# NEW FROGS OF THE GENUS *ELEUTHERODACTYLUS* (FAMILY LEPTODACTYLIDAE) FROM THE SAN ANTONIO REGION OF THE COLOMBIAN CORDILLERA OCCIDENTAL

by

**John D. Lynch***

**Resumen**

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Se encuentran 17 especies del género *Eleutherodactylus* en un sitio de un bosque nublado (finca San Pedro) a 1700-2000 m.s.n.m. en el municipio de Dagua, Departamento del Valle del Cauca, Colombia, esta cifra incluye dos especies poco conocidas, *E. calcaratus* y *E. palmeri.* Las 17 especies se integran a la fauna eleutherodactylina de varios sitios dentro de los bosques nublados de San Antonio. Se redescriben *E. calcaratus* y *E. palmeri* usando material nuevo y se nominan cuatro especies previamente no conocidas.

**Palabras claves:** Eleutherodactylus, Leptodactylidae, Colombia

**Abstract**

Seventeen species of *Eleutherodactylus* are known from a cloud forest locality (finca San Pedro) at 1700-2000 m in Municipio Dagua, Depto. Valle del Cauca, Colombia, including two poorly-known species, *E. calcaratus* and *E. palmeri.* These 17 species make up the eleutherodactyline fauna found at several sites within the forests of San Antonio. *Eleutherodactylus calcaratus* and *E. palmeri* are redescribed based on fresh material and four species, previously unknown, are named from these forests.

**Key words:** Eleutherodactylus, Leptodactylidae, Colombia

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Over much of the past decade, I have been concerned about the identities of two species of *Eleutherodactylus* described by George Boulenger from the cloud forests of the central part of the Cordillera Occidental in western Colombia and have undertaken fieldwork in the region in quest of fresh material of these and other frogs (Fig. 1). Boulenger (1908) described *Hylodes calcaratus* from San Antonio [Depto. Valle del Cauca], Colombia and (1912) described *Hylodes palmeri* from "Pueblo Rico, Chocó, S.W.Colombia, 5200 feet". Cochran and Goin (1970) provided accounts for each species but confused a variety of frogs under the names. These were two species that I had failed to identify in the collections being accumulated for the cloud forests of the Cordillera Occidental and I continued to search for these organisms using my notes on the type-specimens. As a result of fieldwork carried out in 1991 and 1992, I now think that I have located each species and can incorporate each into the modern literature.

During the efforts to secure fresh material of *E. calcaratus* and *E. palmeri*, I had the opportunity to do fieldwork at some cloud forest sites under study by colleagues from the Universidad del Valle. One of these sites, Finca San Pedro, just south of Queremal (Municipio Dagua), is especially rich in eleutherodactyline frogs. Fieldwork there, primarily by Fernando Castro and his students, has revealed the presence of *E. babax, E. brevifrons, E. calcaratus, E. cerastes, E. erythropleura, E. gracilis, E. mantipus, E. molybrignus, E. orpacobates, E. palmeri, E. ruizi, E. thectopternus, E. w-nigrum* and four undescribed *Eleutherodactylus* species in the forest remnants; only *E. ruizi* remains unvouchered by preserved specimens (it is known from San Pedro based on photographs only). Three of those undescribed species are named in the following accounts as is another undescribed species, common to the north, but extremely rare in the San Antonio region.

## Materials and Methods

Specimens were measured to the nearest 0.1 mm using dial calipers and dissecting microscopes. Terminology follows Lynch and Duellman (1980). Means are reported as ± one standard error of the mean. In the following accounts, four abbreviations are used for dimensions: E-N (distance between eye and nostril), HW (greatest head width), IOD (interorbital distance), and SVL (snout to vent length). Four abbreviations are used to identify collections: BM (British Museum [Natural History], London), ICNMHN (Museo de Historia Natural, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá), IND-AN (amphibian collection of INDERENA, Unidad de Investigación Federico Medem, Bogotá), and UVC (Museo de Historia Natural, Universidad del Valle, Cali). Information reported in diagnoses is not repeated in descriptions unless there is some qualification.

## Taxonomic accounts

### *Eleutherodactylus calcaratus* (Boulenger)

Boulenger (1908) named *Hylodes calcaratus* based on a single adult male (BM 1947.2.15.53), 17.6 mm SVL, from San Antonio, S. W. Colombia (= Cerro San Antonio, Municipio La Cumbre, Depto. Valle del Cauca). Cochran and Goin (1970:391-92, pl. 50g-i) provided a description and photographs of another specimen but their account confuses a variety of frogs with *Eleutherodactylus calcaratus*. They presumed that their specimen was an adult male and that the holotype was a juvenile but were mistaken in both points.

***Diagnosis.*** (1) skin of dorsum finely tuberculate, that of venter areolate; no dorsolateral folds; (2) tympanum prominent, its length 1/4-1/3 eye length; (3) snout subacuminate in dorsal view (more rounded in females), rounded in lateral profile; canthus rostralis indistinct; (4) upper eyelid broader than IOD, bearing one or more conical tubercles; no cranial crests; (5) vomerine odontophores triangular in outline, narrowly separated, low; (6) males with short vocal slits and white nuptial pads; (7) first finger shorter than second; disks on outer fingers expanded, round; (8) fingers bearing lateral fringes; (9) ulnar tubercles present, subconical; (10) conical tubercle on heel; small tubercles along outer edge of tarsus; no tubercle on inner edge of tarsus; (11) two metatarsal tubercles, inner oval, much larger than outer; supernumerary plantar tubercles present; (12) toes bearing lateral fringes, no webbing; fifth toe much longer than third; (13) dorsum brown with darker brown markings; venter cream reticulated with brown; throat bearing inverted brown triangle; posterior surfaces of thighs brown; (14) adults small, males 15.8-22.8 mm ($\bar{x}$= 20.2 ± 0.4, n = 16) SVL, 4 females 30.7-31.6 mm SVL.

The presence of prominent tubercles on the upper eyelids and heels in combination with the reticulated ventral surfaces and a uniformly brown posterior surface of the thigh enables prompt recognition of *E. calcaratus*. However, these characters provide little indication of the relationships of the organism.

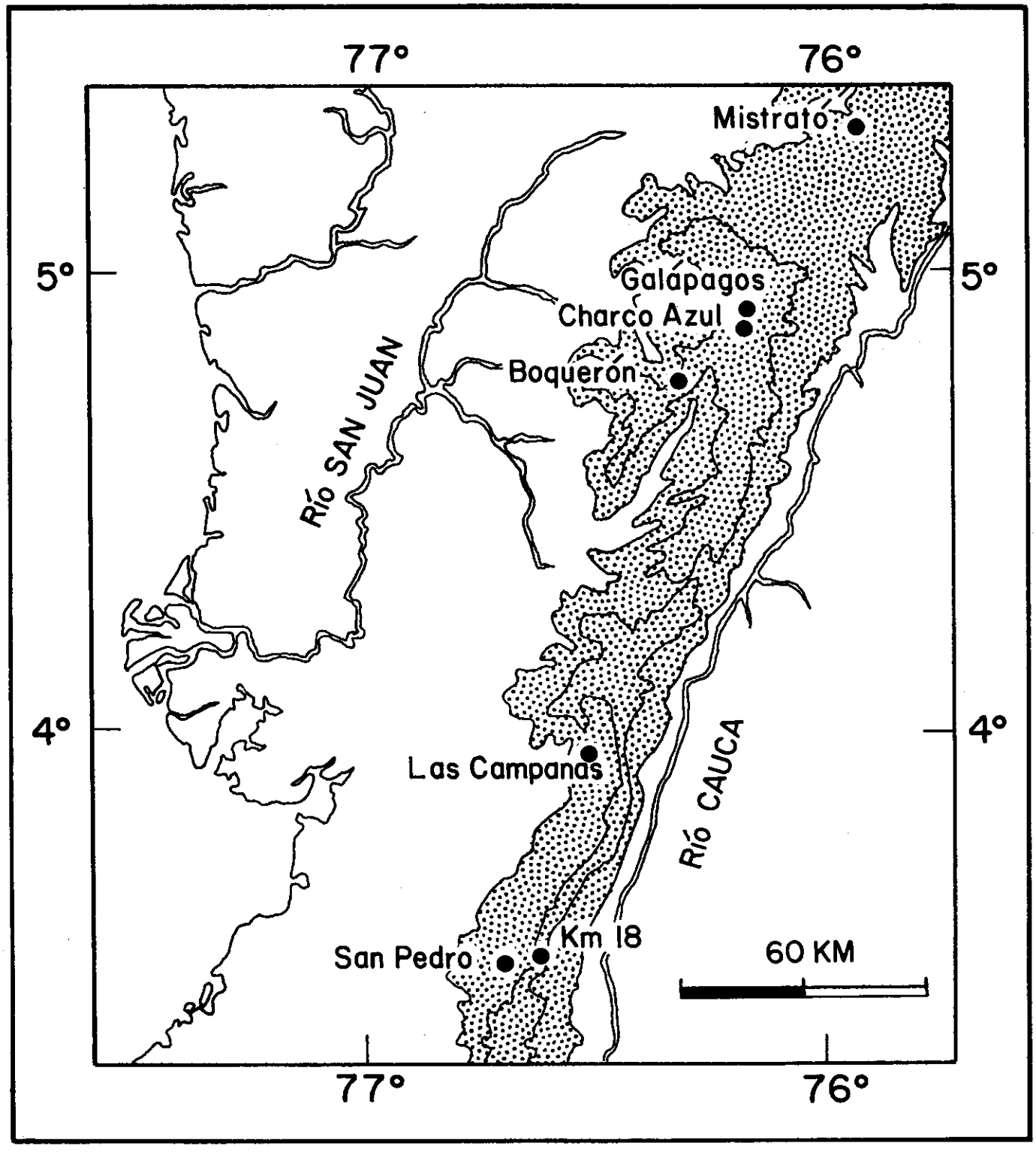


**Figure 1.** Map of west-central Colombia showing localities mentioned in the text. Areas above 1000 m are stippled. 1000 and 2000 meter contour lines are included on the map.

