

## Identity of Two Andean *Eleutherodactylus* with the Description of a New Species (Amphibia: Leptodactylidae)

John D. Lynch<sup>1</sup>

Museum of Natural History  
University of Kansas, Lawrence.

**ABSTRACT** – Field work on the high eastern slopes of the Ecuadorian Andes resulted in the collection of specimens of two species of *Eleutherodactylus* heretofore known only by holotypes from "Equator." The species are redescribed based on fresh material and are compared with other Ecuadorian *Eleutherodactylus*. *Eleutherodactylus devillei* is a member of the *surdus* group, and *E. glandulosus* is a member of the *curtipes* group. The specimens of *E. devillei* are all females and in explanation of the unbalanced sex ratios observed in this and two other species of Andean leptodactylids from Ecuador the hypothesis is advanced that the unbalanced sex ratios may reflect the collectors' bias.

*Eleutherodactylus chloronotus* is named on the basis of material collected in the valley of the Río Papallacta, Napo Province, Ecuador. Breeding was observed in March but not in July. The non-polymorphic species occurs at high elevations (2500-3350 meters) and is related to *E. devillei* and *E. surdus*. Young specimens characteristically have a bright green dorsal stripe which fades with an increase in size.

\* \* \*

Frogs of the genus *Eleutherodactylus* make up a conspicuous element of the Neotropical fauna. Approximately 300 species are presently recognized, and a large number of South American species probably remain to be described. The most recent synopsis of the genus, Boulenger's (1882) catalogue, included 45 species; in the ensuing 40 years about half of the now recognized species of the genus in northwestern South America were named by Boulenger from Ecuador. Few of these were illustrated and the "descriptions" were lists of those characters that Boulenger considered important. Many of the nominal species were based on specimens with inexact locality data (e.g., Andes of Ecuador, western Ecuador, or eastern Ecuador); the only descriptive data available are those included by Boulenger in the species diagnoses.

Incomplete descriptions, inaccurate locality data, lack of figures, and the diversity of the genus have contributed to the difficulty of identifying frogs of this genus, which are notorious for the subtle species differences available in preserved material.

It will ultimately be necessary to redescribe most, if not all, of the species named by Boulenger, if we are to gain an understanding of the composition of the genus. This paper was prompted by the rediscovery of the first two species of the genus named by Boulenger (*H. devillei* and *H. glandulosus*) on the eastern slopes of the Andes in Napo Province, Ecuador. Neither species has been collected at elevations above 3000 meters in spite of intensive field work above Papallacta, Napo Province, Ecuador.

### *Eleutherodactylus devillei* (Boulenger)

*Hylodes DeVillei* Boulenger, 1880, Bull. Soc. Zool. France, 5: 47 [Holotype. – IRSNB 1009, adult female, collected in the "Andes of Ecuador", by Émile de Ville, 1874-75].

*Hylodes devillei*: – Boulenger, 1882, Cat. Bat. Sal. British Mus., p. 213. Nieden, 1923, Das Tierreich, 46: 445.

<sup>1</sup>Present address: Department of Zoology, University of Nebraska, Lincoln, Nebraska, 68508.

*Eleutherodactylus devillei*: — Peters, 1955, Rev. Ecuat. Entomol. Parasit., 2: 351. Gorham, 1966, Das Tierreich, 85: 69.

**Diagnosis:** — (1) skin of dorsum smooth, that of venter areolate; dorsolateral folds present; (2) tympanum evident, round, one-third to one-half diameter of eye; (3) snout acuminate in dorsal view, sloping in lateral profile; (4) interorbital space greater than width of eyelid; frontoparietal ridges prominent; (5) prevomerine teeth present, on two large processes; (6) males unknown; (7) first finger shorter than second, digital pads expanded, round; (8) fingers with lateral fringes; (9) forearm with poorly defined row of tubercles along outer edge; (10) inner tarsal fold present, not prominent, no outer tarsal fold or tubercles; (11) inner metatarsal tubercle about three times size of compressed, ovoid outer metatarsal tubercle; plantar surface lacking supernumerary tubercles; (12) toes bearing lateral fringes, lacking webs; (13) dorsum brown with black chevrons and flecks; venter cream with brown reticulations; posterior surface of thigh pale yellow-brown with brown reticulations; limbs with narrow bands; (14) adults moderate-sized, females 26.0 - 43.5 mm snout-vent length.

