

Two New Frogs of the Genus *Eleutherodactylus* from Eastern Ecuador (Amphibia: Leptodactylidae)

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ABSTRACT — Two new species of the leptodactylid frog genus *Eleutherodactylus* (*E. croceoinguinis* and *E. variabilis*) are named from the upper Amazon lowlands of Ecuador. Both are small species whose relationships are obscure; they do not appear to be closely related to one another. *Eleutherodactylus variabilis* exhibits extensive pattern polymorphism whereas *E. croceoinguinis* is uniform in coloration.

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Relatively few species of *Eleutherodactylus* have been recorded from the Amazonian lowlands of Brasil, Colombia, Ecuador, and Peru. The vast majority of the frogs of the genus described from South America are Andean or from the Pacific versant of Colombia and Ecuador, and the Caribbean versant of Venezuela. Nearly all of the species known to date from the upper Amazonian lowlands were reported by Andersson (1945), Lutz and Kloss (1952), Melin (1941), and Shreve (1935).

Field work by parties from the University of Kansas Museum of Natural History (KU) in 1966 and 1967 and by Mr. Charles M. Fugler between 1964 and 1966 has revealed a relatively rich assemblage of species of the genus in Napo Province (formerly part of Napo-Pastaza Prov.), Ecuador. No fewer than fifteen species of *Eleutherodactylus* have been collected at Santa Cecilia, site of a Texaco Oil Company field camp on the Río Aguarico (00°02' N, 76°58' W), and at Limón Cocha, a village on the Río Napo (00°24' S, 76°37' W). Two of these species are described below; both are diminutive frogs and are relatively common at Santa Cecilia.

Eleutherodactylus variabilis, new species

Holotype:--KU 99011, from Limón Cocha, Napo, Ecuador, 300 meters, collected 19 June, 1965, by Charles M. Fugler.

Paratopotypes:--KU 99012-39, University of Illinois Museum of Natural History (UIMNH) 53919, 54142-44, 54151-60, 54280, 64662, 77363-96.

Diagnosis:--(1) skin of dorsum shagreened, that of flanks and venter areolate; (2) tympanum visible externally, one-fourth to one-half diameter of eye; (3) snout acuminate in dorsal view; (4) interorbital distance greater than eyelid width, no frontoparietal ridges; (5) prevomerine teeth present, in two small clumps; (6) vocal slits and subgular vocal sac in males; (7) first finger slightly shorter or as long as second; digital pads expanded, round; (8) fingers lacking lateral fringes; (9) forearm lacking tubercles on outer edge; (10) tarsus lacking tubercles on outer edge; an inner tarsal tubercle present; (11) inner metatarsal tubercle five to six times size of small, conical outer tubercle; plantar surface lacking supernumerary tubercles; (12) toes bearing weak lateral fringes, free or with a very brief web;

(13) dorsal pattern variable, polymorphic; venter flecked with black; large yellow spot(s) in groin edged with black; posterior surface of thigh unicolor; light spot below eye; (14) adults small, males 15.7-22.0, females 21.9-26.8 mm snout-vent length.

Description:--(Figs. 1-3) Head as wide as or wider than body; head longer than wide; head width 30.7 to 37.2 (mean 33.7) percent snout-vent length; snout acuminate in dorsal view, sloping in lateral profile; canthus rostralis well defined, constricted just posterior to nostrils; loreal region concave, sloping abruptly to lip; nostrils lateral, much closer to tip of snout than to eye; length of eye less than distance from eye to nostril; width of eyelid 65.3 to 93.6 (mean 75.0) percent interorbital distance; tympanum round, 26.9 to 54.9 (mean 38.0) percent diameter of eye, not sexually dimorphic; supratympanic fold well defined; tongue large, oval, notched behind, posterior one-half free; choanae large, completely visible when roof of mouth is viewed from directly below; prevomerine teeth present on oval, raised dentigerous processes lying medial and posterior to choanae; three or four teeth on each process; males