***Description*** (For proportions, n = 13 for males, 5 for females).-- Head as wide as body in males, less than in females; head wider than long; HW of males 37.9-42.3% ($\bar{X}$= 39.9 ± 0.4) SVL, of females 37.8-42.5% ($\bar{X}$= 40.1); nostrils protuberant, directed dorsolaterally; E-N of males 69.7-96.3% ($\bar{X}$= 83.3 ± 2.0) eye length, females 77.8-95.4% ($\bar{X}$= 87.8); loreal region concave. sloping abruptly to lips; lips not flared; upper eyelid bearing conical tubercle on posterolateral part of eyelid; upper eyelid width 95.2-121.0% ($\bar{X}$= 110.6 ± 2.5) IOD in males, in females 100.0-125.0 ($\bar{X}$= 113.2)%; temporal region vertical in males, slightly sloping in females; supratympanic fold ending above arm; tympanum round, its length 24.2-36.7% ($\bar{X}$= 30.6 ± 1.1) eye length in males, 27.8-35.9% ($\bar{X}$= 32.1) in females, separated from eye by distance equal diameter of tympanum; postrictal tubercles conical; postocular folds prominent; choanae longer than wide, not concealed by palatal shelf of maxillary arch; vomerine odontophores median and posterior to choanae; odontophores of female slightly larger than a choana, separated by a distance equal 1/2 odontophore width, triangular in outline, elevated, bearing 6 teeth in transverse row; odontophores of males smaller than a choana, bearing 3-4 teeth in transverse rows; tongue about 1 1/2 times as long as wide, posterior edge notched, posterior 1/2 not adherent to floor of mouth; males have vocal slits posterolateral to tongue.

Skin of lower back and flanks of males bearing small flat tubercles, of rest of dorsum less evident; dorsum of female bearing many small low tubercles outlining dark markings; skin of upper surfaces of limbs smooth; discoidal folds well anteriad of groin; no perianal tubercles or anal sheath; ulnar tubercles not prominent, antebrachial largest; oval thenar tubercle about same size as bifid palmar tubercle; numerous supernumerary palmar tubercles; subarticular tubercles round, elevated; crenulated lateral fringes on fingers and on outer edge of Finger IV; disk of thumb scarcely expanded, disks of II-IV expanded, all larger than tympanum, round, bearing broad ventral pads.

Heel bearing conical tubercle; smaller tubercles along outer edge of tarsus; inner metatarsal tubercle twice as long as wide, about 6 times size of round outer metatarsal tubercle; low supernumerary plantar tubercles at bases of Toes II-IV; toes bearing lateral keels (almost fringe) and expanded disks; disks slightly smaller than those of outer fingers; tip of Toe III reaches to base or distal edge of penultimate subarticular tubercle of Toe IV; tip of Toe V reaches to base or middle of distal subarticular tubercle of Toe IV; heels overlapping slightly when flexed hindlimbs are held perpendicular to sagittal plane; shank 52.4-56.3% ($\bar{X}$= 54.4 ± 0.3) SVL in males, 47.8-56.5% ($\bar{X}$= 54.0) in females.

Brown above with pale postocular folds; pale area broadens posteriorly as band, angling posterolaterally; tip of snout pale; canthal-supratympanic stripe dark brown; dark brown markings (scapular W, sacral chevron, anal triangle); ventral surfaces cream; throat bearing brown triangle (apex pointed posteriorly) with poorly defined lateral bands; belly mottled or reticulated with brown; undersides of shanks banded black and cream; anterior surfaces of thighs, groin, lower flanks, and undersides of thighs brown with pale spots; posterior surfaces of thighs brown.

*Remarks.*-- About 40% of the specimens of *E. calcaratus* have crural stripes (tan in preservative, rust in life) extending along the lateral edge of the shank. When crural stripes are present, no limb bars are present. *Eleutherodactylus calcaratus* is not one of the more common frogs in the San Pedro region. To date, we have found this species along both transects over the Serranía de los Paraguas (Boquerón and Galápagos), as well at three sites in the San Antonio region (Km 18 [Zíngara], Cerro San Antonio, and finca San Pedro) at elevations between 1700 and 2200 meters.

***Eleutherodactylus palmeri* (Boulenger)**

Boulenger (1912) named *Hylodes palmeri* on the basis of two immature females (BM 1947.2.16.86-87) from "Pueblo Rico, Chocó, S. W. Colombia, 5200 feet". As was normal for the times, he made no comparisons. Cochran and Goin (1970:398-99) described a frog from Norte de Santander as this species but fortunately illustrated (their Plate 54 d-f) the larger cotype (BM 1947.2.16.86), here designated as the lectoholotype.

Lynch and Ruiz (1983) reported, without further comment, specimens of this species as *E. parvillus* from Quebrada Sopladero, Depto. Cauca, Colombia, 2190 m. *Eleutherodactylus parvillus* is a species of the lowlands and lower cloud forests and is confined to western Ecuador (Lynch and Duellman, 1996). *Eleutherodactylus palmeri* resembles *E. parvillus* in having yellow flash marks on the anterior and posterior surfaces of the thighs, groin, and concealed surfaces of the shank but is a larger frog.

***Diagnosis.*** (1) skin of dorsum smooth except for warts in dark spots, that of venter areolate; no dorsolateral folds; (2) tympanum not prominent, its diameter 1/3-1/2 eye

length; (3) snout short, subacuminate in dorsal view, rounded in lateral profile; canthus rostralis sharp; (4) IOD slightly broader than upper eyelid; no cranial crests; (5) vomerine odontophores low, round to oval in outline; (6) males with vocal slits, subgular vocal sac, nuptial pads; (7) first finger shorter than second; digital pads large, rounded; (8) no lateral fringes on fingers; (9) no ulnar tubercles; (10) small tubercles on heel and outer edge of tarsus; inner tarsal tubercle low; (11) two metatarsal tubercles, inner oval, 3 - 5 times size of subconical outer; (12) toes bearing lateral keels, no webbing; fifth toe much longer than third; (13) dorsum pale gray with pale brown markings; no canthal stripe; venter finely stippled with brown; pigmentless area in groin; in life, upper arm, groin, concealed shank, and posterior surfaces of thighs pale yellow; (14) adults small, males 15.2-20.3 ($\bar{x}$= 18.4 ± 0.6, n = 22) mm SVL, females 23.0-28.4 ($\bar{x}$= 25.4 ± 0.3, n = 21) mm SVL.

*Eleutherodactylus palmeri* is most similar to *E. parvillus* but differs from that species in being larger and males having nuptial pads on the thumbs. Preserved specimens are also similar to *E. ridens* and one of the new species named below.

***Description*** (N for proportions given below is 19 for males, 22 for females).-- Head as wide as body, wider than long in adult females, slightly wider than long to as long as wide in males and juvenile females; HW in males 36.5-39.9 ($\bar{x}$= 38.0 ± 0.5)% SVL, in females 37.9-44.9 ($\bar{x}$= 40.7 ± 0.4)%; snout subacuminate to subovoid in dorsal view, acutely rounded in lateral profile; E-N in males 71.0-82.6 ($\bar{x}$= 78.0 ± 1.5)% eye length, in females 81.8-100.0 ($\bar{x}$ = 90.4 ± 1.3)%; nostrils weakly protuberant, directed dorsolaterally; canthus rostralis sharp, weakly concave; in females, loreal region weakly concave, sloping gradually to lips; in males, loreal region flat, sloping abruptly to lips; lips not flared; upper eyelid bears one to three small tubercles, none pungent; upper eyelid width in males 80.0-100.0 ($\bar{x}$= 90.2 ± 2.7)% IOD, in females 68.8-110.3 ($\bar{x}$= 80.1 ± 2.0)%; suparatympanic fold indistinct; in most individuals, tympanum concealed beneath skin (lowermost edge of annulus usually apparent without desiccation) but with slight desiccation becomes evident; in a few individuals, annulus adpressed against skin and relatively distinct; tympanum round, separated from eye by distance equal tympanum diameter; tympanum length in males 30.4-46.4 ($\bar{x}$= 38.0 ± 2.6)% eye length, in females 35.7-48.5 ($\bar{x}$= 41.1 ± 3.7)%; postrictal tubercles small; skin on rest of head smooth; choanae moderate-sized, round, not concealed by palatal shelf of maxillary arch; vomerine odontophores median and posterior to choanae, low, separated medially by distance equal to 1 1/2 to 2 times odontophore width; each odontophore about size of a choana, bearing 2-3 teeth in small individuals, 3-4 in larger specimens, in a transverse row or clump; in small individuals (including most males), odontophore smaller than a choana; tongue longer than wide, its posterior border notched, posterior 2/5 not adherent to floor of mouth; males with long vocal slits posterolateral to tongue and subgular, external vocal sac.