**Description:** — (Fig. 1) Snout-vent length in females 26.0 - 43.5 mm; head not as broad as body; head slightly wider than long; head width 35.3 - 40.9 (mean 37.7) percent snout-vent length; snout acuminate in dorsal view; canthus rostralis sharp; loreal region distinctly concave, sloping abruptly to lip; a pair of frontoparietal ridges at edges of interorbital region extending from anterior to eyes to level of tympani; width of upper eyelid 54.2 - 84.1 (mean 70.8) percent interorbital space; glandular fold on outer edge of eyelid; length of eye greater than distance between eye and nostril; tympanum round, 31.7 - 51.6 (mean 41.3) percent diameter of eye; supratympanic fold glandular; tongue not large, fleshy, free for posterior edge only; choanae minute, completely visible when roof of mouth is viewed from directly above; prevomerine dentigerous processes present, bearing 3-4 teeth per process; processes tear-drop in shape, mesiad and posteriad to choanae; each process about 6 times size of a choana; processes separated medially by distance equal to basal width of one process.

Skin of dorsum smooth with scattered, minute pustules; prominent dorsolateral folds run from eye to below sacrum; flanks smooth with scattered pustules; skin of venter coarsely areolate; shank 51.2 - 63.0 (mean 57.0) percent snout-vent length; skin of limbs (ventral) smooth except on posteroventral surfaces of thighs; anal opening normal; a row of tubercles on posterolateral surfaces of forearm; three palmar tubercles, median and outer partly fused, inner largest; few supernumerary tubercles; subarticular tubercles round, low, simple; lateral fringes on fingers, no webbing; tips of fingers expanded into round pads, each with a terminal transverse groove; first finger shorter than second (Fig. 2); no outer tarsal folds or tubercles; inner tarsal fold present, faint, extending length of tarsus; metatarsal tubercles large, inner three times size of outer, not compressed; outer metatarsal tubercle compressed, ovoid like inner; supernumerary tubercles lacking on plantar surface; subarticular tubercles of toes moderate-sized, round, low, simple; tips of toes expanded into pads slightly smaller than those of hand; toes lacking web, with lateral fringes.

Dorsum brown with black markings; dorsal markings consisting of two chevrons and several irregularly distributed spots; dorsal surfaces of thighs pale brownish-yellow with brown reticulations; shanks, tarsi, and feet brown with narrow black bands about one-eighth to one-fifth width of interspaces; three to five bands on shanks; supratympanic stripe black; canthal streak black; lips usually lacking bars, if present, bars ill-defined and black; cream stripe along edge of lip or not; venter pale yellow with moderate to heavy brown or black reticulations and spots; hidden surfaces of shanks and tarsi brown spotted with cream. In life the ground color is greenish-brown and the venter is pale yellowish-cream reticulated with brown or black.

**Comparisons:** — Too little is known of the Andean *Eleutherodactylus* in order to speak convincingly of species groups, although most of the species of the higher parts of the Andes are superficially, at least, similar in skin texture and proportions. I have referred to these species as the *unistrigatus* group (Lynch, 1968). For present purposes, I use the *unistrigatus* complex (Group II of Cochran and Goin, 1969) to denote those species of the genus with relatively short limbs (as reflected in the low values for tibia/snout-vent ratios) and a stocky appearance, ranging from the eastern

