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Eleutherodactylus laticorpus, a Peculiar New Frog from the Cerro Tacarcuna Area, Panamanian-Colombian Frontier

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ABSTRACT

Eleutherodactylus laticorpus, new species, is a medium-sized (SVL 30–40 mm), bluish-eyed eleutherodactyline having a broad head (49–55% of SVL), but with the body being even noticeably wider (58–72% of SVL), particularly when defensively inflated. It is the northernmost member of the South American *sulcatus* species group. The position of *E. laticorpus* within the *sulcatus* group is uncertain. Despite certain resemblances, it lacks

a synapomorphy (involving the quadratojugal) uniting species from the Andean cordilleras of Colombia and Ecuador (*E. cadenai*, *E. cerastes*, *E. cornutus*, *E. helonotus*, *E. ingeri*, *E. ruizi*, *E. sernai*). *Eleutherodactylus laticorpus* shares a snout-shape character with the other extra-Andean member of the *sulcatus* group, namely *E. sulcatus* of the upper Amazonian basin, but this suggestion of sister-group relationship needs corroboration.

INTRODUCTION

The highlands of Darién are of limited extent and not particularly high, seldom exceeding 1200 m above sea level (fig. 1), but they nonetheless provide a richness of endemic species and relict distributions that invite closer study. The herpetological diversity is due in part to physiographic and atmospheric features that allow maintenance of lush cloud forest on ridges as low as 750 m in

eastern Panama (Myers, 1969). Only in a restricted area on the Colombian border does one find a significant expanse of upland above 1000 m that is *below* cloud forest—on the massif of Cerro Tacarcuna and on the immediately adjacent ridges of Cerro Tanela to the north and Cerro Malí to the southeast (figs. 1, 2).

The first biological exploration into the Tacar-

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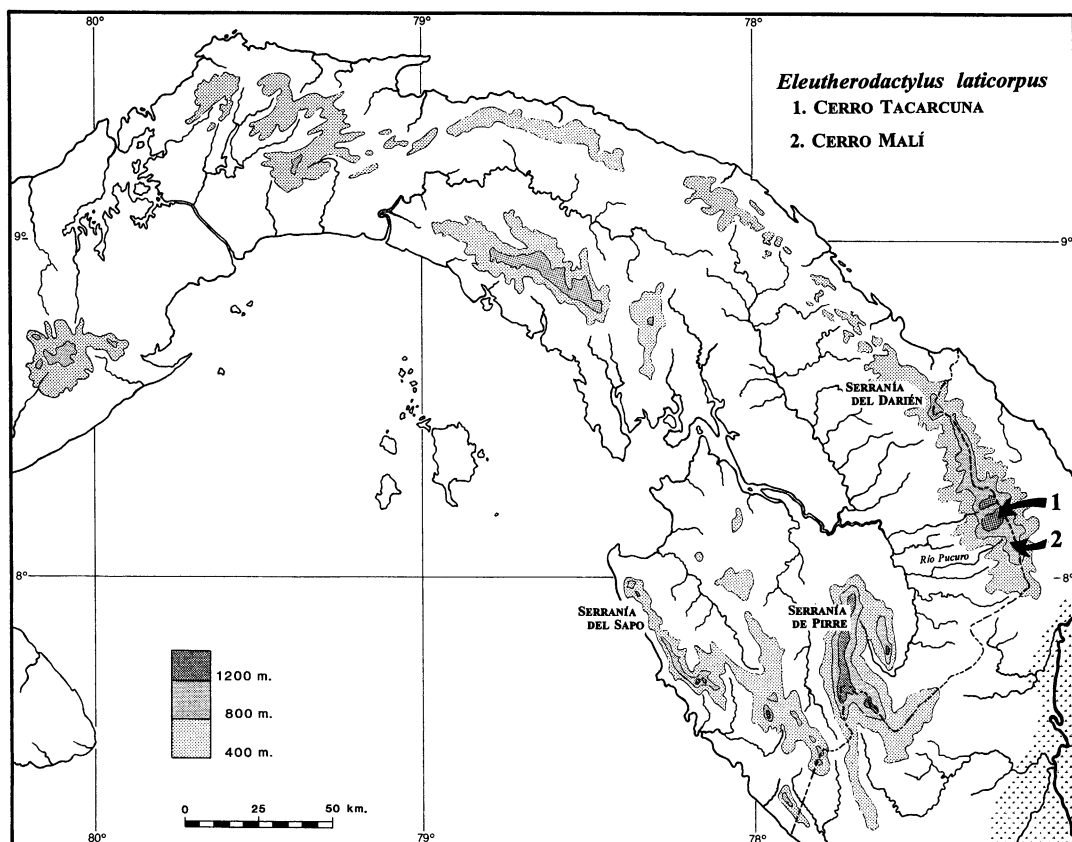