Skin of dorsum smooth except for small warts in black spots and very fine ridglets; low areolations on lower flanks grading into coarse areolations of venter; discoidal folds prominent, well anteriad to groin; undersides of posterior surfaces of thighs coarsely areolate; throat feebly areolate; anal opening not extended in sheath; skin of limbs smooth; palmar tubercle bifid, twice size of oval thenar tubercle; numerous supernumerary palmar tubercles, smaller than subarticular tubercles (pungent, subconical, round); fingers bearing expanded disks, that of thumb smallest, of II-IV larger than tympanum, that of II half size of tympanum but as wide as tympanum; disks apically rounded, bearing broad ventral pads; reproductively active males have white glandular nuptial pad on swollen thumb.

No tubercles on knee; short, fold-like tarsal tubercle on distal one-fourth of inner edge of tarsus; inner metatarsal tubercle twice as long as wide, 3-5 times size of round, subconical outer; supernumerary plantar tubercles at bases of toes II-IV; subarticular tubercles round, pungent; toes with slight lateral keels distally; disks and pads of toes as large as those of outer fingers; tip of Toe V reaching to distal border of distal subarticular tubercle of Toe IV; heels of flexed hindlimbs touch or overlap slightly when limbs held perpendicular to sagittal plane; shank in males 47.7-57.3 ($\bar{x}$= 51.2 ± 1.3)% SVL, in females 46.9-53.2 ($\bar{x}$= 50.6 ± 0.5)%.

Pale gray with pale brown interorbital bar edged anteriorly by cream bar; cream patch or line above brown anal triangle; small scapular and sacral brown spots; limb bars thin, oblique on shanks; no canthal stripe or only diffuse brown pigment posterior to nostril and anterior to eye; supratympanic stripe and labial bars pale brown; venter peppered with brown (appears cream); anterior and posterior surfaces of thighs, concealed surfaces of shank, upper area of groin more densely peppered with brown; colorless area in lower portion of groin; tops of digital disks off-white. In darker individuals, dorsum brown, side of head darker than dorsum; occipital W-shaped mark, sacral and scapular chevrons, bars on forearms and legs

brown; snout pale gray. The venter is darker in juveniles than in adults.

In life, *E. palmeri* is orangish-tan, flesh-colored, or brown with brown markings; venter yellow to dirty cream to heavily stippled with brown; upper arm, groin, concealed shank, anterior and posterior surfaces of thigh lemon yellow; throat of males bright yellow; iris pale gray-green with reddish horizontal streak and black reticulation.

***Natural history.*** Adults are found at night on vegetation 0.2-3.0 m above ground in relatively dry to very wet primary forest. In the Reserva Forestal de Yotoco, adults were found in forests well away from streams. In the San Antonio region near Cali, adults were abundant in areas adjacent to as well as well away from streams. Two amplectant pairs were found on 4 July 1979. Each pair was maintained separately and each female deposited eggs by 1030 h on 6 July 1979. The freshly deposited eggs are white and weakly adherent. In August 1980, specimens were found under leaves, bark, and logs during the day near the Quebrada Sopladero at the lower edge of the Parque Nacional Natural Munchique (Depto. Cauca). Animals collected at night are very pale and often change to dark brown during the day.

Fernando Castro and Taran Grant showed me a useful means of identifying this species in the field by pointing out to me that individuals (even small juveniles) have a distinctive and pungent odor unlike any of the other species found at San Pedro. I have used this ready means of identifying *E. palmeri* at other sites in Valle del Cauca and it seems absolutely characteristic.

***Remarks.*** *Eleutherodactylus palmeri* is presently known along all transects of the Cordillera Occidental made between Pueblorico (Risaralda) and Munchique (Cauca). The species is normally found between 1500 and 2000 meters elevation but extreme values were found along the Pueblorico transect (980-2400 m). Based on material in ICN and UVC, the species also appears to be present on the western flank of the Cordillera Central in Quindío.

## New Species

One of the more striking (in life) species of eleutherodactyline frogs found in Valle del Cauca is a frog I first found while collecting on the Serranía de los Paraguas in 1991. In 1995, the species was found as well in the forests near Queremal (Municipio de Dagua). During the course of my inventory of the collections of the Museo de Historia Natural at the Universidad del Valle, additional specimens were encountered. In allusion to its striking appearance in life, it is here named

***Eleutherodactylus deinops* sp. nov.**

***Holotype.*** ICNMHN 36917, an adult female, taken along quebrada La Seca, finca San Pedro, ca. 7 km S Queremal, Municipio de Dagua, Departamento Valle del Cauca, Colombia, 1800-1850 m, on 12 July 1995 by John D. Lynch (original number JDL 20351).

***Paratypes.*** ICNMHN 36918-19, UVC 12030, topotypes taken with holotype; UVC 6872, Campamento Corea, Farallones de Cali, Depto. Valle del Cauca, Colombia, 2600 m; ICNMHN 29369-70, Boquerón, 20-24 km del cementerio El Cairo, vereda Las Amarillas, Municipio San José del Palmar, Departamento del Chocó, límite con Valle del Cauca, Colombia, 1900-2250 m; UVC 9019, 9091-94, Cerro El Inglés, vereda Las Amarillas, Municipio de El Cairo, Depto. Valle del Cauca, Colombia, 2200-2500 m.

***Diagnosis.*** (1) skin of dorsum densely tuberculate, that of venter finely areolate; no dorsolateral folds; (2) tympanum prominent, its length 22.6-40.0% eye length; (3) snout long, nearly rounded in dorsal view, rounded in profile; canthus rostralis prominent; lips flared in adult females; (4) upper eyelid about as broad as IOD, bearing one conical tubercle; smooth cranial crests; (5) vomerine odontophores prominent, oval, narrowly separated; (6) vocal slits and nuptial pads present in adult males; (7) first finger shorter than second; broad, round discs on outer fingers, that of thumb narrow; (8) fingers bearing lateral fringes; (9) ulnar tubercles nonconical; (10) conical tubercle on heel, row of nonconical outer tarsal tubercles, low fold on inner edge of tarsus; (11) two metatarsal tubercles, inner oval, more than 6 times size of round outer; supernumerary plantar tubercles at bases of toes; (12) toes bearing lateral fringes, no webbing; fifth toe much longer than third; (13) brown above with black flecks forming loose reticulum and a cream interorbital bar; some dorsal ridges outlined in cream; venter cream with brown flecks (females) or dense brown reticulum (males); posterior surfaces of thighs brown; (14) adults moderate-sized, two males 35.1-36.6 mm SVL, five females 38.3-49.6 ($\bar{x}$= 42.7) mm SVL.

*Eleutherodactylus deinops* is a member of the subgenus *Eleutherodactylus* (as defined by Lynch and

Duellman) and is readily distinguished from all other species by virtue of the combination of prominent eyelid tubercle, smooth cranial crests, prominent tympanum, and dark chevrons on the throat.

***Description*** (Proportions are reported for four males and eight females).-- Head as broad as body in females, broader than body in males; head wider than long; HW 39.4-42.1 ($\bar{x}$= 40.7)% SVL in males, 39.7-43.5 ($\bar{x}$= 41.4 ± 0.4)% SVL in females; snout not quite rounded in dorsal view, rounded in lateral profile; E-N 80.8-95.1 (x = 90.9)% eye length in males, 90.5-102.0 ($\bar{x}$= 97.3 ± 1.9)% eye length in females; nostrils protuberant, directed dorsolaterally; canthus rostralis well defined, sinuous in females, weakly concave in males; loreal region concave, sloping abruptly to lips; lips weakly flared posteriorly in adult females; many small tubercles on upper eyelid, sometimes showing a tendency to form transverse rows, and one conical tubercle on posterolateral part of upper eyelid (connected to postocular ridges); upper eyelid width 91.2-121.2 ($\bar{x}$= 104.6)% IOD in males, 82.9-102.1 ($\bar{x}$= 90.3 ± 2.3)% IOD in females; ICN 29370 with well developed fleshy transverse interorbital fold (other individuals have traces of such a fold, in form of tubercles); deep furrow between eyes, edges defined by underlying cranial crests (Fig. 2); tympanum small, round, separated from eye by distance 1.5 X its diameter; annulus distinct except dorsally and posterodorsally; tympanum length 25.0-32.0 ($\bar{x}$= 28.4)% eye length in males, 22.6-40.0 ($\bar{x}$= 30.2 ± 2.3)% eye length in females; postrictal tubercles subconical; choanae round, not concealed by palatal shelf of maxillary arch when roof of mouth is viewed from directly above; vomerine odontophores median and posterior to choanae, large, each about twice size of a choana, separated on midline by distance 1/5 width of odontophore, each bearing a slanted row of 4-6 teeth; tongue longer than wide, posterior border notched, posterior 1/4 not adherent to floor of mouth.