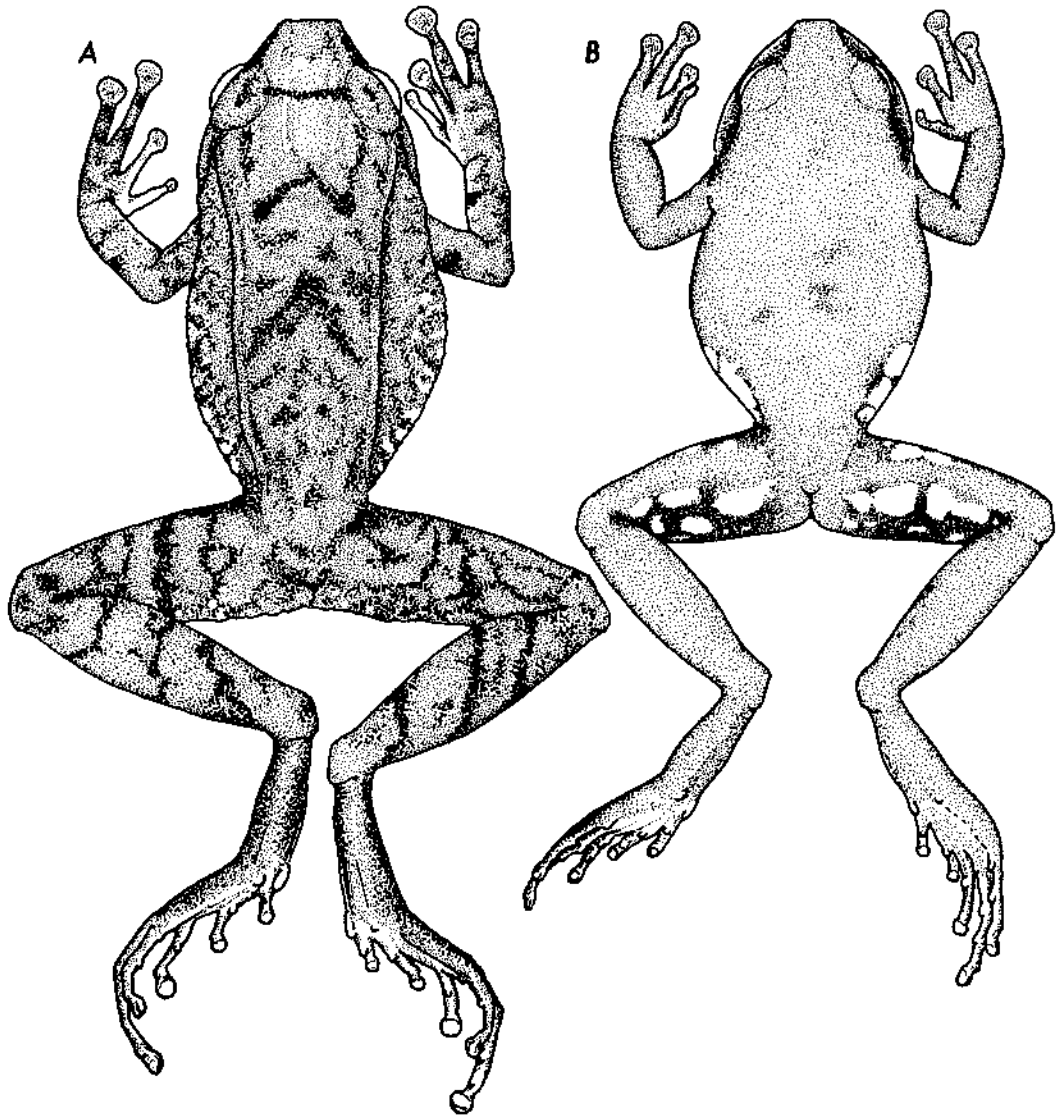


FIGURE 1. Dorsal views of (A) *Eleutherodactylus devillei*, adult female, 38.9 mm snout-vent length, UIMNH 55832, and (B) *E. glandulosus*, adult female, 34.2 mm snout-vent length, UIMNH 55848.

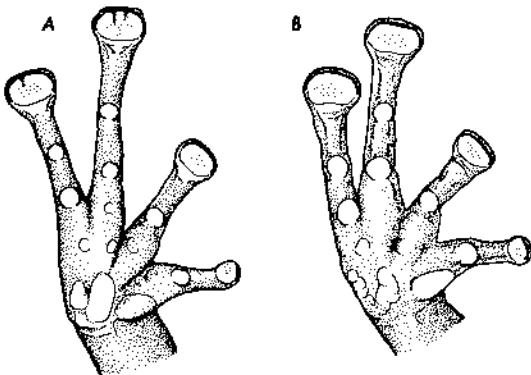


FIGURE 2. Palmar views of hands of (A) *Eleutherodactylus devillei*, UIMNH 55831 and (B) *E. glandulosus*, UIMNH 55836. Both x 4.

cordillera of Venezuela to Argentina and Bolivia. I have refrained from listing the nominal species of this complex, because I am not personally familiar with all of them. Members of this complex exhibit a wide range of variation in the expansion of the digital pads, presence of glandular ridges on the dorsum, external expression of the tympanum, size, and color pattern. Some species possess frontoparietal ridges and others do not. Those possessing frontoparietal ridges are usually larger species, but this state is not invariable.

The members of the *biporcatus* group have perhaps the greatest development of ridges although for its size *E. galdi* possesses more prominent ridges. Few species of the genus have as well developed cranial crests as does *devillei*. Boulenger (1880) suggested a close relationship between *devillei* and *sulcatus* (a member of the *biporcatus* group). Well developed cranial crests are also present in the *galdi* group (*appendiculatus*, *galdi* and *margaritifer*). The latter group is readily distinguishable by the narrow head, ornamentation of the squamosal bones, and development of numerous elongate tubercles on the body. The members of the *biporcatus* group differ in their more massive skull, lack of digital expansion, and toad-like habitus.