Fig. 1. Eastern Panama, showing collecting stations for *Eleutherodactylus laticorpus*, new species, on the Colombian border.

cuna-Malí area seems to have been that of the 1914–1915 Darién Expedition of the American Museum of Natural History (Anthony, 1916, 1923). Myers was on Cerro Malí briefly in 1963, with W. E. Duellman (Myers, 1969: 25), in a camp established by Pedro Galindo of the Gorgas Memorial Laboratory. After Galindo's team finished work in 1959 and 1963–1964³ (Galindo, 1960, 1965), the area was not further explored until 1975, when a small expedition reopened the earlier trails onto Cerro Malí and from there cut a new trail onto Cerro Tacarcuna (fig. 2). The scientific staff of the 1975 expedition consisted of

botanists Alwyn H. Gentry and Scot Mori, and zoologists Rudolf Hinds and C. W. Myers.

The botanical collections from the 1975 expedition provided a hint of the long and complex history of this part of the Isthmus of Panama. As summarized by Gentry (1983: 233–234):

Cerro Tacarcuna harbors an isolated montane forest on its upper slopes (above 1,400–1,500 meters). This forest may be considered a relict from Pleistocene times. The dominant tree species is an oak, *Quercus humboldtii*, previously known only from the Andes of northern South America and the only species of its north temperate genus to reach that continent. Associated with the oaks were other tree species previously known only from the Andes or the Central American mountain systems. Above the oak forest, on the highest ridges of the Tacarcuna massif, occurs an elfin forest with *Drimys* and *Clusia*, the two most prevalent tree species. This forest is restricted to the steepest ridge tops and, where best developed, has a low 5-to-6-meter-high canopy formed by gnarled, twisted, intertwined trees. Everything is covered by thick growths of moss and leafy liverworts . . .

³ This work resulted in the discovery that Anthony's (1916, 1923) "Mt. Tacarcuna" is a peak (Pico Malí) on what today is called "Cerro Malí" (Fairchild and Handley, 1966: 17). This was confirmed in 1975 by Myers (unpubl., field journal pp. 647, 647A), who found the site on the Cerro Malí massif from where Anthony's distinctive photograph of the "Summit of Mt. Tacarcuna" was taken 60 years earlier.



Fig. 2. Cerro Tacarcuna massif, viewed from 1420 m elevation atop Pico Malí, looking northwest across the Río Pucuro valley (see fig. 1). *Eleutherodactylus laticarpus*, new species, occurs both on Cerro Malí and on Cerro Tacarcuna, which connect above the head of the Río Pucuro along the international border. Arrow shows location of expedition campsite at 1590 m elevation—the type locality of *E. laticarpus* (see fig. 6, upper). Dotted line shows route of approach on trail established by the 1975 expedition. (Photographed January 23, 1975.)

As might have been predicted, the summit vegetation of Cerro Tacarcuna (i.e., above 1,400 meters) is extremely rich in endemic species, previously undescribed. About 20 percent of its plant species are new to science (46 out of 239 species analyzed to date). Obviously, the discovery of all these species will be of great interest in biogeographic, taxonomic, and evolutionary studies.

Perhaps more interesting are the distributional patterns shown by non-endemic strictly montane species: 21 of these were previously considered endemic to Costa Rica and adjacent Chiriquí Province of Panama; 12 were previously known only from the Andes; an additional 10 were known from both Costa Rica-Chiriquí and the Andes; while 13 are widespread montane species mostly ranging from southern Mexico to Peru or Bolivia. Several especially spectacular range disjunctions include *Grammitis randallii* (Jamaica and Cerro Tacarcuna), *Podocarpus magnifolia* (Guayana highlands, Bolivia, and Cerro Tacarcuna), and *Chrysochlamys clusiaefolia* (Guayana highlands, Venezuelan Coastal Range, Cerro Tacarcuna). Six species were previously known only from other Panamanian mountain tops—3 from Cerro Jefe, 2 from Cerro Campana, and 1 from Cerro Pirre. Of special