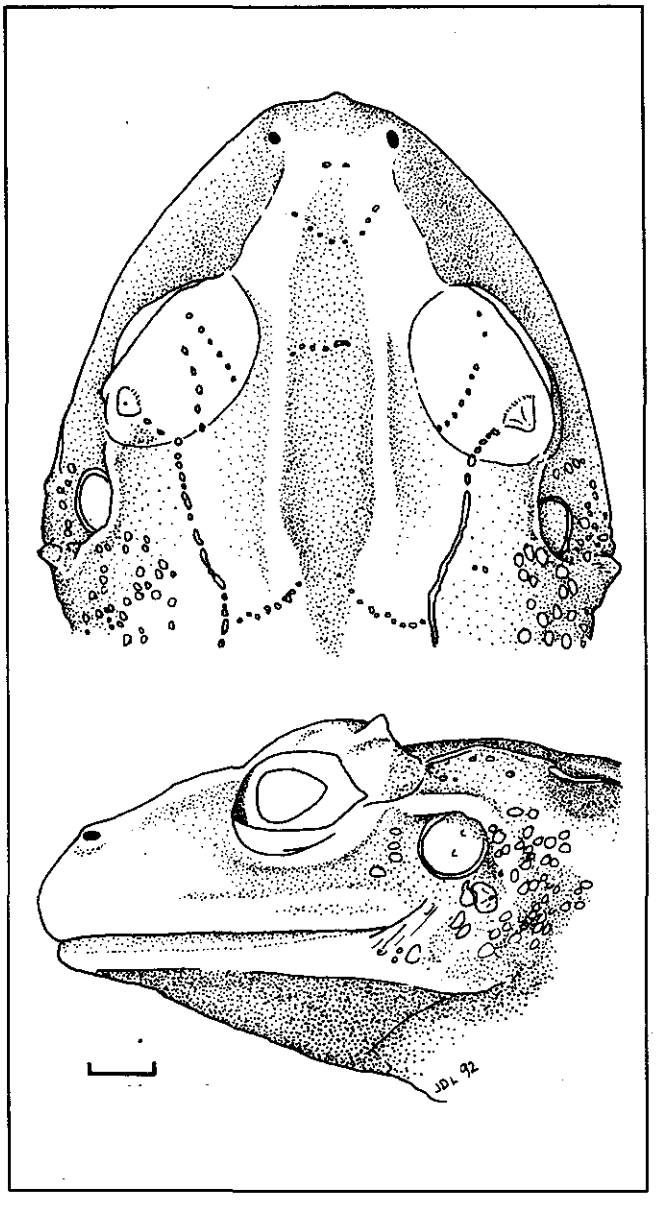


**Figure 2.** Head of *Eleutherodactylus deinops* sp. nov. UVC 9091. Scale equals 2 mm.

Skin of dorsum densely tuberculate; tubercles low, of various sizes, more densely packed on flanks than on dorsum; top and sides of head least densely tuberculate; tubercles form rows, viz., H-shaped mark on occiput, interocular ridge (Fig. 2); discoidal folds low, well anteriad to groin; no anal sheath; pair of large conical tubercles below vent; forearm bearing series of nonconical tubercles, antebrachial largest; palmar tubercle divided into three parts, aggregate not much larger than oval thenar tubercle; supernumerary palmar tubercles numerous, covering entire palm; subarticular tubercles round, elevated, nonconical; prominent lateral fringes on long, narrow digits; outer edge of palm bearing series of connected tubercles, continuing as fleshy fold along postaxial surface of Finger IV; Digits II-IV bearing obvious discs (larger than tympanum), disc of Finger I scarcely expanded; discs of Fingers III-IV 3X width of digit below disc, of Finger II, about 2X; digital discs strongly emarginate; circumfernetial grooves complete on all digits, defining pads that are broader than long; first finger shorter than second; dark glandular nuptial pad in adult males.

Inner edge of tarsus bearing vague low fold on distal 1/3; inner metatarsal tubercle twice as long as wide; outer metatarsal tubercle round, subconical, less than 1/6 size of inner metatarsal tubercle; supernumerary plantar tubercles prominent, usually one at bases of Toes I-IV, sometimes in a row of up to three; subarticular tubercles round (except basal of Toe IV, longer than wide), nonpungent; toes bearing lateral keels (or narrow fringes); toe discs large (but not so large as those of hand), about twice width of digit below disc, round with broad pads; tip of toe V reaches to distal border of distal subarticular tubercle of toe IV; heels overlapping when flexed hindlegs are held perpendicular to sagittal plane; hindlimbs long, shank 59.0-63.6 ($\overline{X}$= 62.0)% SVL in males, 54.0-65.4 ($\overline{X}$ = 60.6 $\pm$ 1.3)% SVL in females.

Brown to reddish brown above with numerous small black or dark brown spots, almost forming a reticulum; some ridges highlighted with cream; ICN 29369 has cream outline to large sacral triangle and has cream outlines to thigh bands. Shank bands difficult to detect (except in ICN 29369). Venter cream with brown flecks in females to heavily reticulated with brown (males); vague barring pattern on throat, most obvious as pale lines along margin of lower lip; uniform brown stippling on concealed surfaces of limbs; canthal stripe obsolete in adults, obvious in juvenile male; supratympanic stripe poorly developed; two prominent labial bars, each entering eye; pale interocular line in a vague brown interorbital triangle/bar.

In life, *E. deinops* is gray to reddish-brown above with dark brown or black flecking; some dorsal ridges orange to rust; venter brown with yellow wash or dull brown with vague darker mottling; posterior surfaces of thighs brown; iris orange, yellow, cream, or bronze with black radii.

*Measurements of holotype in mm.*-- SVL 49.6, shank 28.5, head width 19.7, head length 18.5, chord of head length 20.1, upper eyelid width 4.1, IOD 4.8, tympanum length 1.5, eye length 6.5, E-N 5.9.

***Etymology.*** Greek (*deinos*, fierce, and *opos*, eye) and used as a noun in apposition.

***Natural history.*** Three individuals were collected as they perched on stems high on dirt banks in deep forest. Two others were found in very dense forest. Too few observations have been made to generate any generalizations concerning activities of this frog. Based on limited information, reproduction appears to be aseasonal (reproductively active individuals taken in February, June, July, and November). Juvenile males (lacking vocal slits and nuptial pads) are 23.9 and 31.0 mm SVL. Females 24.5-34.3 mm SVL have narrow, unconvoluted oviducts and minute ovarian eggs.

***Remarks.*** At present, the relationships of *E. deinops* are not known. The smooth cranial crests closely resemble those of *E. cacao* but the two species are not thought to be closely related. Initially, I thought this species allied to *E. quinquagesimus* (extreme southern Colombia and northern Ecuador) because it has some suggestion of an interocular fold and long limbs. However, *E. quinquagesimus* does not have the long fifth toe characterizing the subgenus *Eleutherodactylus* (Lynch and Duellman, 1996).

In 1991 and 1992, a distinctive small frog having orange flash colors was found in northern Valle del Cauca and western Risaralda. Late in 1992, I visited the Museo de Historia Natural of the Universidad del Valle and found other examples of the frog catalogued in their collections. Through the assistance of Dr. Fernando Castro, I was able to visit one of the remnants of cloud forest on the crest of the Cordillera Occidental just north of the Buenaventura-Cali road. Fernando and Juan Castro and I found the frog to be abundant in the forest remnant on the Finca Zíngara.

***Eleutherodactylus juanchoi* sp. nov.**

***Holotype.*** ICNMHN 35063, an adult female, obtained by Juan Castro at finca Zíngara, corregimiento Bitaco, Municipio La Cumbre, Departamento de Valle del Cauca, Colombia, 1960-1990 m, on 13 December 1992.

***Paratypes.*** ICNMHN 35064-84 collected with the holotype; ICNMHN 29357, Depto. Valle del Cauca, Municipio de El Cairo, Charco Azul, 1775 m; ICNMHN 30345, Depto. Risaralda, Municipio Mistrató San Antonio del Chamí, 1880 m.