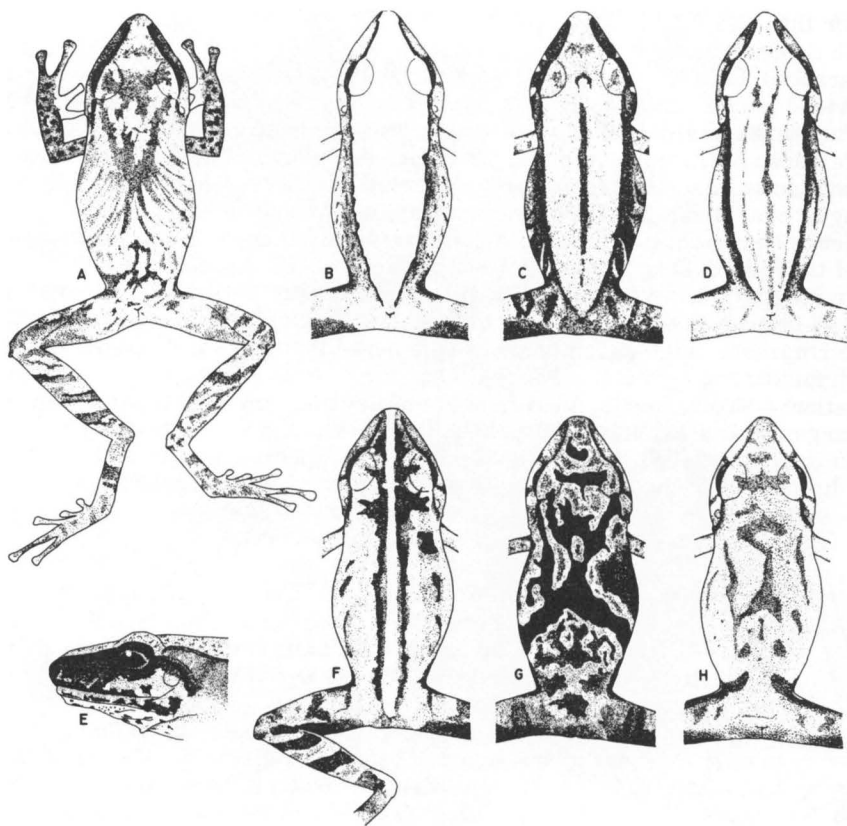


FIGURE 1. Dorsal pattern polymorphism in *Eleutherodactylus variabilis*. a) KU 99011, holotype, chevron pattern; b) KU 104494, dorsoconcolor pattern; c) KU 104499, one-stripe pattern; d) KU 104503, multi-stripe pattern; e) KU 104505, side of head of male; f) KU 104512, middorsal stripe pattern; g) KU 104505, chevron pattern; and h) KU 104531, chevron pattern. Outlines based upon KU 99011 and 104505.

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have short vocal slits and a subgular vocal sac.

Skin of dorsum shagreened (rarely smooth), that of venter areolate; dorsolateral, paravertebral, and middorsal folds present or not; anal opening unmodified; shank 46.7 to 58.3 (mean 52.6) percent snout-vent length; discoidal folds well defined laterally and posteriorly; forearm lacking tubercles; three palmar tubercles, median and outer partially fused; palm with few flat supernumerary tubercles; subarticular tubercles small, round, simple; fingers lacking webbing or lateral fringes; digital pads enlarged, those of third and fourth fingers much expanded, not emarginate, with terminal transverse groove (Fig. 2); pad of third finger nearly as large as tympanum; first finger slightly shorter than or as long as second.

Tarsus bearing one tubercle on inner surface, outer surface lacking tubercles; inner metatarsal tubercle five to six times as large as small, conical outer metatarsal tubercle; plantar surface devoid of supernumerary tubercles or bearing fewer than five; subarticular tubercles small, subconical, simple; toes with poorly developed lateral fringes and very brief webbing; tips of toes expanded, bearing terminal transverse groove on each pad.

Dorsum gray, brown, or dark brown in preservative with darker spots or stripes; canthal stripe dark brown or black; lip lighter than top of head; spot below eye yellow, or white, or pale bronze; flanks usually lighter than dorsum, spotted or with narrow bars; forearm barred (two or three bars); upper arm colorless or flecked; thighs with two or three dark brown bars equal in width to cream or light brown interspaces; shank with three to four bars; venter cream to white with irregular (in abundance and appearance) dark brown to black flecks (Fig. 3); black-edged white area(s) in groin, divided medially or confluent, extending over proximal anteroventral surface of thighs and anteriorly on flanks; posterior surface of thigh uniform brown in color.