Cranial crest development within the *unistrigatus* complex is most noticeable in *buckleyi*, *curtipes*, *devillei*, and *glandulosus*. The former two have narrow digital pads and differ from one another in color pattern. *Eleutherodactylus glandulosus* has expanded digital pads but differs in color pattern (see below). Among the known species of the genus in northwestern South America, *E. devillei* is most likely to be confused with *E. surdus*. The two species are probably related and are similar in color pattern; they differ in the concealment of tympanum and lack of cranial crests in *surdus*. Some specimens of *E. buckleyi* and *E. curtipes* have a mottled venter, but these species have narrow digital pads, a white lip stripe, and a longer, more sloping snout. *Eleutherodactylus devillei* is considered most closely related to *E. chloronotus* new species, a sympatrant with a small tympanum, digital pads, no cranial crests, and different coloration, and *E. surdus* of the higher slopes of the western Andean Cordillera.

*Distribution and specimens examined:* — Known only from the upper drainage of the Rio Papallacta, Napo Province, Ecuador. ECUADOR, Napo: Baeza, WCAB 35531; Cuyuja (also spelled Cuyeya and Cuyujua), UIMNH 55825-35 (55833 is cleared and stained); 3 km. E. Papillacta, 2900 m., KU 117570-71; Rio Bermejo, Cordillera Guacamayo, WCAB 35653; "Andes of Ecuador" IRSNB 1009 (holotype).

*Eleutherodactylus glandulosus* (Boulenger)

*Hylodes glandulosus* Boulenger, 1880, Bull. Soc. Zool. France, 5: 47 [Holotype. -IRSNB 1010, adult female collected in the "Andes of Ecuador", by Émile de Ville, 1874-75]. 1882, Catalogue Batrachia Salientia. . . British Museum, p. 212. Nieden, 1923, Das Tierreich, 46: 450. *Eleutherodactylus glandulosus*: — Peters, 1955, Rev. Ecuat. Entomol. Parasit., 2: 351. Gorham, 1966, Das Tierreich, 85: 74.

*Diagnosis:* — (1) skin of dorsum weakly granular, that of venter areolate, no dorsolateral folds; (2) tympanum visible externally, round, one-third to one-half diameter of eye; (3) snout round in dorsal view, truncate in lateral profile; (4) upper eyelid two-thirds interorbital distance, frontoparietal ridges faintly indicated; (5) prevomerine teeth present, on moderate-sized processes; (6) males with median subgular vocal pouch and slits; (7) first finger shorter than second, digital pads well developed, round; (8) fingers with poorly developed lateral fringes; (9) row of tubercles along outer edge of forearm; (10) inner tarsal fold present for one-half length of tarsus, no outer tarsal fold or tubercles; (11) inner metatarsal tubercle oval, about four times size of round, conical outer metatarsal tubercle; plantar surface bearing numerous small supernumerary tubercles; (12) toes with poorly developed lateral fringes and web; (13) color and pattern: dorsum yellow-tan to brown with poorly defined brown blotches; venter uniformly pale yellow sometimes sparsely reticulated with brown; limbs not barred; anterior and posterior surfaces of thighs and concealed surfaces of shank dark brown to black with large yellow spots; flanks brown with large yellow spots; (14) adults moderate sized, males 21.5 - 26.2, females 29.4 - 38.3 mm. SVL.

*Description:* — Snout-vent length 21.5 - 26.2 mm in males, 29.4 - 38.3 mm in females; head as wide as body, slightly wider than long; head width 34.9 - 40.4 (mean 38.4) percent snout-vent length; snout round in dorsal view, truncate in lateral profile; width of upper eyelid 52.6 - 76.6 (mean 63.3) percent interorbital distance; canthus rostralis sharp, slightly constricted at nostrils; length of eye slightly less than distance from eye to nostril; tympanum round, with prominent tympanic ring, 33.4 - 42.0 (mean 37.9) percent diameter of eye in males, 37.5 - 49.6 (mean 44.9) in females; supratympanic fold prominent; loreal region concave, sloping abruptly to lip; tongue moderate to large, oval in outline, fleshy, notched posteriorly, free for posterior one-fifth; choanae small, just within margin of lips when roof of mouth is viewed from directly above; prevomerine denticulous processes present, low, subtriangular, mesiad and posteriad to choanae, each bearing 4-5 teeth in a transverse row along posterior edge.