***Diagnosis.*** (1) skin of dorsum nearly smooth, that of venter areolate; no dorsolateral folds; (2) tympanum round, its length 26-38% eye length; (3) snout short, subacuminate in dorsal view, rounded in profile; canthus rostralis sharp; (4) upper eyelid narrower than IOD, lacking prominent tubercles; no cranial crests; (5) vomerine odontophores oblique, small, widely separated; (6) males with vocal slits, no nuptial pads; (7) first finger shorter than second, outer fingers with broad, round disks; (8) fingers bearing narrow lateral keels; (9) indistinct ulnar tubercles; (10) rounded tubercles on heel, none on tarsus; (11) two metatarsal tubercles, inner oval, 4-6 times size of subconical outer; no supernumerary plantar tubercles; (12) toes bearing large rounded disks, indistinct

lateral keels, no webbing; fifth toe much longer than third; (13) cream above with dark brown to black subocular bar, supratympanic stripe, scapular and sacral spots; hands and feet brown to black; venter cream; concealed surfaces of limbs colorless (carmen in life); (14) adults small, males 18.1-23.0 ($\bar{X}$= 20.6 ± 0.3, n = 22) mm SVL, females 24.2-28.3 ($\bar{X}$= 26.1 ± 0.4, n = 10) mm SVL.

*Eleutherodactylus juanchoi* is most similar to *E. palmeri*, *E. parvillus*, and *E. ridens*. Among these, *E. juanchoi* is apparently most closely related to *E. ridens*, a smaller frog (males 9.5-17.1 [$\bar{X}$= 13.6 ± 0.6, n = 37] mm SVL, females 17.3-23.3 [$\bar{X}$= 20.2 ± 0.6, n = 27] mm SVL) also having red flashmarks on the concealed limbs. *Eleutherodactylus ridens* has a conical heel tubercle and lacks nuptial pads in the males. The flashmarks on the concealed limbs of *E. palmeri* and *E. parvillus* are pale yellow. In the field, *E. juanchoi* is most easily recognized as a small frog that appears to be wearing dark gloves on its hands and feet.

***Description.*** Head as broad as body in males or narrower than body (gravid females), slightly longer than wide; HW in males 35.6-41.4% ($\bar{X}$= 38.1 ± 0.3, n = 22) SVL, in females 35.3-42.0% ($\bar{X}$= 38.6 ± 0.4, n = 13); snout lacking papilla at tip; snout short, E-N of males 70.0-92.0% ($\bar{X}$= 78.4 ± 1.0, n = 22) eye length, in females 73.0-100.0% ($\bar{X}$= 82.2 ± 2.1, n = 12); nostrils protuberant, directed laterally; canthus rostralis relatively sharp, slightly concave; loreal region slightly concave, sloping abruptly to lips; lips not flared; minute tubercles along lateral edge of upper eyelid, none pungent; upper eyelid width in males 78.3-100.0% ($\bar{X}$= 92.2 ± 1.4) IOD, in females 70.8-96.4 ($\bar{X}$= 86.2 ± 2.6, n = 10); interorbital space flat, no cranial crests; supratympanic fold poorly defined, if visible; tympanum length in males 25.8-36.7% ($\bar{X}$= 31.4 ± 0.7, n = 21) eye length, in females 26.5-38.5% ($\bar{X}$= 32.0 ± 1.0, n = 12); lower 3/4 of tympanum visible, separated from eye by distance approximately equal to tympanum length; postrictal tubercles low, rounded; choanae round, not concealed by palatal shelf of maxillary arch; vomerine odontophores median and posterior to choanae, separated medially by distance 1 1/2 to 2 times width of odontophore, each less than 1/2 size of a choana, oblique, elevated, bearing a transverse row of 2-4 teeth; tongue longer than wide, its posterior edge bearing shallow notch, posterior 1/2 not adherent to floor of mouth; males with vocal slits posterolateral to tongue; vocal sac subgular.

Dorsum smooth to covered with very low areolations; skin of lower flanks areolate; discoidal folds well anteriad to groin; no anal sheath or enlarged perianal tubercles; ulnar tubercles low, easily overlooked; thenar tubercle oval, about 1/2 size of bifid palmar tubercle; supernumerary tubercles low, at base of each finger; subarticular tubercles round, not elevated; fingers bearing indistinct lateral keels (possibly preservation artifact); disks of fingers II-IV expanded, round, bearing broad ventral pads (Fig. 3); disks of fingers III-IV about twice width of digit below disk, that of thumb scarcely expanded.

One to two rounded tubercles on heel; inner metatarsal tubercle 2 1/2 times as long as wide, not elevated, 4-6 times size of subconical outer metatarsal tubercle; subarticular tubercles round, not elevated; lateral keels only on medial edges of toes; toes bearing large round expanded disks bearing ventral pads; disks of toes larger than those of outer fingers; tip of Toe V reaches to distal edge of distal subarticular tubercle of Toe IV, tip of Toe III reaches to middle of penultimate subarticular tubercle of Toe IV; when hindlimbs flexed and held perpendicular to body, heels touch; shank in males 44.4-53.6% ($\bar{X}$= 48.6 ± 0.5, n = 22) SVL. in females 45.8-55.6% ($\bar{X}$= 49.4 ± 0.8, n = 13).

Cream above with dark brown to black subocular bar, supratympanic stripe, and dot at anterior edge of eye (Fig. 3); other markings brown, *viz.*, poorly defined interorbital bar, pair of scapular spots, pair of sacral spots, and pair of inguinal spots; other dorsal surfaces finely stippled with brown and variably flecked with brown; limb bars poorly developed, those on shank, if distinct, oblique and narrower than interspaces; anal triangle brown; underside of forearm, hand, tarsus, and foot brown; venter cream with light stipple of brown; anterior surfaces of thighs, posterior surfaces of thighs, undersides of shanks, tops of tarsi colorless (peripheral areas stippled with brown).

Pattern is best developed in juveniles (generally much darker than adults); ventral surfaces brown to nearly black; concealed surfaces of limbs uniformly stippled with dark brown; dorsal surfaces brown with darker interorbital bar, occipital W-shaped mark, sacral chevron, inguinal bar (last three markings each contain a pair of darker brown spots); facial markings as described for adults except that there is a white patch in front of eye and labial bar and a white spot at tip of snout.

In life, *E. juanchoi* is pale brown to orangish-brown above with darker brown markings (suborbital bar often black); ventral surfaces soft white to gray to pale brown,

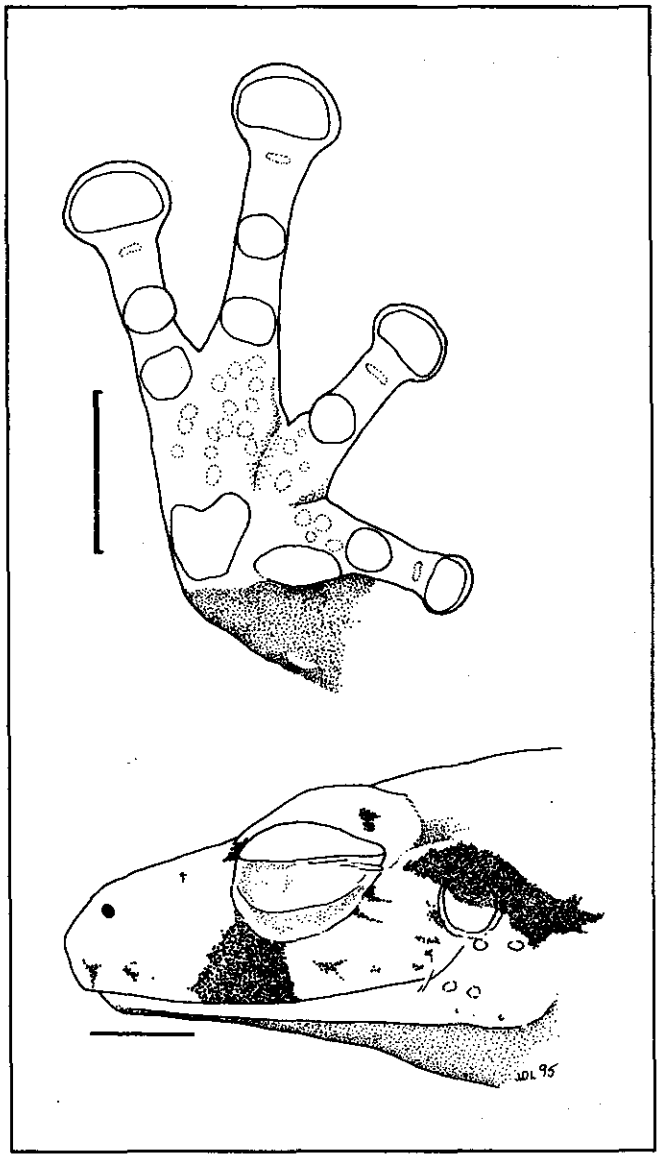

**Figure 3.** Side of head showing color pattern and palm of *Eleutherodactylus juanchoi* sp. nov. ICNMHN 35078. Scales equal 2 mm.

with cream flecks or not; anal triangle brown with white supraanal bar; groin, axilla, anterior and posterior surfaces of thighs, undersides of shanks, tops of tarsi, and inner digits orange to carmen; iris green to nearly turquoise blue above, gray below, with red to reddish-brown horizontal streak and black flecks. In life, juveniles have black venters flecked with white and lack orange areas on the concealed surfaces of the limbs.