In life dorsum highly variable in color: ground color cream, greenish brown, red, brown, or yellow with brown, greenish brown, or reddish brown spots or stripes, which may or may not be edged in yellow or yellow-green; flanks paler than dorsum and marked with brown or black spots or bars; limbs colored as dorsum; posterior surface of thigh usually dark gray-brown but in some individuals reddish-brown reticulated with gray-brown; venter white to creamy white flecked or spotted with black or greenish-brown; groin lemon-yellow edged with black; iris bronze with reddish or bronze horizontal stripe; lip bronze with yellow or yellow-bronze spot below eye; canthal stripe dark brown or black.

Variation:--Sexual dimorphism is not pronounced in *E. variabilis*. Females attain a larger size than do males but do not differ in proportions or color.

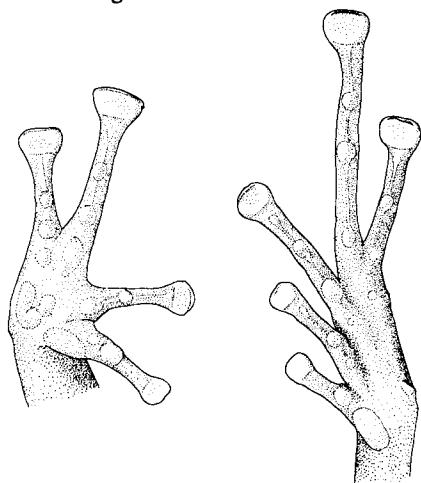


FIGURE 2. Hand and foot of *Eleuthero-dactylus variabilis* (KU 99011).

Considerable variation is evident in dorsal color pattern (Fig. 1) and pigmentation of the venter (Fig. 3). The ventral coloration varies continuously from pale cream with few brown flecks to nearly black, punctated with white or cream and with bright yellow patch(es) in the groin. Variation in dorsal color pattern is discontinuous and presumed polymorphic. Five discrete color patterns are known and a sixth (the unicolor pattern, 5.3 percent of the sample) probably is an artifact, because all specimens having this pattern are poorly preserved and this pattern was not observed by me in the field in June, 1967, when I collected 42 specimens of *E. variabilis*. The mottled (or chevron) pattern (Figs. 1a, g, h) contains a range of continuous variation from an ill-defined pattern (Fig. 1a) to one sharp and contrasting

(Fig. 1g). The ground color varies from tan to dark brown and the markings from light brown to black. One polymorph (Fig. 1b) has light to medium brown flanks with a burnt-orange to dull red dorsum. This polymorph very closely approaches the dorsoconcolor tautomorph seen in several Middle American *Eleutherodactylus* (Lynch, 1966). The middorsal stripe polymorph (Fig. 1f) has tan to medium or dark brown flanks and dorsum except for the stripe and heel patch which are burnt-orange or dull red. The other two striped polymorphs (Figs. 1c and d) correspond to some of the *sanmartinensis* and *venustus* tautomorphs of Lynch (1966). In the one-stripe polymorph (Fig. 1c) the dorsum is brown and the flanks, middorsal stripe, and interorbital markings dark brown. The multi-striped polymorph is tan with light to dark brown stripes, the dorsolateral stripes being the darkest.

The frequencies of the polymorphs are similar to those reported for *E. mexicanus*, *E. pygmaeus*, and *E. rhodopis* (see Lynch, 1966) in that there is one poly-

