, or banana leaves within three meters of the forest floor. Some individuals were found at the edge of the banana groves but most were in densely shaded situations.

*Eleutherodactylus areolatus* is very distinctive in many respects; no other species of the genus known to me has bifid subarticular tubercles or distal papillae on the digital pads. Very few species have completely areolate skin. The species is definitely not allied to the other South American "Syrrhophus" (see Lynch, 1968, for list) and has no near relative of which I am aware. The species is known only from the forested Pacific lowlands of Eucador (Fig. 4) but probably also occurs in the Chocó of Colombia.

Specimens examined. ECUADOR, Pichincha: Santo Domingo de los Colorados, 600 m., KU 117487-91, 119474-500, 118129 (cleared and stained), 119501 (cleared and stained), WCAB 44396-400; 19 km. S, 5 km. E Santo Domingo delos Colorados, Río Baba, UIMNH 77409.



Figure 4. Known localities for Eleutherodactylus areolatus.

No locality, Ecuador, WCAB 35709–10. Other locality records are those of Boulenger (1898).

#### Literature Cited

- BOULENGER, G. A. 1898. An account of the reptiles and batrachians collected by Mr. W. F. H. Rosenberg in western Ecuador. Proc. Zool. Soc. London, 1898:107-26, pls. 10-18.
- DESPAX, M. 1911. Reptiles et batraciens de 1' Équateur recueillis par M. le Dr. Rivet. Mission de 1' Équateur (Arc de méridien équatorial), 9(2):18-43, 3 pls.
- LYNCH, J. D. 1968. Systematic status of some Andean leptodactylid frogs with a description of a new species of *Eleutherodactylus*. Herpetologica, 24:289-300.
- PARKER, H. W. 1934. Reptiles and amphibians from southern Ecuador. Annals and Magazine of Natural History, (10)14:264-73.
  - ———. 1938. The vertical distribution of some reptiles and amphibians in southern Ecuador. *Ibid.*, (11)2:438–50.
- PETERS, J. A. 1955. Herpetological type localities in Ecuador. Revista Ecuatoriana Entomología-Parasitología, 2:335-52.
  - -----. 1960. The snakes of Ecuador: A checklist and key. Bull. Mus. Comp. Zool., 122:491-541.
- WERNER, F. 1894. Herpetologische nova. Zoologischer Anzeiger, 17:410-15.