***Measurements of holotype in mm.*** SVL 25.2, shank 12.0, HW 10.0, head length 10.0, chord of head length 10.6, upper eyelid width 2.7, IOD 2.9, tympanum length 1.0, eye length 3.5, E-N 3.0.

***Etymology.*** Named for Juan ("Juancho") Castro who collected the holotype and was such a valuable contributor to efforts in the field in december 1992.

***Remarks.*** *Eleutherodactylus juanchoi* is sympatric (at some localities) with *E.palmeri* (see earlier account) and preserved specimens of the two species once were confused by me (but, fortunately, not in print). Although I can point to no synapomorphies, I think that *E. juanchoi, E. palmeri, E. parvillus*, and *E. ridens* are very closely related. The differences among these four species are most easily seen in living material but close inspection of preserved specimens enables most specimens to be identified with confidence.

***Eleutherodactylus juanchoi*** is very abundant at finca Zíngara but elsewhere is inexplicably uncommon to rare. In addition to the localities mentioned for paratypes, I have seen specimens of *E. juanchoi* from Las Campanas, near Lago de Calima (UVC) and finca San Pedro (ICNMHN, UVC). Falin Joglar showed me a slide of an individual from Cerro San Antonio (not collected) and Jorge Restrepo has seen it frequently at Bitaco.

In 1980, I encountered the first specimen of a frog superficially resembling *E. latidiscus*. Occasional additional females were acquired at comparable elevations into western Antioquia. In the absence of males, I was reluctant to provide a name for the animal but in 1994 and 1995 I discovered that the frog was reasonably common in the cloud forests of Valle del Cauca and was able to locate males. The species appears to be most nearly related to *E. permixtus* of the Cordillera Central (Lynch et al., 1994).

***Eleutherodactylus platychilus* sp. nov.**

***Holotype.*** ICNMHN 36901, adult female, one of a series taken along quebrada La Seca, finca San Pedro, ca. 7 km S Queremal, Municipio de Dagua, Departamento Valle del Cauca, Colombia, 1800-1850 m, on 12-13 July 1995 by John D. Lynch and Erik R. Wild.

***Paratopotypes.*** ICNMHN 36902-07, UVC 12028-29, taken with holotype; UVC 11721, 11850, 11969-70.

***Paratypes.*** ICNMHN 8206, Quebrada Sopladero, Parque Nacional Natural Munchique, Municipio del Tambo,

Cauca, 2100 m., ICNMHN 16596, Km 16.5-17.0, carretera de Nutibara a La Blanquita, Municipio de Frontino, Antioquia, 1900 m.

***Diagnosis.*** (1) skin of dorsum smooth to finely shagreen, that of venter areolate; no dorsolateral folds; (2) tympanum prominent, its length 37-56% eye length; (3) snout long, subacuminate in dorsal view, rounded in profile; lips flared in adult females; (4) upper eyelid narrower than interorbital space, bearing small tubercles; no cranial crests; (5) vomerine odontophores triangular in outline; (6) males lacking vocal slits and nuptial pads; (7) first finger shorter than second, broad, round discs on outer fingers; (8) fingers bearing lateral fringes; (9) ulnar tubercles not prominent; (10) small tubercles on heel and outer edge of tarsus; (11) two metatarsal tubercles, inner oval, more than eight times size of oval outer; supernumerary plantar tubercles at bases of toes I-IV; (12) toes bearing lateral fringes, no webbing; toe disks round, smaller than those of outer fingers; fifth toe very long; (13) dorsum brown without pattern; labial stripe cream; venter yellow-brown, flecked with brown; groin and concealed surfaces of limbs (except posterior thigh) black with cream flecks, posterior surfaces of thighs black; (14) adults moderate-sized, four males 25.3-29.7 ($\overline{X}$= 27.4) mm SVL, ten females 42.0-50.9 ($\overline{X}$= 46.4 ± 0.8) mm SVL.

***Eleutherodactylus platychilus*** is most similar to *E. permixtus* but differs in lacking a color pattern and because females of *E. platychilus* have rounded canthi rostrali and flared lips (Fig. 4). Unlike *E. permixtus, E. platychilus* is a frog of deep forest.

***Description*** (Proportions given below are based on four males and 13 females). Head wider than body (least apparent in gravid females), wider than long; HW in males 37.7-40.7 ($\overline{X}$= 39.6) % SVL, in females 38.8-42.9 ($\overline{X}$= 40.7 ± 0.3) % SVL; snout bearing terminal papilla in smaller individuals; nostrils protuberant, directed dorsolaterally; snout long, especially in females; E-N in males 97.3-111.4 ($\overline{X}$= 101.5) % eye length, in females 94.6-139.6 ($\overline{X}$= 119.4 ± 3.7) % eye length; canthus rostralis distinct in males and juvenile females, straight; canthus rostralis rounded, weakly concave in adult females; loreal region concave, sloping rapidly to lips in males and young females, gradually to lips in adult females; upper eyelid narrower than flat interorbital space, in males eyelid 93.1-93.6 ($\overline{X}$= 93.2) % IOD, in females 59.2-93.3 ($\overline{X}$= 76.0 ± 3.0) % IOD, bearing one to three small prominent tubercles (none pointed or elongate); supratympanic fold indistinct, closely adpressed to tympanum; tympanum higher than long (more nearly round in males), separated from eye by distance 1.2-1.5 times length of tympanum; horizontal

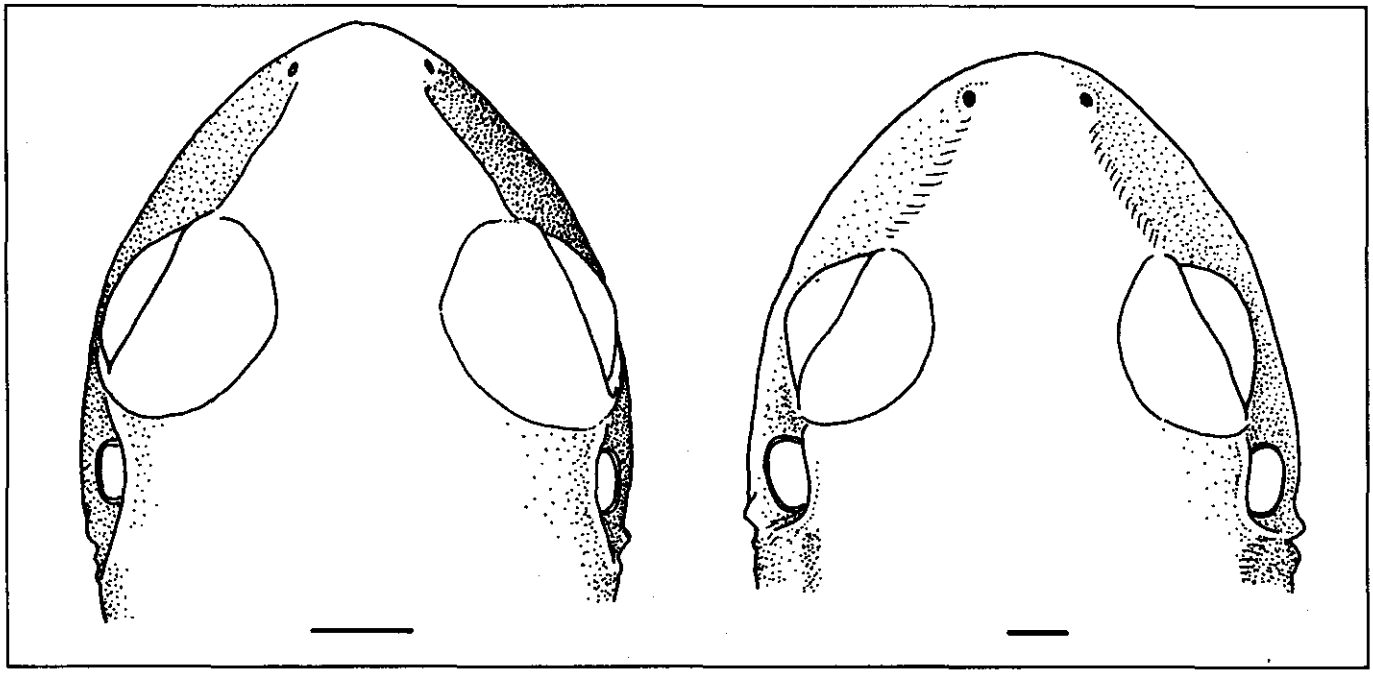

**Figure 4.** Dorsal views of head of *Eleutherodactylus platychilus* sp. nov., showing ontogenetic changes in snout shape. Left, juvenile, ICNMHN 36905; right, adult female, UVC 10937. Scales equal 2 mm.

length of tympanum in males 39.4-40.5 ($\overline{X}$= 39.8) % eye length, in females 37.0-55.5 ($\overline{X}$= 44.4 ± 1.4) % eye length; choanae round (males) to oval (large females), not concealed by palatal shelf when roof of mouth is viewed from directly above; vomerine odontophores median and posterior to choanae, triangular in outline, separated medially by distance equal 3/4 odontophore width, each bearing 3-4 teeth in a transverse row; odontophores prominent in adult females, less elevated in smaller individuals; tongue longer than wide, posterior 1/3-2/5 not adherent to floor of mouth, posterior border notched.