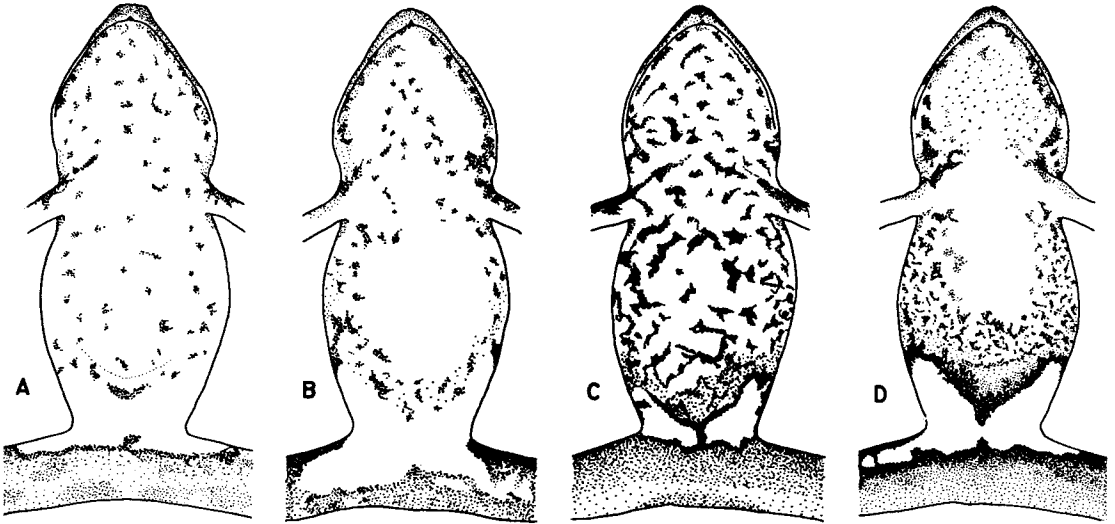


FIGURE 3. Variation in ventral pigmentation in *Eleutherodactylus variabilis*. a) KU 99011, holotype; b) KU 99021; c) KU 99013; and d) KU 99039.

morph making up nearly 60 percent of the population (chevron or mottled, 55.7 percent) whereas the other polymorphs are uncommon: dorsoconcolor polymorph (Fig. 1b), 5.3 percent; one-stripe polymorph (Fig. 1c) 24.5 percent; multi-striped polymorph (Fig. 1d), 4.6 percent; middorsal stripe polymorph (Fig. 1f), 4.6 percent; and, if real (see above), unicolor, 5.3 percent. Conspicuously different in the two cases is the presence of the middorsal stripe polymorph and the lack of a light-lipped polymorph in *E. variabilis* and the converse in the Mexican species.

Etymology:--Latin, in reference to the variety of color patterns and colors in life.

Natural History:--Most specimens for which accurate data are available were collected from bushes at night. Voices were traced to this species in February and March, 1967. In June, 1967, most of the 42 specimens collected were found at night in ecologically disturbed, open situations, but a few were collected in relatively dense forest. Diurnal activity was observed only on overcast days. Fugler collected the frogs by day on the forest floor at Limón Cocha, Napo, Ecuador. Egg clutches are not known.

Distribution:--In addition to the type locality [00°24' S, 76°37' W] located on the Río Napo, approximately 17 km NNW of Providencia, near the junction of the Río Jivino], specimens are known from Santa Cecilia on the Río Aguarico. All specimens are from elevations between 300 and 340 meters. The specimens from

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Santa Cecilia are as follows: KU 104484-545, 104592, 109087-93, 111138-79, and UIMNH 77397-402. The specimens from Santa Cecilia are not designated as paratypes.

Comparisons:--Few species of *Eleutherodactylus* have been described from the Amazonian lowlands of western South America. Most of the species described by Andersson (1945) appear to be members of the intermediate elevation fauna although some are clearly members of the lowland fauna as well (*E. brevicrus* and *E. nigrovittatus*). Both of the species described by Shreve (1935) occur at Limón Cocha and Santa Cecilia but differ in color and size from *E. variabilis*. *Eleutherodactylus variabilis* bears superficial resemblance to a much larger frog (known in the literature as *E. gollmeri*) but lacks the red spots on the posterior surface of the thigh, black face mask, and has a polymorphic dorsal pattern.

At present the relationships of *E. variabilis* must remain unknown due to the imperfect state of our knowledge of the South American frogs of the genus *Eleutherodactylus*. Only one other species (*E. croceinguinis*, see below) approaches it in color. The spots in the groin in that species vary from yellow-orange to reddish-orange and are always separated medially. In addition, there are two spots on each side in *croceinguinis*. Flecking on the venter and dorsal pattern polymorphism do not occur in that species and it is somewhat smaller than *E. variabilis*.

Eleutherodactylus croceinguinis, new species

Holotype:--KU 110789, from Santa Cecilia, Napo, Ecuador, 340 meters, collected 16 June 1967, by John D. Lynch.

Paratopotypes:--KU 104575-84, 104614-16, 109078-85, and 110790-93. KU 109086, a topotype, is cleared and stained and therefore not designated as a paratype.