interest are the shared Andean/Tacarcuna and Costa Rica/Tacarcuna species. All but one (*Anthericum macrophyllum* Baker) of the species shared by Costa Rica/Chiriquí and Tacarcuna are derived from South American groups. The species limited to Tacarcuna and the Andes include groups of both North and South American derivation. These patterns suggest that some floristic exchange between Tacarcuna and the Andes has occurred subsequent to the isolation of Tacarcuna from Costa Rica/Chiriquí but that at some earlier time Tacarcuna and Costa Rica/Chiriquí must have undergone floristic interchange while mutually isolated from an Andean source area. Moreover, the presence of montane oak forest at 1,500 meters on Cerro Tacarcuna (1,400 meters on Cerro Mali with one tree at 1,200 meters on the spur ridge south of the Pucuro) provides strong evidence for an "isthmian effect" of altitudinally depressed vegetation zones in the Panamanian isthmus, since the lower limit of similar oak forest in the Colombian Andes is at 2,300–2,500 meters. Extrapolated back to the Pleistocene such an "isthmian effect" would have made the Panamanian isthmus a much more effective land bridge for montane organisms than has been previously suspected.



Fig. 3. *Eleutherodactylus laticorpus*, new species. The holotype, shown nearly twice life size.

This interesting forest, barely within political Central America, seems to be the northernmost outpost for frogs of the South American *Eleutherodactylus sulcatus* species group (sensu Lynch, 1981, 1986a). This is a primarily Andean group, with an outlier in the upper Amazon basin. The new species is a little fat frog, which we name,

***Eleutherodactylus laticorpus*, new species**

Figures 3, 4, 5A–C

HOLOTYPE: AMNH 100000 (field no. CWM 12982), an adult female caught by C. W. Myers on February 1, 1975, in montane forest on southwest sector of Cerro Tacarcuna massif, 1590 m elevation, Darién Province, Republic of Panama. Approximately 8°10'N, 77°40'W.

PARATYPES: AMNH 100001, taken at 1630 m on February 9, 1975, and AMNH 100002, taken at 1450 m on February 12, 1975—two male specimens collected by C. W. Myers in February 1975, on southwest sector of Cerro Tacarcuna massif, Darién Province, Republic of Panama. KU 76227, a juvenile female (skull removed) collected by W. E. Duellman on July 9, 1963, on Cerro Malí, 1410 m, Darién Province, Republic of Panama.

OTHER SPECIMEN: KU 76228, collected by W. E. Duellman on July 12, 1963, Cerro Malí, 1450 m, Darién Province, Republic of Panama. This is a small juvenile female (16.3 mm SVL, 9.2 mm head width); except for a color note, it does not contribute to the description.

ETYMOLOGY: From the Latin *latus* (wide) + connecting *-i* + *corpus* (body), referring to the remarkably rotund body.

DIAGNOSIS: (1) dorsal skin tuberculate, ventral skin smooth; short longitudinal and transverse dorsal folds present or absent; head broad, 49–55% SVL, body very broad, 58–72% SVL; (2) tympanum present, higher than long, obscured dorsally; (3) snout obtuse in dorsal view, sloping in profile; canthus rostralis rounded, concave in dorsal view; lips flared; (4) upper eyelid with prominent conical tubercle; (5) prevomerine odontophores broad, weakly arched, posterior to choanae; (6) males lacking vocal slits and nuptial pads; (7) first finger slightly longer than second or subequal, first two much wider than other two, fingers pointed, weakly dilated; (8) fingers lacking lateral fringes; (9) ulnar tubercles present; (10) outer edge tarsus with rounded tubercles; heel tuberculate

but no projecting calcar tubercle; (11) two metatarsal tubercles, inner elongate, pungent, over twice size of round outer; supernumerary plantar tubercles absent or few; (12) toes lacking lateral fringes and webbing; toes with pointed, dilated discs; (13) body gray (brown in life) with inconspicuous small gray blotches; limb bars narrow; groin, rear of thigh, and concealed part of shank with a flash pattern of black on white or pale rose; venter white or orange, with indistinct darker mottling; iris blue to bluish gray in life; (14) males 30 mm, female 40 mm SVL.

In general appearance, *Eleutherodactylus laticorpus* resembles the larger *E. bufoniformis*, but presence of a small, prominently elongated tubercle on the upper eyelid and the blue or bluish gray eyes readily distinguish it from *bufoniformis* and other broad-headed eleutherodactylines in lower Central America. See Comparisons for further discussion.

Description

The following description is a composite based on the holotype and two paratypes from Cerro Tacarcuna, except that the osteological section is based on the cranium of the juvenile paratype from Cerro Malí.

