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A NEW SPECIES OF *COLOSTETHUS* (ANURA: DENDROBATIDAE) FROM THE CORDILLERA DE MERIDA, NORTHERN ANDES, SOUTH AMERICA

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ABSTRACT.—*La Marca, Enrique. 1985. A new species of* Colostethus *(Anura: Dendrobatidae) from the Cordillera de Mérida, northern Andes, South America. Occ. Pap. Mus. Zool. Univ. Michigan, 710: 1–00, figs. 1–4. Colostethus molinarii* n.sp., of the *C. alboguttatus* species group, is described from near Bailadores, State of Mérida, Venezuela. It is distinguished from the other members of this group by coloration details of the dorsum, sides and venter, the size of the palmar tubercle, expansion of the digital pads, development of the lateral fringes of the toes, extension of the interdigital membrane of the feet, and size of the tympanum.

Key words: Colostethus, *taxonomy, Venezuela, frog, Anura, Dendrobatidae, Cordillera de Mérida.*

RESUMEN.—*La Marca, Enrique. 1985. A new species of* Colostethus *(Dendrobatidae) from the Cordillera de Mérida, northern Andes, South America. Occ. Pap. Mus. Zool. Univ. Michigan, 710: 1–00, figs. 1–4. Colostethus molinarii* sp. nov., una especie de ranas perteneciente al grupo de *C. alboguttatus*, es descrita de las vecindades del pueblo de Bailadores, en el Estado Mérida, Venezuela. La nueva especie se distingue de otras en el grupo por detalles en la coloración del dorso, flancos y vientre; por el tamaño del tubérculo palmar, expansión de las almohadillas digitales, desarrollo pronunciado de los rebordes laterales en los dedos de los pies; extensión de la membrana interdigital de los pies, y tamaño del tímpano.

Palabras clare: Colostethus, *taxonomía, Venezuela, rana, Anura, Dendrobatidae, Cordillera de Mérida.*

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INTRODUCTION

The Venezuelan Cordillera de Mérida, usually called the Venezuelan Andean System, is an orographic feature extending from 7°30′ N to 10°10′ N and 69°20′ W to 71°50′ W (Monasterio and Reyes, 1980). The herpetofauna has been sampled only in a few places in this mountain range. Frogs of the genus *Colostethus,* which are numerous in other Andean cordilleras, were poorly known in the Cordillera de Mérida until very recently. Only *Colostethus alboguttatus* (Boulenger) and *C. collaris* (Boulenger) were recorded from this mountain range prior to 1972, when Dole and Durant (1972) described *C. meridensis.* Seven other species have been described more recently (*C. haydeeae, C. leopardalis, C. orostoma*; Rivero, 1976; and *C. humilis, C. inflexus, C. mayorgai, C. saltuensis*; Rivero, 1978).

In 1977 I collected two specimens of *Colostethus* at the Cascada de Bailadores, a waterfall near the border between the states of Mérida and Táchira (Fig. 1). Twenty-six additional specimens were collected there and at another locality near Bailadores in June 1982 and July 1983. Comparisons of these specimens with known species reveals that these frogs represent an undescribed species.

Morphological terms follow Lynch and Duellman (1980). Recording of foot webbing follows Edwards' (1974) method, as modified by La Marca (1984). Measurements (mm ± one standard deviation) are given only for adult males and females. The criteria for determining adulthood were vocal slits and enlarged testes for males, convoluted oviducts and/or enlarged eggs for females. Museum abbreviations employed in the paper correspond to the Colección de Vertebrados de la Universidad de Los Andes (CVULA) and Museum of Zoology of The University of Michigan (UMMZ).

SPECIES ACCOUNT

Colostethus molinarii, new species

HOLOTYPE: CVULA 2820 (Field number ELM (Enrique La Marca) 1007), an adult female with deeply convoluted oviducts and eggs 1.5 mm in diameter, from Las Playitas, 2270 m, near Bailadores (8°15′ N, 71°50′ W), Estado Mérida, Venezuela. Collected by Enrique La Marca and Jesús Molinari on 16 July 1983.