Diagnosis:--(1) Skin of dorsum pustulate, that of venter areolate; (2) tympanum concealed; (3) snout subacuminate in dorsal view; (4) interorbital distance slightly less than width of eyelid, no frontoparietal ridges; (5) prevomerine teeth present in two small clumps; (6) vocal slits and sac absent in males; (7) first finger shorter than second; digital pads expanded, round; (8) fingers lacking lateral fringes; (9) forearm with row of tubercles along outer edge; (10) tarsus with row of tubercles along outer edge, heel tubercle not enlarged; no inner tarsal fold or tubercles; (11) inner metatarsal tubercle three to four times size of rounded outer metatarsal tubercle; supernumerary tubercles absent on plantar surface; (12) toes lacking lateral fringes and webbing; digital tips expanded, less so than fingers; (13) dorsum mottled and spotted with browns and flecked with white; venter brown, heavily flecked with cream; two colorless spots (yellow to reddish-orange in life) on each side in groin; posterior surface of thigh unicolor; (14) adults small, males 13.9-18.2, females 17.4-20.2 mm in snout-vent length.

Description and variation:--(Fig. 4) Head as wide as, or narrower than, body; head as long as wide; head width 34.7 to 38.2 (mean 36.4) percent snout-vent length; snout subacuminate in dorsal view, blunt in lateral profile; canthus rostralis well defined, slightly constricted; loreal region concave, sloping abruptly to lip; nostrils lateral, much closer to tip of snout than to eye; length of eye slightly less than distance from eye to nostril; interorbital distance 75.4 to 119.4 (mean 93.6) percent eyelid width; tympanum concealed beneath skin; supratympanic fold present, not greatly thickened; tongue large, oval, not notched behind, posterior one-third free; choanae large, round, completely visible when roof of mouth is viewed from directly below; dentigerous processes of prevomers present, lying median and posterior to choanae, closely approximated medially, oval, each process bearing two to four teeth; male lacking vocal slits.

Skin of dorsum pustular, lacking ridges, that of flanks and venter areolate; discoidal folds not apparent; anal opening unmodified; shank 51.3 to 58.4 (mean 54.6) percent snout-vent length; forearm with a row of tubercles along outer edge;

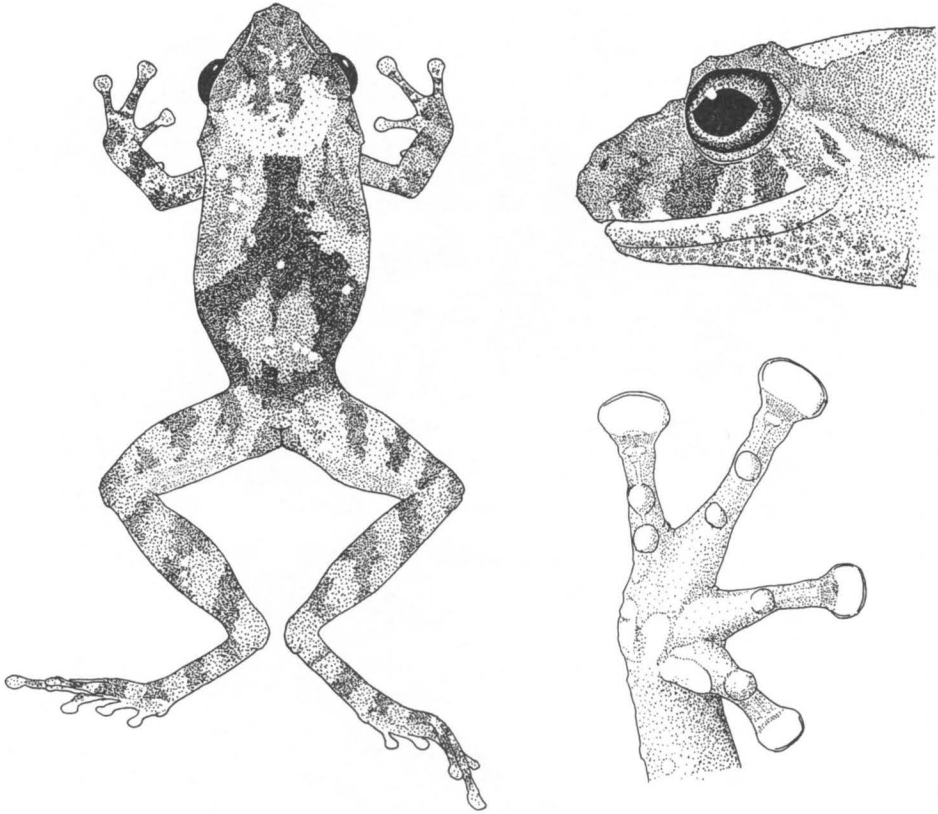


FIGURE 4. *Eleutherodactylus croceoinguinis*. Female paratype (KU 109079).

three palmar tubercles, median largest; subarticular tubercles relatively small, round, simple; fingers lacking lateral fringes and webbing; digital pads enlarged, rounded, not emarginate, with terminal transverse groove across tip; second finger slightly longer than first.