Dorsum smooth to very finely shagreened but developing low, dense warts on lower back and onto upper flanks; flanks covered with low warts; low warts on side of head just in front of tympanum; upper surfaces of limbs finely shagreen with scattered nonconical tubercles; no anal sheath; enlarged flattened perianal warts on hindlimbs below vent; undersides of thighs coarsely areolate; skin of throat smooth; discoidal folds obsolete, well anteriad to groin; antebrachial tubercle present and 1-2 smaller tubercles along outer edge of forearm; palmar tubercle bifid, larger than oval thenar tubercle; numerous small supernumerary tubercles; subarticular tubercles round, elevated, nonconical; fringe on postaxial surface of Finger IV and outer edge of palm; discs expanded, round, those of fingers III and IV 2.2-2.8 times as broad as digit below discs, of Finger II, 1.9-2.3 times as broad, of thumb 1.4-1.6 times as wide; ventral surfaces of discs bearing broader than long pads, defined by circumferential grooves; tip of Finger I reaches to base of pad of Finger II when each is adpressed equally. Minute tubercles on heel and outer edge of tarsus; low fold or elongate tubercle on inner edge of tarsus, about as long as inner metatarsal tubercle, and separated from inner metatarsal tubercle by its own length; inner metatarsal tubercle 2.5 times as long as wide, not compressed, more than eight times size of oval, nonconical outer metatarsal tubercle; numerous small supernumerary plantar tubercles (not visible in some specimens) and larger single plantar tubercles at bases of Toes I-III, one or two tubercle at base of Toe IV; subarticular tubercles round, nonconical, elevated; toe discs round, smaller than those of fingers, 2-2.5 times as wide as digit below disc; tip of Toe III reaches about 1/5 of way between pennultimate and distal subarticular tubercles of Toe IV; tip of Toe V reaches to distal edge of distal subarticular tubercle of Toe IV; heels overlapping when flexed hindlimbs held perpendicular to sagittal plane; shank in males 50.2-51.8 ($\overline{X}$= 50.9) % SVL, in females 48.0-55.3 ($\overline{X}$= 50.7 ± 0.6) % SVL.

Dorsum light to medium brown without pattern or bearing diffuse darker pigment on flanks; tympanum cream to pale brown; no canthal stripe; labial stripe cream; most individuals lack any trace of labial bars, when present, diffuse; limb bars rarely evident, when present on forearm and shank/tarsus, those of shank oblique and equal in width to interspaces; throat and venter yellow-brown, latter flecked with brown; undersides of thighs brown with cream flecks; axilla, groin, anterior surfaces of thighs, ventral surface of shank, and concealed surface of tarsus black with cream flecks; posterior surfaces of thighs black (rarely with two or three pale flecks); digits paler than dorsum.

***Measurements of holotype in mm.*** SVL 45.5, shank 23.2, HW 18.6, head length 16.5, chord of head length 18.7, upper eyelid width 3.8, IOD 5.2, tympanum length 2.5, eye length 4.5, E-N 5.9.

***Etymology.*** Greek (*platy*, meaning flat, and *cheilus*, meaning lips), in reference to the flaring of the lips seen in large females.

***Natural history.*** Except for the finca San Pedro site, this species is rare. Extensive fieldwork along the Murrí transect (Antioquia) yielded a single example. One specimen was found in the Munchique region in 1980 (the first specimen detected) and a second was found in that area in 1993. By way of contrast, I found four individuals along about 100 meters of the quebrada La Seca on the evening of 12 July 1995. All records are in cloud forest but only limited collecting has been done at higher elevations. Guillermo Ortiz found an adult female (UVC 7720) at Campamento Corea on the Farallones de Cali at 2700 m in December 1984. In spite of relatively extensive collecting at that site by students of the Departamento de Biologia (Universidad del Valle), no additional specimens have come to light. Based on our experience at San Pedro, the rarity of this frog at Corea may be a function of the habit of students collecting in open plant associations by day rather than careful searching of vegetation along streams at night. This species appears to be larger than *E. permixtus*; this supposition is based on finding a juvenile female, ICNMHN 32982, 35.3 mm SVL.

In 1985, Jorge Restrepo brought a sample of frogs he had collected near San José del Palmar to me in Bogotá. Among the frogs he had found at "Los Galápagos" (a site on the crest of the Serranía de los Paraguas) was an undescribed species of *Eleutherodactylus*. His specimens were clearly of an unrecognized species but were not in

excellent condition. In the course of fieldwork in the northern Cordillera Occidental in 1987 and 1988, Cristina Ardila, Vicente Rueda, Pedro Ruiz, and I found additional material of the undescribed frog. Restrepo's enthusiasm for the frog was founded in part on his having seen material in life and knowing that, while most *Eleutherodactylus* exhibit muted coloration, a red-eyed *Eleutherodactylus* with a green body and orange flash markings was almost certainly undescribed. Its distinctive coloration serves to distinguish it from all congeners.

*Eleutherodactylus restrepoi* sp. nov.

***Holotype.*** ICNMHN 16587, an adult female obtained at finca El Palmar, Km 16, road from Nutibara toward La Blanquita, Region de Murri-Alto de Cuevas, corregimiento de Nutibara, Municipio de Frontino, Departamento de Antioquia, Colombia, 1960 m, on 12 July 1987 by J. Vicente Rueda.

***Paratypes.*** ICNMHN 16589, 16594, topotypes. ICNMHN 16590, ca Km 15.5 from Nutibara toward La Blanquita, 2000 m; 16588, 16591-93, Km 18, carr. Nutibara-La Blanquita, 1940 m; ICNMHN 17037-38, Km 17, carr. Carmen del Atrato to vereda Guaduas, Mcpio. Carmen del Atrato, Depto. Chocó, 1790 m; ICNMHN 11637-38, 12.0-12.6 km by road E San José del Palmar, Mcpio. San José del Palmar, Depto. Chocó, 1850-1860 m; ICNMHN 11723-24, 14105-06, IND-AN 864-65, UV 8021-22, 8032-37, 8085, 9330, 9353-56, 9395-98, "Los Galápagos", 14.8-15.4 km by road E San José del Palmar, Mcpio. San José del Palmar, Depto. Chocó, 1980-2000 m; UVC 9126-43, El Boquerón, Mcpio. El Cairo, Depto. Valle del Cauca; UVC 9445, vereda Las Amarillas, Mcpio. El Cairo, Depto. Valle del Cauca.

***Diagnosis.*** (1) skin of dorsum smooth, that of venter areolate; no dorsolateral folds; (2) tympanum absent; (3) snout subacuminate in dorsal view, rounded in profile; canthus rostralis rounded; (4) upper eyelid about as wide as IOD; no cranial crests; no tubercles on upper eyelid; (5) vomerine odontophores prominent, oval in outline; (6) males lack vocal slits and nuptial pads; (7) first finger shorter than second; fingers II-IV with large disks; (8) fingers bearing lateral keels; (9) no ulnar tubercles; (10) subconical tubercle on heel, none on tarsus; (11) two metatarsal tubercles, inner oval, 4-6 times size of rounded outer; supernumerary plantar tubercles indistinct; (12) toes bearing fleshy lateral fringes, expanded disks (smaller than those of fingers); fifth toe very long; (13) no color pattern, dark brown (green or brown in life) above, cream ventrally; axillae, concealed surfaces of limbs orange to yellow in life; iris red in life; (14) adults moderate-sized, males 24.9-32.8 ($\bar{X}$= 28.2 ± 0.5, N = 19) mm, females 30.2-39.4 ($\bar{X}$= 35.9 ± 0.6, N = 17) mm SVL.

***Eleutherodactylus restrepoi*** is readily distinguished from most *Eleutherodactylus* because it lacks ears (no tympanum, no cavum tympanicum). Aside from that diagnostic feature, the frog has relatively large digital disks (Fig. 5) and lacks a color pattern. In life, *E. restrepoi* is easily recognized because it has yellow or orange flash marks on the lower flanks and concealed surfaces of the limbs.

***Description.*** Head as wide as body, wider than long; HW 39.4-42.4% ($\bar{X}$= 41.0 ± 0.2, N = 11) SVL in males, 39.6-44.2% ($\bar{X}$= 41.6 ± 0.4, N = 14) in females; nostrils weakly protuberant, directed anterolaterally; E-N 72.1-92.3% ($\bar{X}$= 81.4 ± 2.7, N = 7) eye length in males, 80.0-100.0% ($\bar{X}$= 89.4 ± 2.3, N = 12) in females; loreal region weakly concave, sloping abruptly to lips; lips not flared; interorbital space flat; upper eyelid width 82.1-123.3% ($\bar{X}$= 97.6 ± 5.9, N = 6) IOD in males, 71.4-126.7% ($\bar{X}$= 104.4 ± 4.6, N = 12) in females; cavum tympanicum absent; supratympanic fold prominent, ending above base of forearm (Fig. 5); postrictal tubercles subconical; choanae small, not concealed by palatal shelf of maxillary arch; vomerine odontophores median and posterior to choanae, oval, heavy, each with a transverse row of up to 7 teeth, separated medially by distance less than 1/4 width of an odontophore in large females (broader separation, ca 1/2 odontophore width, in smaller individuals); odontophores 3 times size of a choana; posterior margin of tongue notched, posterior 1/3 not adherent to floor of mouth.