The female holotype is sexually mature at 40 mm SVL, as evidenced by enlarged oviducts, which contain a few mature ova. The two Cerro Tacarcuna paratypes of 30 mm SVL were determined to be males based on the presence of testes; these are likely to be sexually mature or virtually so based on relative size (δ 75% of ϕ SVL), inasmuch as size dimorphism usually is pronounced in *Eleutherodactylus*. If these two paratypes are sexually mature, secondary sex characteristics such as vocal slits and nuptial pads are lacking in males of this species. Males might have slightly larger ears, but the tympana are somewhat obscured and the data are not sufficient to demonstrate a relative difference in size (table 1).

MORPHOLOGY: Head wide, 49.5–55.0 percent of SVL, wider than long. Body appreciably wider than head, greatest body width 58.0–71.5 percent of SVL. Snout obtuse in dorsal view, sloping in profile; nostrils weakly protuberant, directed laterally; canthus

TABLE 1
Measurements (in mm) of *Eleutherodactylus laticorpus*, n. sp., from Cerro Tacarcuna

	AMNH 100000 Holo- type ♀	AMNH 100001 Paratype ♂	AMNH 100002 Paratype ♂
Snout-to-vent (SVL)	40	30	30
Tibia	21.1	17.6	16.1
Head length ^a	14.6	12.2	11.5
Greatest head width	19.8	16.5	15.8
Greatest body width	28.6	17.4	19.8
Upper eyelid width	3.1	3.1	3.4
Interorbital distance	4.5	3.1	2.7
Tympanum length	2.0	1.8	2.3
Eye length	4.5	3.6	4.0
Eye-naris	4.6	3.6	3.3

^a Tip of snout obliquely to angle of jaw.

rostralis acutely rounded, concave in dorsal view; loreal region concave, sloping gradually to flared lips. Eyes relatively small. Interorbital space subequal to (δ paratypes) or appreciably wider (ϕ holotype) than upper eyelid; cranial crests palpable. No distinct supratympanic fold; tympanum higher than long, separated from eye by a distance somewhat greater than its length, moderately depressed and dorsally obscured.

Choanae small, subtriangular, not concealed by palatal shelf of maxillary arch. Prevomerine odontophores posterior to choanae, broad, weakly arched, juxtaposed medially, each extending laterally nearly to level of lateral margin of a choana; each odontophore bearing a row of about 8–11 teeth. Tongue about as long as wide, posterior edge feebly indented, posterior and lateral edges not adherent to floor of mouth.

Upper eyelid bearing one moderately long conical tubercle (evident in fig. 3). Dorsal surfaces of head, body, and limbs tuberculate, with fine as well as coarse tubercles. Pattern of short folds conspicuous in holotype, less evident or absent in paratypes: *Holotype*—Lyre-shaped ridge between eyes; short dorsolateral ridges behind eye;)(shaped ridges above shoulders connected by transverse ridge to form an “H”; interrupted parasagittal ridges down back. *AMNH 100001*—Aforesaid structures much

fainter and transverse ridge lacking, leaving widely separated)(ridges above shoulders. AMNH 100002—No discrete ridges.

Enlarged tubercles on limbs tending to be arranged in ridgelike rows of tubercles coinciding with limb bars. Two or three large tubercles along outer edge of forearm, separating tuberculate skin above from smooth skin below. Ventral surfaces, lower flanks, and anterior/posterior surfaces of thighs smooth. Discoidal fold not apparent.

Palmar tubercle deeply divided, subequal to and less elevated than oval thenar tubercle. Supernumerary palmar tubercles present but obscure and nonprojecting; subarticular tubercles rounded or longer than wide. No fringes or webbing on fingers (basal skin between fingers fleshy and not extending beyond subarticular tubercles). First two fingers much wider than outer two; finger tips pointed and weakly dilated, with extremely faint groove on fingers 3–4 being the only trace of disc development. Relative finger length $3 > 1 \geq 2 > 4$, with first finger only slightly longer or subequal to second.

No tarsal fold. Outer edge of tarsus bearing row of several conspicuous, rounded tubercles between heel and outer metatarsal tubercle. Heel tuberculate. Inner metatarsal tubercle twice as long as wide, pungent, not compressed. Outer metatarsal tubercle not prominent, round, less than half the size of inner metatarsal tubercle. A few small, inconspicuous supernumerary plantar tubercles present or absent; subarticular tubercles prominent. No fringes or webbing. Each toe bearing pointed, dilated disc with apical groove extending around sides. Relative toe length $4 > 3 > 5 > 2 > 1$; tip of toe 3 extends to middle or to distal edge of penultimate subarticular tubercle of toe 4, tip of toe 5 fails to reach proximal edge of this tubercle. Heels of flexed hind legs touch; heel of adpressed limb reaching between eye and tip of snout.