Row of tubercles along outer edge of tarsus ending in slightly enlarged heel tubercle (Fig. 4); inner tarsal tubercles or folds absent; inner metatarsal tubercle elongate, three to four times as large as round, conical outer metatarsal tubercle; plantar surface lacking supernumerary tubercles; subarticular tubercles of toes like those of hand; toes lacking lateral fringes or webbing; digital tips expanded, round, bearing terminal transverse groove.

Dorsum and flanks mottled or blotched with dark brown on a lighter brown background and flecked with white; limbs light brown with dark brown bars; bars as wide as light interspaces; three bars on thigh, three on shank; posterior surface of thigh uniform brown; anal patch dark brown or black; venter usually cream, heavily flecked with dark brown, especially on throat; two light spots on each side of groin.

In life the dorsum is yellow-brown to brown spotted with dark brown and flecked with white or yellow. A very narrow, yellow middorsal stripe was evident in one specimen. The flanks are brown to nearly black, blotched with darker brown and flecked with white or yellow. The bars on the limbs are dark brown to black on the light to dark brown ground color. The posterior surface of the thigh is uniform creamy-brown to reddish brown. The venter is gray to black (usually brown) flecked with cream. The spots in the groin vary from yellow to reddish-orange

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in life. The iris is gray, finely reticulated with black.

Etymology:--Latin, in reference to the color of the inguinal spots in life.

Natural History:--All but one specimen for which data are available, were taken at night on vegetation in low, swampy, forested situations. No voices were heard that could be attributed to this species, no clasping pairs were found, and no egg clutches have been found. One large female was taken by day in a shady ravine near the headwaters of the Río Conejo, about 2 kilometers NE of Santa Cecilia.

Distribution:--I have seen specimens of *E. croceoinguinis* from two localities in Napo Province [the type-locality and Limón Cocha (UIMNH 77362 and 80722)] and one locality in Pastaza Province [Veracruz, 9 km E of Puyo (University of Michigan Museum of Zoology 127892, 5 specimens)].

Comparisons:--*Eleutherodactylus croceoinguinis* differs from most species of the genus by its small adult size. Male *E. brevicrus* are as small but differ in their bright red flash colors on the flanks, groin, and posterior surface of the thigh, lack of yellow or white flecks on the dorsum, presence of an inner tarsal tubercle, and shorter leg (shank less than 50 percent snout-vent length). The concealed tympanum as well as flash colors will serve to separate *E. croceoinguinis* from the other small species of the upper Amazon basin (*E. acuminatus*, *E. brevicrus*, *E. carvalhoi*, *E. pseudoacuminatus*, and *E. variabilis*).

ACKNOWLEDGMENTS

I am grateful to Hobart M. Smith, Charles F. Walker, and Ernest E. Williams for the loan of material in their care. A travel grant from the Committee on Systematics and Evolutionary Biology (University of Kansas) enabled me to carry out field work involving these two species during the summer of 1967. William E. Duellman and Arthur C. Echternacht gave helpful criticisms of the manuscript.

LITERATURE CITED

- Andersson, L. G. 1945. Batrachians from east Ecuador Arkiv für Zoologi, 37A: 1-88.
- Lutz, B. and G. R. Kloss. 1952. Anfíbios anuros do alto Solimões e Rio Negro Apontamentos sobre algumas formas e suas vicariantes. Memórias do Instituto Oswaldo Cruz, 50: 625-78.
- Lynch, J. D. 1966. Multiple morphotypy and parallel polymorphism in some neotropical frogs. Syst. Zool., 15: 18-23.
- Melin, D. 1941. Contributions to the knowledge of the Amphibia of South America. Meddelanden från Göteborgs Musei Zool. Avdel. 88. 71 p.
- Shreve, B. 1935. On a new teiid and Amphibia from Panama, Ecuador, and Paraguay. Occ. Pap. Boston Soc. Nat. Hist., 8: 209-18.



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Journal of Herpetology, Vol. 2, No. 3/4. (Dec. 10, 1968), pp. 129-135.

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