PARATYPES: Cascada de Bailadores, 1800 m: CVULA 819–820, by E. La Marca, 26 July 1977; UMMZ 176207, by E. La Marca, 12 June

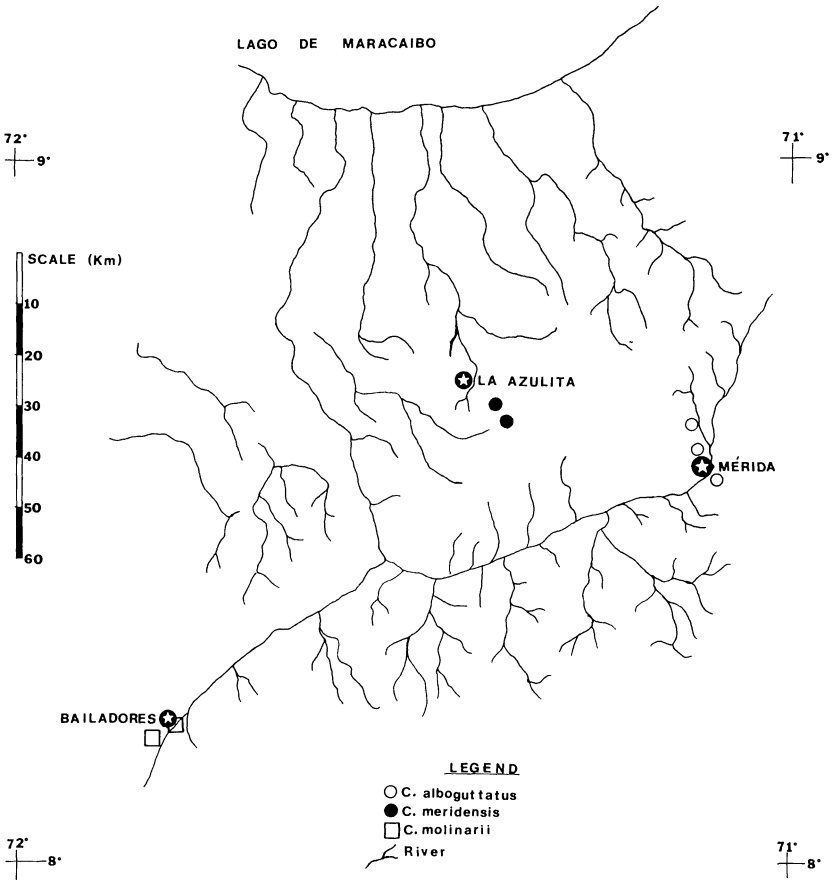

FIG. 1.—Map showing localities where *Colostethus molinarii* and the closely related taxa *C. alboguttatus* and *C. meridensis* are found.

1982; UMMZ 176208–176224, 176225 (tadpole), by E. La Marca, L. Nieto and S. Sardello, 27 July 1982. Las Playitas, 2270 m, nr. Bailadores; CVULA 2821–2826, by E. La Marca and J. Molinari, 16 July 1983.

DIAGNOSIS—A medium-sized *Colostethus* ($\bar{x}$ snout-vent length (SVL) males: 24.9 mm ± 1.1, females: 27.3 mm ± 2.0) distinguished from other *Colostethus* by the following combination of characters: (1) skin of dorsum shagreened to minutely tuberculate; (2) tympanum small, distinct ventrally, its length about ⅓ that of eye; (3) snout subovoid; (4) canthus rostralis curved, distinct; loreal region almost vertical to slightly concave; (5) length of eye greater than eye to nostril distance;

(6) upper eyelid width narrower than interorbital distance; (7) first finger equal in length to second; (8) pad of third finger almost twice as wide as adjacent phalanx; (9) fingers lacking lateral fringes; (10) third finger not swollen in males; (11) anal sheath short and thickened; (12) tarsal fold slight; (13) inner metatarsal tubercle oval, about two times the size of rounded outer; (14) toes moderately webbed, web formula: I (1.0–1.5)–0.5 II (1.0–1.5)–(0.5–1.0) III 1.5–1.0 IV 0.5–1.0 V; (15) third toe with flap-like lateral fringes; (16) pads on toes about equal to those on fingers; (17) dorsolateral dark stripe present; (18) inguinal stripe absent; (19) ventrolateral stripe absent; (20) discrete mark on chest absent; (21) throat with fine dark stippling in adult males, pale in adult females; (22) venter pale, with conspicuous markings only in males.