COLOR: The ground color of all dorsal surfaces was brown in life, with inconspicuous small gray blotches. The dorsal ridges, when present, and some tubercles were paler yellowish brown (♀ holotype) or orangish brown (AMNH 100001♂), with a tendency for the pale ridges and some tubercles to be further differentiated by blackish edging. The

specimen (AMNH 100002♂) lacking dorsal ridges has a blackish interorbital stripe, an oblique blackish postorbital stripe through the tympanum (faintly indicated in others), and vaguely horizontal body markings. All specimens have several poorly defined, close-set dark labial bars below the eye. There are three blackish bars atop the thighs, three or four on the shanks, and several on the tarsus, these hind limb bars being narrower than the interspaces. The groin (and also flanks of AMNH 100001), posterior thigh, and concealed part of the shank are black reticulated, with pale markings that were pale rose in the female and white in the males. Fingers 1–2 and toes 1–3 were pale orange above, with pale areas of the same orange on palms and soles.

The female holotype had the ventral surfaces pale orange overall; the juvenile female paratype from Cerro Malí also had the “belly pale orange” (W. E. Duellman field catalog); but the two males had white venters. The pale ventral surfaces were slightly darkened with indistinct pale gray or brown mottling, darkest around the lower jaw and on the throat (fig. 4). The iris was described as pale bluish silver in two juveniles from Cerro Malí (W. E. Duellman field catalog). The iris was light blue in the female holotype and one male paratype and pale bluish gray in the other male paratype (AMNH 100002) from Cerro Tacarcuna; there was sparse black venation or black suffusions and a shallow, horizontal, brown or bronzy butterfly-shaped mark through the pupil; palpebrum clear. The tongue was white.

In preservative, the brown ground color has variably faded to duller brown or gray, with darker elements of the patterns still discernible (fig. 4). Any pastel colors of venter and thighs are faded to white.

SKULL: The following description is based on the cranium of a juvenile female paratype (KU 76227) from Cerro Malí. The specimen measured 34.6 mm SVL, 19.2 mm head width.

Skull (fig. 5A–C) flattened anteriorly, broader than long; alary processes of premaxillae broad, directed posterodorsally; septomaxillae large; *pars facialis* of maxilla deep, separated from nasals, not ornamented (possibly a juvenile trait); in lateral view,