Skin of dorsum weakly glandular, no dorosolateral, paravertebral, or cranial folds present (Fig. 1); anal opening not modified; skin of venter areolate; granules smaller on posteroventral surfaces of thighs; skin on limbs (excepting posteroventral surfaces of thighs) smooth; shank 50.5-57.7 (mean 53.4) percent snout-vent length; row of tubercles along lower edge of forearm; three palmar tubercles, outer smallest; supernumerary tubercles on palms; subarticular tubercles round, moderate sized, simple; fingers with poorly developed lateral fringes and lacking webbing; tips of fingers bearing enlarged pads, each with terminal transverse groove at tip, pads wider than long (Fig. 2); no outer tarsal folds or tubercles; low, though prominent, inner tarsal fold for one-half length of tarsus; inner metatarsal tubercle oval, not compressed, two and one-half times as long as wide; outer metatarsal tubercle round, conical, one-fourth size of inner; numerous small supernumerary tubercles on plantar surface; subarticular tubercles of toes slightly smaller than those of fingers; digital pads of toes like those of fingers, but smaller, toes bearing ill-defined lateral fringes, not webbed.

Dorsum brown to yellow-tan and either lacking pattern or with small diffuse brownish blotches; venter yellow, sometimes weakly reticulated with brownish flecks; limbs not barred; canthus marked with dark brown streak; supratympanic stripe present; flanks brown with large yellow spots; posterior surfaces of thighs and adjacent surfaces of shanks dark brown to black with yellow spots.

*Comparisons:* — *E. glandulosus* is most likely to be confused with some specimens of *curtipes*, although the latter has minute digital pads. Some specimens of *curtipes* have relatively well defined yellow spots on the flanks and upper surfaces of the thighs; however, the limbs are always barred in *curtipes*, and the posterior surfaces of the thighs are unicolor.

*Specimens Examined:* — ECUADOR, Napo: Cuyuya, UIMNH 55836-45, 55847-49. I have also seen the holotype, IRSNB 1010, from the "Andes of Ecuador".

*Remarks:* — Nothing can be gained through restriction of the type localities of these two species, although it is not unlikely that Émile de Ville did travel over part of the route of Francisco Orellana and hence was in the headwater region of the Río Papallacta. The presently known locality records for these two species do provide us with a rough approximation of the distribution of *devillei* and *glandulosus* — the higher eastern slopes of the eastern Andean Cordillera in Ecuador.

All specimens of *devillei* examined to date (16) are females. While the series is not so large as to be suggestive of an unusual sex ratio, the sex ratio is surprising. *Eleutherodactylus glandulosus*, which occurs sympatrically, has a 50:50 sex ratio and is known from fewer specimens. Two other species occurring in the same general locality have unbalanced sex ratios based on the known specimens: *Niceforonia festae* is presently known (in US museums) from 20 female specimens, although Peracca (1904) reported both males and females in the type-series of "several" specimens; *Eleutherodactylus trepidotus* is known from 72 females collected by various persons during all parts of the year from localities within 6 kms of Lago de Papallacta.

If the males and females select different diurnal concealment sites, then a collector who searches for specimens in a certain way (e.g., looking beneath large rocks or logs) could have a biased sample. I have collected biased samples of *Eleutherodactylus unistrigatus* by varying my collecting techniques. In collecting specimens by day only from beneath relatively large rocks away from small bushes and herbs I was able to collect predominately females. By collecting only beneath small piles of rocks at the bases of clumps of grass, herbs or bushes (again by day) I was able to obtain a sample skewed in favor of males. Collecting at night in the same region, I was attracted to calling males and therefore could bias my sample in that direction. The net result from

a collecting period of a few days at one locality with both day and night collections represented is an approximate 50:50 sex ratio. This may be an explanation for the apparent absence of males in these three Andean leptodactylids.

Extensive collecting in the headwater region of the Río Papallacta, Napo, Ecuador, revealed a rich eleutherodactyline fauna. Part of the material has been previously reported (Lynch, 1968). This report concerns the undescribed *Eleutherodactylus* mentioned in the earlier account. The following eleutherodactyline species are sympatric with the new species: *Eleutherodactylus curtipes*, *E. devillei*, *E. glandulosus*, *E. trepidotus*, and *Niceforonia festae*. Two species of *Atelopos* (*figenscens* and *pachyderma*), one *Colostethus*, and one *Gastrotheca* (*plumbeum*) were also found with the new species of *Eleutherodactylus*.

*Eleutherodactylus chloronotus* sp. nov.

*Holotype*: — KU 117519, adult male, Ecuador, Napo Province: 3 km E Papallacta, 2900 meters, collected 7 March 1968 by John D. Lynch.