Colostethus molinarii is a member of the *C. alboguttatus* species group, a monophyletic assemblage that comprises the following species: *C. alboguttatus* (Boulenger), *C. dunni* (Rivero), *C. haydeeae* Rivero, *C. leopardalis* Rivero, *C. mayorgai* Rivero, *C. meridensis* Dole and Durant, and *C. orostoma* Rivero. Within the group, dark dorsolateral stripes are shared only by *C. alboguttatus, C. haydeeae, C. mayorgai* and *C. orostoma*. Of these, *C. alboguttatus* possesses large whitish dots on the venter, *C. haydeeae* has orange ventral coloration and the first finger longer than the second, and *C. orostoma* possesses intense yellow coloration on the venter. *Colostethus molinarii* most closely resembles *C. mayorgai,* a species known only from the mountains of La Carbonera and El Chorotal, by having a yellowish venter, but it differs from *C. mayorgai* in several characters (attributes for *C. molinarii* given in parentheses). *Colostethus mayorgai* possesses pale dorsolateral stripes (usually absent), males with reddish-brown dorsum (greenish), females with mottled venter (cream, without markings), yellow inguinal spots (lacking), no flap-like fringes along toes (present), digital pads 1.4 times larger than penultimate phalanx (1.8), tympanum ½ length of eye (⅓). Furthermore, *C. molinarii* possesses a more pronounced palmar tubercle than *C. mayorgai* and it is more conspicuously webbed than the latter (Fig. 2).

Description.—Males and females are approximately the same size: $\bar{x}$ SVL in males = 24.9 mm ± 1.1 (range: 23.9–26.5 mm, n = 5); $\bar{x}$ SVL in females = 27.3 mm ± 2.0 (range: 23.9–30.3 mm, n = 9); head wider than long, head width 35.5 ± 0.01% SVL (n = 13); interorbital space smooth; interorbital distance about 1.4 times greater than upper eyelid width; canthus rostralis well-defined, curved; nostrils slightly elevated, directed laterally and slightly backwards; nostrils closer to tip of snout than to eye; loreal region almost vertical to

slightly concave, descending abruptly to lips; snout subovoid in dorsal view; tip of snout broadly rounded in dorsal view, nearly truncated in some specimens; tip of snout slightly rounded to nearly truncate in lateral profile; length of eye about 1.5 times eye to nostril distance; internarial distance 1.7 times eye to nostril distance; tympanum about ⅓ length of eye, not very conspicuous; tympanum separated from eye about ⅔ its horizontal length; thick supratympanic ridge; two conspicuous tubercles at rictus; tongue longer than wide, oval, entire or slightly notched in its posterior end; posterior ½ of tongue not adherent to floor of mouth; choanae rounded, partially or totally concealed by partial shelf of maxillary arch; maxilla and premaxilla toothed; teeth pedicellate and long.

Dorsum shagreened to minutely tuberculate, with tubercles more conspicuous on lower back; flanks tuberculate; throat, chest and venter shagreened to finely tuberculate; brachium and antebrachium tuberculate; hand length 27.9 ± 0.01% SVL (n = 14); palmar tubercle single, rounded, 2 to 2.5 times size of thenar; thenar tubercle elongated, twice as long as wide; no supernumerary tubercles; subarticular tubercles moderately sized, flattened, rounded or oval; small pads on fingers; largest pad on third finger, about ¾ size of tympanum; pads wider than long; pad on third finger 1.8 times wider than adjacent phalanx; fingers free, not bearing lateral fringes; first and second fingers of equal length; third finger not swollen in males.