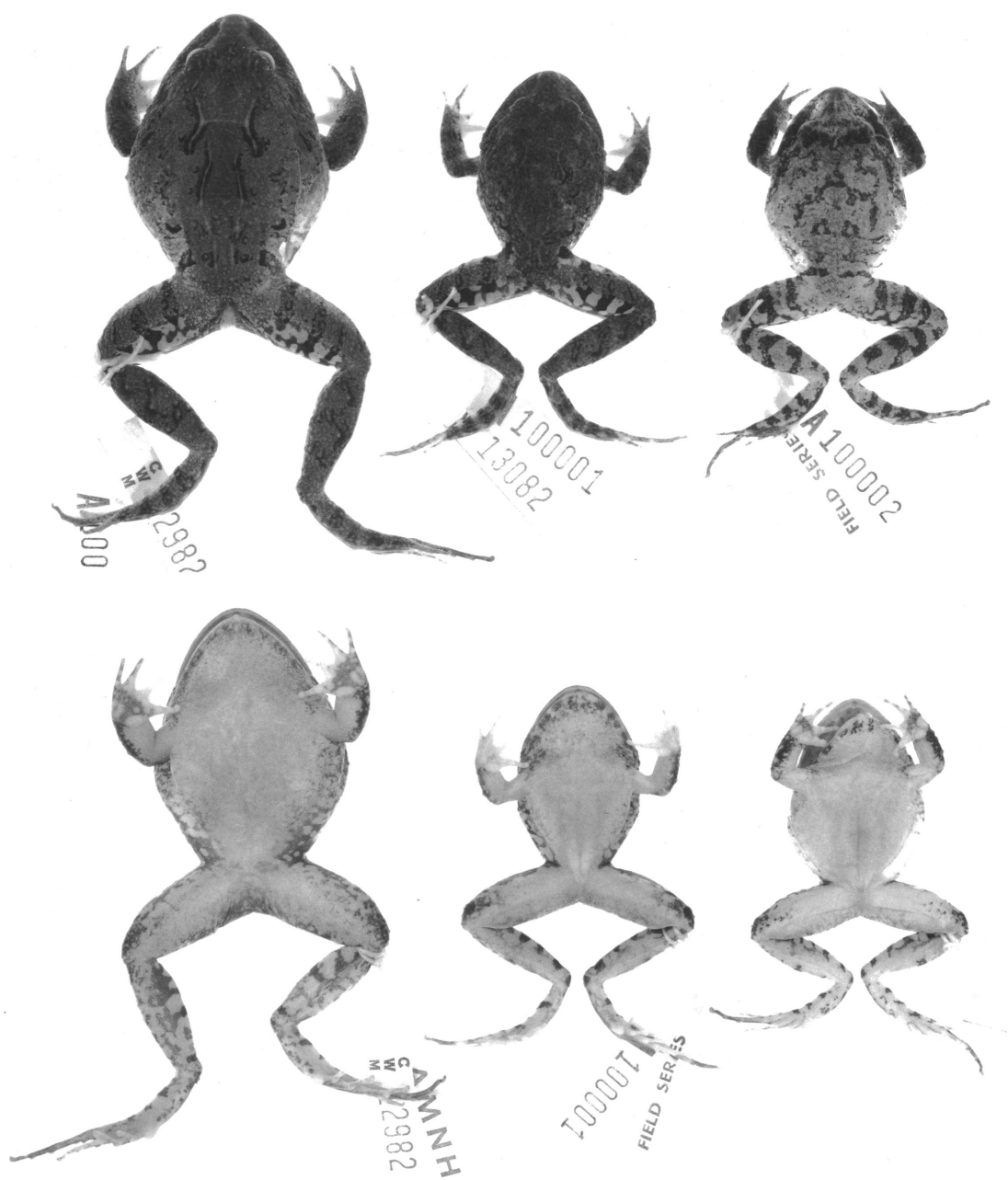


Fig. 4. *Eleutherodactylus laticarpus*, new species. Dorsal and ventral views of the type series, $\times 1$. Left to right: AMNH 100000♀ (holotype), AMNH 100001♂, AMNH 100002♂.

maxilla tapering posteriorly; quadratojugal not deepened in region of overlap with maxilla; nasals large, triangular in outline, in contact along most of their median borders, touching anterolateral corners of frontopa-

rietals; rhomboidal section of sphenethmoid exposed dorsally; frontoparietal fontanelle covered by bone; frontoparietals bearing parasagittal crests, more pronounced posteriorly than anteriorly; posterior part of

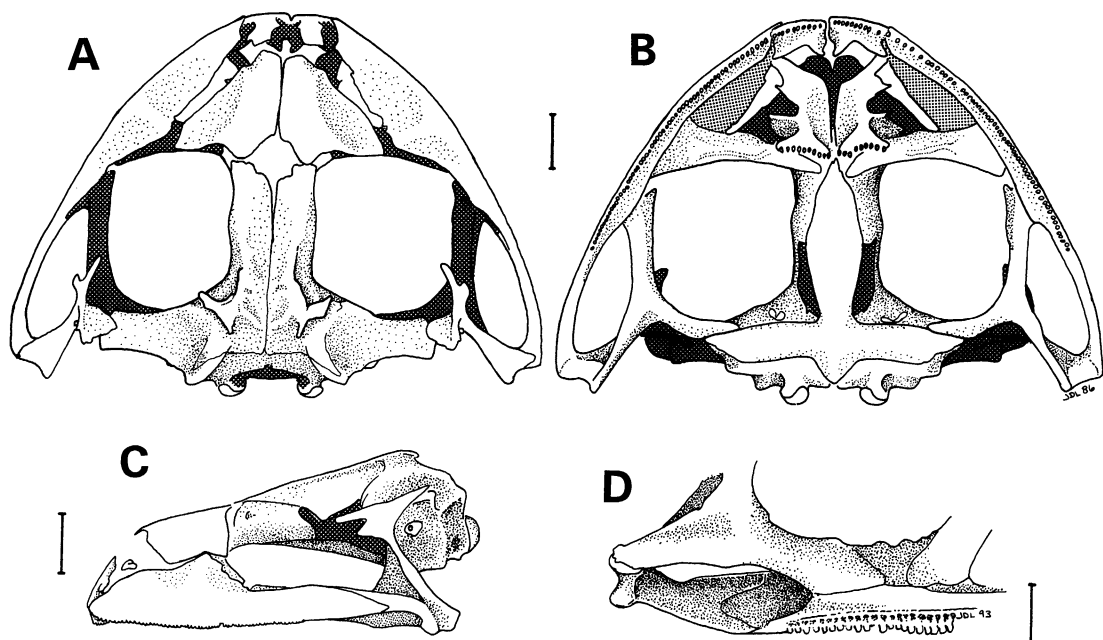


Fig. 5. A–C. Cranium of *Eleutherodactylus laticorpus* (KU 76227, juvenile ♀) in dorsal, ventral, and lateral views. D. Three-quarter view of the lingual surface of the posterior portion of the left upper jaw of *Eleutherodactylus cerastes* (UVC 8429), showing the bifurcate head of the quadratojugal. Scale lines = 2 mm.