*Paratopotypes*: — (33). KU 117516-18, 117520-49. Same data as holotype.

*Diagnosis*: — (1) skin of dorsum glandular, sinuous paravertebral folds present, skin of venter areolate; dorsolateral folds absent; (2) tympanum evident, round, upper edge partly concealed, about one-third diameter of eye in both sexes; (3) snout rounded in dorsal view, slightly truncate in lateral profile; (4) interorbital space as wide as upper eyelid in males, wider than in females; frontoparietal ridges lacking; (5) prevomerine teeth present on small denticulous processes; (6) males with median subgular vocal pouch and slits; (7) first finger shorter than second, digital pads well developed, round; (8) fingers lacking lateral fringes; (9) forearm lacking row of tubercles along outer edge; (10) tarsus lacking fold or tubercles along inner edge, ill defined row of tubercles along outer edge; (11) inner metatarsal tubercle oval, large, about six times size of round, conical outer metatarsal tubercle; (12) toes lacking webbing or lateral fringes; (13) color and pattern: dorsum gray to dull orange with a dark brown to black-edged hour-glass mark on back enclosing pale gray area; flanks gray with dark gray to brown sloping bars; venter pale yellow to cream reticulated in gray-brown; limbs yellowish-brown with gray bars; (14) adults moderate-sized, males 22.7 - 30.3, females 25.2 - 36.9 mm in snout-vent length.

*Description*: — Snout-vent 22.7 - 30.3 mm in males, 25.2 - 36.9 mm in females, head as wide as body, wider than long; head width 33.9 - 42.2 (mean 38.2) percent snout-vent length, slightly greater in females than males (Table 1); snout round in dorsal view, slightly truncate in lateral pro-

TABLE 1. Size and proportions of frogs of the *surdus* group in Ecuador.

	N	Snout-vent length	Tibia/SVL	HW/SVL	Eyelid/IOD	Tymp/Eye
<i>chloronotus</i> ♂♂	17	22.7 - 30.3	45.7 - 54.1 (50.5)	33.9 - 40.1 (37.6)	88.5 - 110.9 (100.1)	30.4 - 44.0 (36.1)
<i>chloronotus</i> ♀♀	11	25.2 - 36.9	48.3 - 55.6 (51.9)	37.1 - 42.2 (38.8)	74.4 - 100.0 (89.2)	33.2 - 50.0 (38.0)
<i>devillei</i> ♀♀	16	26.0 - 43.5	51.2 - 63.0 (57.0)	35.3 - 40.9 (37.7)	54.2 - 84.1 (70.8)	31.7 - 51.6 (41.3)
<i>surdus</i> ♂♂	10	28.1 - 33.7	53.0 - 61.4 (56.5)	33.6 - 39.8 (36.8)	63.9 - 91.8 (76.6)	—
<i>surdus</i> ♀♀	18	24.9 - 44.9	55.0 - 61.5 (57.3)	35.4 - 40.8 (37.8)	68.6 - 89.8 (78.2)	—

file; width of upper eyelid equal to interorbital space in males, less than in females; canthus rostralis sharp, constricted behind nostrils; length of eye slightly greater than length of snout; tympanum

round, upper edge concealed beneath fleshy supratympanic fold, 30.4 - 44.0 (mean 36.1) percent diameter of eye in males, 33.2 - 50.0 (mean 38.0) percent in females, distinct in adults, indistinct in young individuals; loreal region very concave, sloping to lip, lips somewhat flared; cranial crests lacking; tongue moderate in size, oval, weakly notched posteriorly, fleshy, posterior edge free; choanae small, completely visible when roof of mouth is viewed from directly above; prevomerine dentigerous processes small, situated mesiad and posteriad to choanae, subtriangular in outline, each process bearing 3 - 6 teeth in a transverse row.

Skin of dorsum decidedly glandular in appearance, that of throat and venter smooth; lower surfaces of limbs smooth; ventral disc poorly defined posteriorly, paravertebral folds on dorsum in hour-glass pattern (Fig. 3); anal opening extended to posterior surface of thighs by an anal flap;