Anal opening well above midlevel of thighs, directed posteroventrally, covered by a short, thickened anal sheath; free margin of anal sheath scalloped; femora, crura and tarsi tuberculate above, smooth below; slight tarsal fold with broadened, flattened, posterior end; tibia length 47.5 ± 0.02% SVL; foot length 49.4 ± 0.03% SVL; outer metatarsal tubercle rounded when viewed from above, subconical in lateral profile; inner metatarsal tubercle oval, about 2.5 times longer than wide, about twice as large as outer; no supernumerary tubercles; subarticular tubercles small, rounded to oval, flattened, toes moderately webbed, web formula: I (1.0–1.5)–0.5 II (1.0–1.5)–(0.5–1.0) III 1.5–1.0 IV 0.5–1.0 V; toes with flap-like lateral keels; keel running along outer edge of fifth toe, from pad to near outer metatarsal tubercle; pads slightly wider than long; largest pad on second and fourth toes, about equal size; pad on fourth toe about equal to pad on third finger, 1.8 times wider than adjacent phalanx (Fig. 2); heels just touch or slightly overlap when thighs are held at right angles to body axis, reaching to anterior corner of eye when legs adpressed forward.

Measurements of holotype: SVL = 24.9 mm; head width = 10.6 mm;

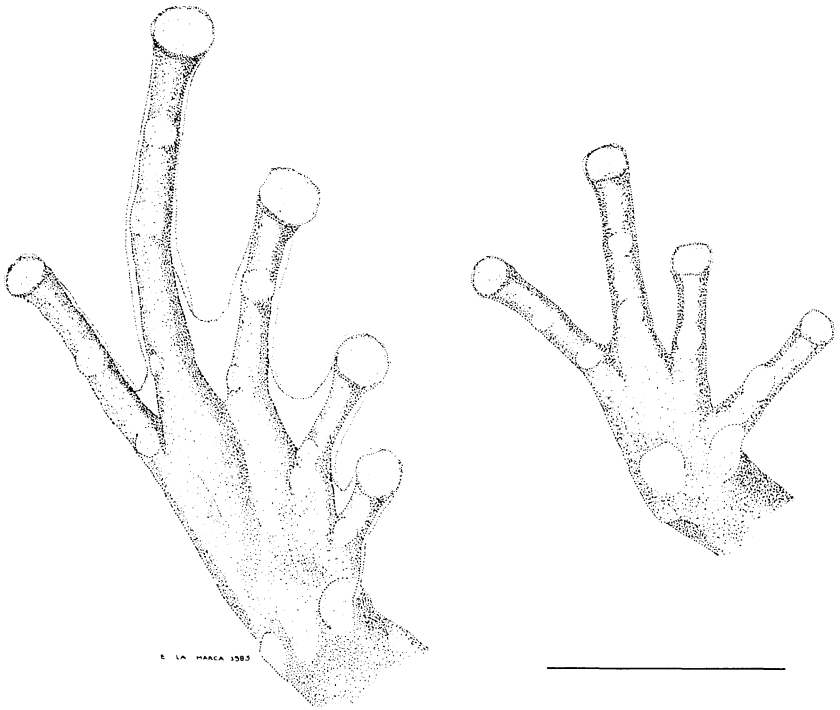

FIG. 2.—Foot and hand of *Colostethus molinarii*. Left, foot of UMMZ 176211. Right, hand of CVULA 2822. Line equals 5 mm.

eye length = 3.6 mm; eye to nostril distance = 2.3 mm; internarial distance = 4.1 mm; interorbital distance = 3.3 mm; upper eyelid width = 1.9 mm; tibia length = 13.5 mm; hand length = 7.7 mm; foot length = 13.5 mm.

Coloration in preservative: Dorsal coloration in adult males darker than in adult females; pale brown dorsum usually with dark paravertebral spots; inverted dark triangle spot with base connecting centers of upper eyelids and apex directed backwards; dark canthal stripes surrounding snout and encompassing nostril openings; dark dorsolateral stripes from posterior border of eye to inguinal region (Fig. 3); dark dorsolateral stripes covering only upper part of tympanum; dorsolateral pale stripe not well defined, running along and above dark dorsolateral stripe, sometimes present; loreal region dusted with gray; dark upper lip with pale spots; pale rictal tubercles (Fig. 3); pale dots on flanks; no continuous pale inguinal stripe or row of pale inguinal spots present; extremities diffusely cross-barred, with crossbars more noticeable on antebrachia and crus (Fig. 3); juveniles more

FIG. 3.—*Colostethus molinarii*. ♀ from Cascada de Bailadores (Specimen not preserved). Photo by S. Sardello.

conspicuously barred than adults; adult females with light cream venters without conspicuous markings; adult males with dark venters (melanophores not uniformly distributed; their absence in some places of venter gives the impression of small pale spots on a dark background); adult females with throat dusted with gray; adult males with darkened throats; palms and soles darker than other ventral surfaces.