frontoparietal bearing flanges elevated above remainder of occiput and lesser flanges of bone extending toward midline; frontoparietals not fused to prootic; occipital artery not enclosed in bony canal or groove; epiotic eminences prominent posteriorly but relatively low; cristae paroticae short, relatively narrow; otic plate of squamosal narrow, overlapping crista parotica but not extending far medially; squamosal crest not ornamented, not developed as supraotic flange; zygomatic ramus of squamosal bifid (a juvenile feature), about as long as otic ramus.

Palatal shelf of premaxilla relatively broad, not deeply dissected; palatal processes long; palatal processes of maxillae narrow, with slight pterygoid processes; teeth pedicellate; vomers large, narrowly separated medially, odontophores triangular in outline and weakly arched; palatines broad, extending medially nearly to cultriform process of parasphenoid, bearing bony ridges; cultriform process pointed, narrowly separated from palatines and vomers, not keeled; parasphenoid alae perpendicular to cultriform process,

broadly overlapped by median rami of pterygoids; anterior rami of pterygoids not reaching palatines; occipital condyles ventrolateral; plectra long.

DISTRIBUTION: In the Serranía del Darién on the border between Panama and Colombia, in montane forest between 1410 and 1630 m above sea level. Although the known specimens are from the Panamanian side of the border, *Eleutherodactylus laticorpus* undoubtedly belongs also to the fauna of Colombia.

Natural History

BEHAVIOR: The three specimens from Cerro Tacarcuna were all found on the forest floor by day. At least the two males were active when first seen, one hopping in relatively dry leaf litter in the early afternoon and the other hopping in leaf litter on a rainy day in cloud forest. According to Duellman's field catalog, a juvenile from Cerro Malí also was found on the ground by day, but another was at the edge of a stream at night.

The Cerro Tacarcuna frogs defensively inflated their bodies when handled (e.g., fig. 3). There was no other intimidating posturing, specifically no widely open-mouth display (the tongue is white).

HABITAT: *Eleutherodactylus laticarpus* was found on Cerro Tacarcuna in an elevational range of 1450–1630 m—an area of evergreen forest (fig. 6) of tall, straight trees, including the dominant *Quercus humboldtii*. The canopy height is about 15–20 m on the ridge and 25–30 m on slopes. The canopy is reached and frequently penetrated by tall *barigona* palms, which are common in these highlands and which can be seen extending above the canopy even on quite distant ridges. There is an understory of treelets, saplings, small tree ferns, and scattered small palms and small bamboo. Buttressing and stilt roots (excluding the very small stilts of the *barigona* palms) and lianas are much less frequent than in lowland forest. The tree-trunk “moss” layer is thin and spotty. Epiphytes, including bromeliads are moderately common; large tank bromeliads grow high on the trunks (and on the ground above 1640 m, in montane thicket cloud forest). There is a scarcity of ferns and herbaceous plants.

The ground of the Cerro Tacarcuna forest was uniformly covered by a thin leaf layer at places where *Eleutherodactylus laticarpus* was found. Under the dead leaves there is a 6–7 cm layer (as measured on the ridge) of humus, which gave the ground a spongy feeling under foot but which compressed to a few cm around camp and on the newly cut trails. This organic layer lies atop a fine, loosely packed brown soil. A cooking fire at the 1590 m camp burned to a depth of 20 cm, because of a collapse of the soil after rootlets and other organic contents had burned out.

The Tacarcuna specimen collected at 1450 m was near the lower limits of the montane oak forest, whereas the one taken at 1630 m was near the upper limit, just below cloud forest of the elfin woodland or montane thicket type.

Field data are not so extensive for Cerro Malí, but the juvenile *E. laticarpus* records (1410 and 1450 m elev.) are from wet montane forest. The lower limit of the wet montane forest coincides with basaltic outcrops

and suddenly damper soil, at 1270 m elevation (by hand-held altimeter). Below this the forest is notably drier on the steep southern side of Cerro Malí. Contrary to an earlier note (Myers, 1969: 25), tree ferns and sub-tree ferns are conspicuous understory elements. The wet ridge forest is composed largely of tall straight trees with a canopy of about 20–25 m, with frequently occurring *barigona* palms penetrating the canopy. Anthony's (1916, 1923) description of the “Mt. Tacarcuna” landscape, as quoted in Myers (1969), actually pertains to what is now called Cerro Malí (see fn. 3), a name possibly not used in Anthony's time.