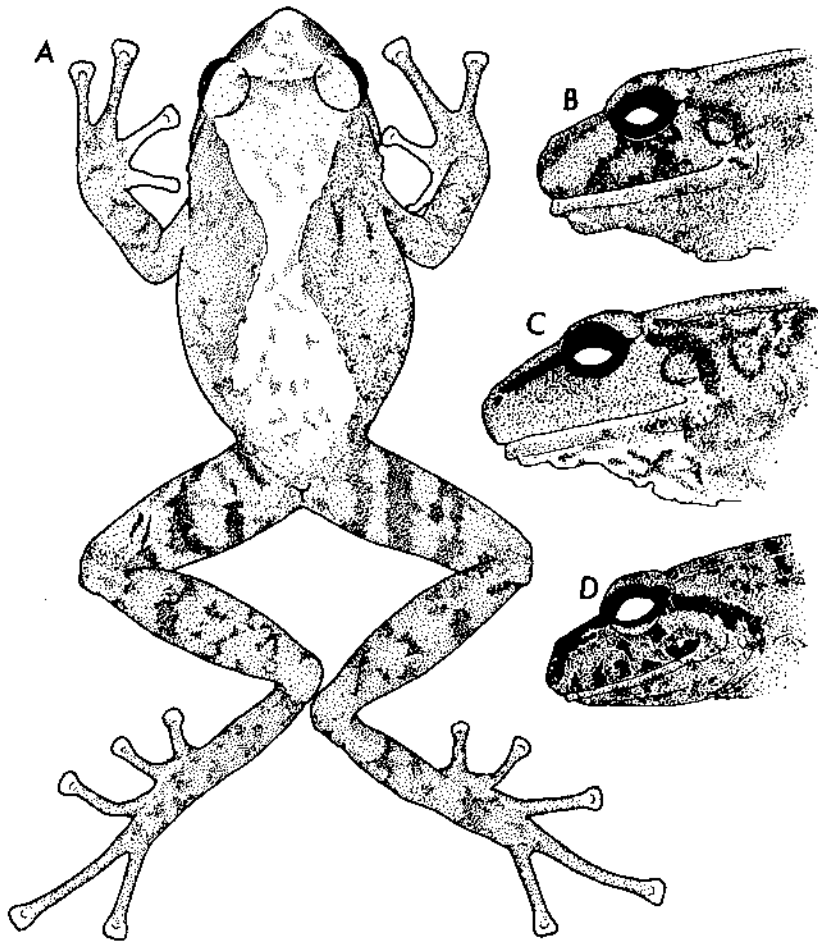


FIGURE 3. (A) dorsal view of *Eleutherodactylus chnaronotus*, holotype, KU 117519, x 4; sides of head of (B) *E. chnaronotus*, KU 117526, (C) *E. devillei*, UIMNH 55832, and (D) *E. surdus*, KU 117615. B - D, x 3.

shank 45.7 - 55.6 (mean 51.1) percent snout-vent length; forearm lacking tubercles along outer edge; three palmar tubercles, all ill-defined, outer smallest; thenar surfaces with few or no supernumerary tubercles; subarticular tubercles of fingers low, flattened, simple, second finger much longer than first; tips of fingers (except thumb) expanded into digital pads; pads wider than long, bearing terminal transverse groove; fingers lacking webbing or fringes; heel bearing a series of small tubercles, none prominent; tarsus lacking fold or tubercles along inner edge, a series of poorly defined tubercles

along outer edge; inner metatarsal tubercle large, oval, about six times size of small, conical outer metatarsal tubercle; plantar surface lacking tubercles or bearing fewer than four supernumerary tubercles; subarticular tubercles of toes low, flattened, small; toes lacking lateral fringes or webbing; tips of all toes expanded into digital pad, wider than long.

Dorsum gray to medium brown with gray to pale green or pale dull orange band from eyes to anus; band outlined with dark brown to black; interorbital area with poorly to well defined dark brown interorbital triangle; side of head pale yellowish gray with brown canthal streak, labial bars, and supratympanic streak; flanks gray to light or medium brown and two or three sloping brown and black bars; venter cream to dirty yellow reticulated with gray-brown; throat cream to dirty gray spotted with pale cream; limbs slightly lighter than dorsum barred with gray to black, three to four bars on thigh and four to five on shank, bars as wide as interspaces (Fig. 3).

In life *E. chloronotus* is pale orange-brown to brown above with or without a light to bright forest green dorsal band and with brown spots. The flanks are cream to white with pale brown bars and the venter cream to creamy yellow or white with faint or distinct brown and black spots and reticulations. The thighs are white to cream with brown to nearly black bars and if cream, the area of the light interspaces on the posterior surface of the thigh is white. The limbs are the same color as the dorsum with brown bars. The iris is bright brownish red with a few black reticulations and a dark brown, nearly black, horizontal streak. Small individuals have a decided green cast ventrally, especially on the throat.