Skin of venter weakly areolate; discoidal folds prominent, well anteriad to groin; palmar tubercle bifid, twice size of oval thenar tubercle; low supernumerary palmar tubercles; subarticular tubercles round, pungent; outer edge of palm with crenulate fold; all digits with ventral pads; tips of fingers II-IV with disks, disks 2-3 times as wide as digit below disk; disks rounded apically; thumb lacking disk; base of thumb of males swollen.

Inner metatarsal tubercle twice as long as wide, 4-6 times size of round outer metatarsal tubercle; tip of third toe reaches distal border of penultimate subarticular tubercle of Toe IV (or just beyond it); tip of Toe V reaches just beyond distal border of distal subarticular tubercle of Toe IV; subarticular tubercles round, pungent; heels overlapping when flexed hind legs are held perpendicular to sagittal plane; heel of adpressed hind limb reaches

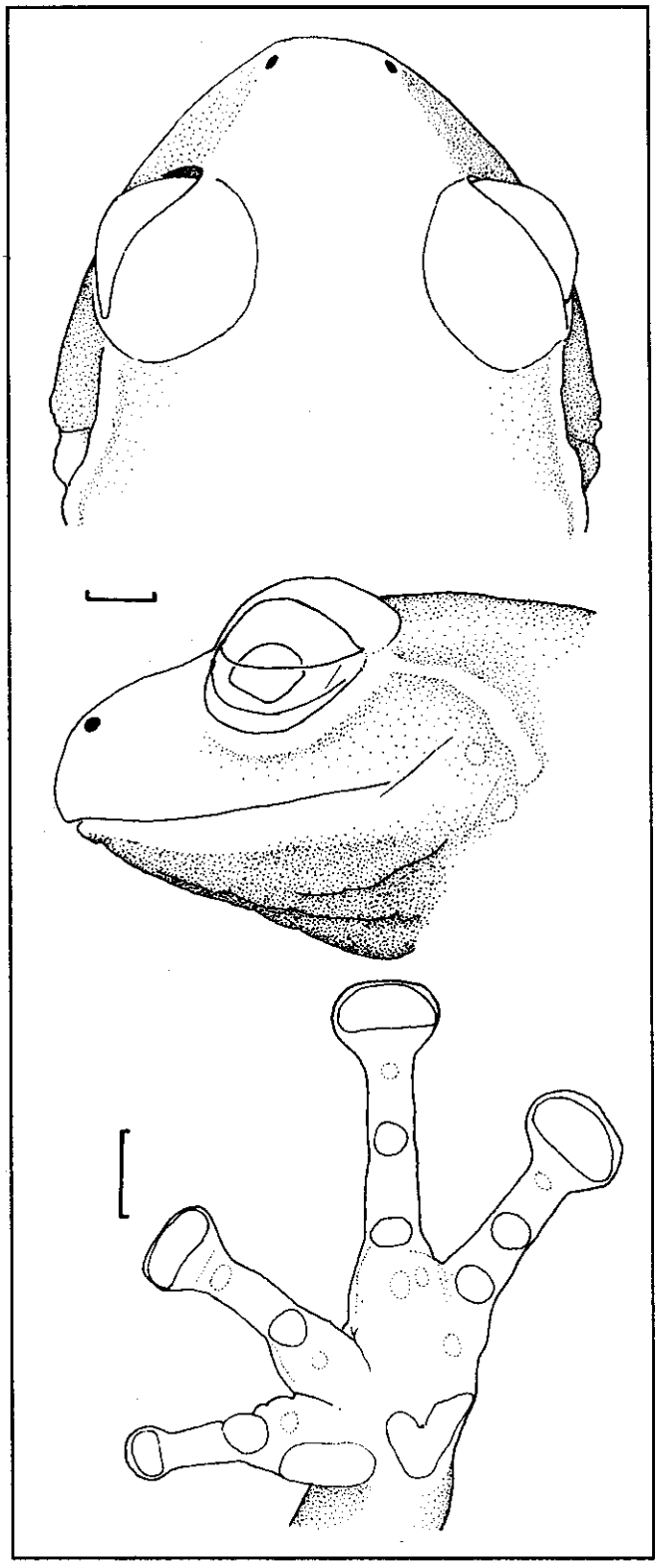

**Figure 5.** Head and hand of *Eleutherodactylus restrepoi* sp. nov. Head based on ICNMHN 28859 hand based on ICNMHN 28880. Scales equal 2 mm.

to eye; shank 52.2-57.4% ($\overline{x}$= 54.8 ± 0.4, N = 12) SVL in males, 52.4-57.5% ($\overline{x}$= 54.9 ± 0.4, N = 14) in females.

Dark brown above except for inner two fingers, wrist, tops of tarsi, and inner three toes (tip of third toe brown); all ventral surfaces cream but with some brown stippling on throat; brown stripe along top of thigh, extending down onto rump; in females, brown stippling extends onto chest.

In life, *E. restrepoi* is green dorsally; side of head, flanks, and limbs reddish-brown; iris red with olive-brown flecks; palms and soles brown; throat and chest yellow; axillae, undersides of thighs, shanks, and concealed surfaces of foot orange to yellow. Mature individuals are green above but smaller individuals are mottled green and reddish-brown or are reddish brown with occasional green flecks. Labial bars are evident in juveniles.

***Measurements of holotype in mm.*** SVL 37.9; shank 20.8; HW 15.6; chord of HL 14.2; HL 13.3; upper eyelid width 3.5; IOD 3.5; eye 4.4; E-N 4.4.

***Etymology.*** This species is named for my friend and colleague, Jorge Humberto Restrepo, known to many of his Colombian colleagues as El joven naturalista vallecaucano, who first collected the species.

***Distribution and natural history.*** Known from cloud forest sites (1790-2100 m) on the western slopes of the Cordillera Occidental in Antioquia and Chocó but probably to be found in western Departamento Risaralda as well. The species appears to be sensitive to moisture. The western slopes of the Serranía de los Paraguas are markedly wetter than the eastern slopes, even at elevations of 2000 m, and *E. restrepoi* is abundant on the western slopes and is absent (apparently) 0.5-1.0 km to the west. This species may be distributed as far south as the San Antonio region. In 1992, I examined a small collection of juvenile *Eleutherodactylus* (UVC, uncatalogued) and noted a single specimen of *E. restrepoi* from finca Zíngara (just N of Km 18); unfortunately, that collection could not be located in 1995.

Specimens are encountered most frequently on the ground and on low herbaceous vegetation in disturbed areas (roadcuts and along trails in the forest). The species has been found only a few times in dense primary cloud forest. Although many individuals have been observed, no calls were heard that could be attributed to this species. In small clearings with abundant groundcover of ferns

and *Equisetum, E. restrepoi* and *E. erythropleura* account for 99% of the eleutherodactyline frogs encountered.

***Remarks.*** Although easily distinguished from all other taxa by its size and coloration, *E. restrepoi* is difficult to associate with other species. The absence of a tympanum (and tympanic annulus and cavum tympanicum) is relatively uncommon among eleutherodactylines but does not suggest the relationships of the frog. It has the "S" condition of the adductor muscles and trigeminal nerve (Lynch, 1986).

## Discussion

Of the seventeen species now known from finca San Pedro, only one lacks a name. That species is being described by Pedro M. Ruiz and me separately. The seventeen species include four that are nearly always found on the forest floor (*E. babax, E. cerastes, E. mantipus*, and *E. ruizi*). Of these, perhaps only *E. mantipus* is diurnal. Two species (*E. brevifrons* and *E. erythropleura*) primarily occur in pastures and along forest edges; each is common in the successional forests of abandoned pastures. *Eleutherodactylus gracilis* and *E. molybrignus* are species nearly confined to stream courses and seeps, usually those of the forests.

## Acknowledgments

I first explored these forests and encountered this fauna in 1979 was was helped in the field by Fernando Castro and Jorge Restrepo. Since 1991, I have returned frequently to this region to better understand its inhabitants. Fieldwork was shared with Roberto Bello, Wilmar Bolívar, Fernando Castro, Juan Castro, Taran Grant, Jorge Restrepo, Pedro Ruiz, Ricardo Sánchez, and Erik Wild. Specimens were loaned and research space was provided by Cristina Ardila, Fernando Castro, William Duellman, Arnold Kluge, Ronald Nussbaum, Pedro Ruiz, and the late Charles Walker. Barry Clarke very kindly permitted extended loans of the British Museum type specimens. Fieldwork at finca San Pedro was greatly facilitated by don Luciano Atoy-Ortega.

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