Comparisons

Eleutherodactylus laticarpus is assigned to the *sulcatus* group, the species of which have the mandibular ramus of the trigeminal nerve passing lateral to the adductor mandibulae muscle, whereas other broad-headed eleutherodactylines in lower Central America have the nerve passing medial to this muscle (Lynch, 1986a). The other broad-headed Central American species of *Eleutherodactylus* (subgenus *Craugastor*) include *E. bufoniformis* and *E. biporcatus* auctorum (Savage and Myers, in prep.); externally, *E. laticarpus* is readily distinguished from all these species by its blue eyes and elongated eyelid tubercle.

Within the *sulcatus* group, *E. helonotus*, *E. ingeri*, *E. ruizi*, and *E. sulcatus* differ from *E. laticarpus* in having granular skin on the venter, in the presence of an inner tarsal fold (except *helonotus*), and in lacking an elongate eyelid tubercle (except *ruizi*).

The smooth skin on the venter and elongate eyelid tubercles of *E. cadenai*, *E. cerastes*, *E. cornutus*, and *E. sernai* make these animals superficially very similar to *E. laticarpus*, but *E. laticarpus* has a strongly sloping snout with flared lips (as in *E. sulcatus* but not in other species of the group). Lateral fringes are present on the digits in all except *E. cadenai*, *E. cerastes*, *E. sernai*, and *E. laticarpus*. *Eleutherodactylus cadenai* has broad contact between the zygomatic process of the squamosal and the maxilla (a bony cheek). *Eleutherodactylus cerastes* and *E. sernai* have green irises in life and vertically



Fig. 6. Montane forest habitats of *Eleutherodactylus laticorpus*, new species, on southwest sector of Cerro Tacarcuna massif. **Upper:** Type locality—high ridge forest near camp at 1590 m elevation (February 11, 1975). **Lower:** Forest at 1450 m elevation—capture site of a paratype (February 12, 1975).

expanded maxillae and quadratojugals (in the area of overlap between these two bones); at least *E. cerastes* has a yellow tongue.

Lynch (1981, 1986b) provided some cladistic structure to our concept of the *sulcatus* group, i.e. [(*cadenai*, *ingeri*) *ruizi*]. We take this opportunity to report an additional synapomorphy shared by the seven Andean species (*cadenai*, *cerastes*, *cornutus*, *helonotus*, *ingeri*, *ruizi*, and *sernai*)—each has the capitate end of the quadratojugal bifurcated such that a ramus of bone extends along the dorsal and the ventral lingual surfaces of the maxilla (fig. 5D). In *E. laticorpus* and *E. sulcatus*, and more than 200 other species of *Eleutherodactylus* (including the broad-headed *Craugastor*) studied by Lynch, the capitate end of the quadratojugal has only the dorsal ramus of bone on the lingual surface of the maxilla.

Eleutherodactylus laticorpus and *E. sulcatus* are therefore plesiomorphically similar regarding the quadratojugal character. However, these two share the spatulate condition of the snout (in contrast to the more truncate shape seen in the Andean species). The snout shape character, dubiously polarized, may be evidence linking the extra-Andean species *sulcatus* and *laticorpus* as sister species, although a similar snout shape is also seen in *E. maussi*—a Venezuelan species of the *biporcatus* group (subgenus *Craugastor*), long-confused with frogs of the *sulcatus* group (Cochran and Goin, 1970, Lynch, 1975, Rivero, 1961).

In summary, we had expected, on geographic grounds, to find evidence of close relationship between *Eleutherodactylus laticorpus* and one or more of the superficially similar *sulcatus* group members from the northern Cordillera Occidental of Colombia.

But the quadratojugal character seems to place *E. laticorpus* outside the Andean assemblage and the head shape seems to ally it with Amazonian *E. sulcatus*. Our only safe conclusion is that *Eleutherodactylus laticorpus* is a peculiar frog.

Acknowledgments

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It should be noted that the success of the 1975 expedition largely rested on the extensive reconnaissance and trail work earlier conducted by Gorgas Memorial Laboratory field parties in 1958–1964. This work (for arbovirus and mammal surveys) was done under the direction of Dr. Pedro Galindo, in collaboration with Dr. Charles O. Handley, both of whom provided trail sketches and other information to Myers that facilitated reopening their old trails onto Cerro Malí and thence to the upper Río Pucuro (Pucro), from where Cerro Tacarcuna could finally be ascended.

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