*Natural History:* — *Eleutherodactylus chloronotus* has been collected in the vicinity of the type-locality in March, July, and November. In all cases the frogs were most commonly found beneath rocks in the more mesic parts of the habitat, although in March, 1968, I collected several specimens hopping about beneath a wet, seeping, rocky ledge. In March, 1968, I found juveniles as small as 13.9 mm in snout-vent length. Females with eggs have been collected in March, July, and November, and egg clutches associated with females were found in March, 1968. On a seeping hillside laden with numerous flat rocks and relatively little vegetation other than mosses and short grasses I found four egg clutches of *E. chloronotus*. The egg clutches were beneath rocks in wet mud, and some of the eggs were lying in water. Two clutches (40 eggs) were accidentally mixed and 14 of these were not preserved and maintained in the lab; these failed to hatch owing to fungus attack. The other two clutches contained 19 eggs; KU 118104 consists of 19 eggs in a stage of development approximating 18 days pre-hatching in *E. nubicola* (Lynn, 1942); the eggs have diameters of 5.3 - 5.8 mm. KU 118105 consists of 19 eggs in a much earlier stage (approximating 26 days pre-hatching in *E. nasutus*, Lynn and Lutz, 1946); these have diameters of 4.8 - 5.2 mm; the yolk diameter is 4.1 - 4.7 mm. The eggs were adherent to one another in life but are not in preservative. In the older eggs, the embryo has clearly defined canthal stripes.

No calls were heard that could be attributed to this species.

*Comparisons:* — In life *E. chloronotus* is readily distinguished from all Ecuadorian *Eleutherodactylus* known by me by the green dorsal stripe. Older females which lack the green stripe are similar to *E. devillei* and *E. surdus*; *surdus* lacks an externally visible tympanum, and *devillei* has a more intense ventral reticulation, cranial crests, and dorsolateral folds. *Eleutherodactylus devillei* lacks labial bars which are well developed in *E. chloronotus* and *E. surdus* (Fig. 3). The three species are considered closely related, do not differ appreciably in proportions (Table 1), and may tentatively be included in a species group (the *surdus* group). The relationships among the Andean *Eleutherodactylus* are not known at present and I include most of the species in the *Eleutherodactylus unistrigatus* complex (Lynch, 1968); within the complex several "species groups" are apparent such as the *myersi* group (Lynch, 1968) and the *surdus* group.

*Specimens Examined:* — ECUADOR, *Napo*: Cuyuja, UIMNH 55823-24, 55846; north side of Laguna Papallacta, 3350 m, KU 109071-72; 3 km E Papallacta, 2900 m (type locality), KU 117516-49, 1181031 (juvs.), 118104-06 (eggs), 118130-33 (cleared and stained, skeletons); 1 km W. Papallacta, 3200 m, KU 111385-86; 4 km W Papallacta, 3300 m, KU 117550-55; Río Bermejo, Cordillera Guacamayo, WCAB 35651.

Special thanks are extended to Drs. A. Capart and G. F. deWitte, Institut Royal des Sciences Naturelles de Belgique (IRSNB) for the loan of the holotypes of *Hylodes devillei* and *H. glandulosus*.



Other material was loaned by Werner C. A. Bokermann, São Paulo, Brasil (WCAB) and Hobart M. Smith, Museum of Natural History, University of Illinois (UIMNH). Specimens preserved in the University of Kansas Museum of Natural History are designated KU. Field work in Ecuador during February and March 1968 was supported by a Grant-in-aid of Research from Sigma Xi.

## LITERATURE CITED

- Boulenger, G. A. 1880. Reptiles et batraciens recueillis par M. Emile de Ville dans Andes de L'Equateur. Bull. Soc. Zool. France, 5: 41-48.
- . 1882. Catalogue of the Batrachia Salientia s. Ecuadata. . . British Museum, 2nd ed. 503 pp.
- Cochran, D. M. and C. J. Goin. 1969. The frogs of Colombia. Bull. U. S. Natl. Mus. *In press*.
- Lynch, J. D. 1968. Systematic status of some Andean leptodactylid frogs with a description of a new species of *Eleutherodactylus*. *Herpetologica* 24: 289-300.
- Lynn, W. G. 1942. The embryology of *Eleutherodactylus nubicola*, an anuran which has no tadpole stage. Carnegie Inst. Washington, No. 541: 27-62.
- and B. Lutz. 1946. The development of *Eleutherodactylus nasutus* Lutz. Boletim do Museu Nacional, n. s., Zool. 79: 1-30.
- Perracca, M. G. 1904. Viaggio del Dr. Enrico Festa nell'Ecuador e region vicine. Boll. Mus. Zool. ed Anat. comp. Univ. Torino 19(465): 1-41.