Coloration in life: Adult females with pale brown dorsum; adult males and juveniles with greenish dorsum; two dorsolateral dark stripes, ochre or greenish, in adult males and females; two pale dorsolateral stripes more conspicuous in juveniles; flanks bearing small white spots in adult females, with white stippling in adult males; beige-yellowish upper venter and throat in adult females; dark venter with pale stippling or spots in adult males; ventral surface of thighs yellowish in adult females, greenish or caramel in adult males and juveniles.

Tadpoles: A single free-swimming tadpole (UMMZ 176225) in Stage 29 (Gosner, 1960) is tentativelly assigned to *Colostethus molinarii*. Measurements of tadpole: Body length = 11.4 mm; total length = 30.7 mm.

Description of tadpole: Body oval in dorsal view, depressed (wider than deep), deepest and widest at about two thirds length of body; snout oval in dorsal view; nostrils dorsolateral, directed an-

terolaterally, at about equal distance from eye and from tip of snout; internarial distance wider than interorbital distance; chondrocranial elements not visible through skin of head; spiracle sinistral, conspicuous, forming a short tube; spiracular opening directed dorsolaterally at midlength of body, closer to bottom of body (about 40% distance from bottom to top); anal tube short, dextral opening; dorsal fin arising at body-tail juncture; caudal fins equal in depth at about 3/5 of tail; fins shallower than tail musculature; caudal musculature slender, tapering gradually without reaching tip of tail; tip of tail oval (Fig. 4).

Mouth ventral, directed anteroventrally; weak lateral folds at place where upper and lower lips meet; a single row of alternating papillae bordering lips, except for relatively wide anterior diastema on upper lip; beaks not completely keratinized; upper beak broadly arched, convex in medial part; acute serrations of equal size on upper and lower beaks; lateral extensions of upper beak smooth; lower beak broadly V-shaped; two upper and three lower rows of denticles; first upper row complete, slightly shorter than second upper row; second upper and first lower rows medially interrupted by narrow gap; second and third lower rows complete; third lower row less keratinized than those of other rows; lower rows about equal size as upper rows (Fig. 4).

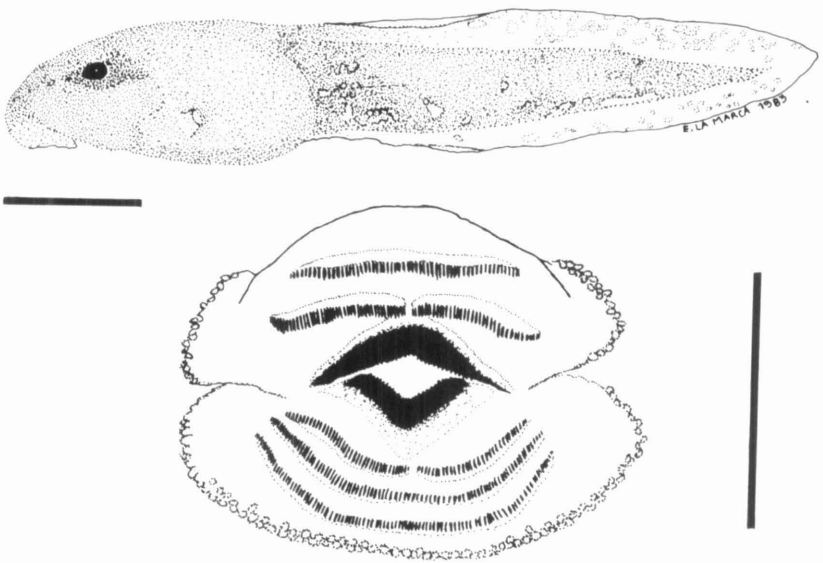

FIG. 4.—Lateral view and mouth parts of a tadpole of *Colostethus molinarii* (UMMZ 176225) in Stage 29. Horizontal bar equals 5 mm. Vertical bar equals 2 mm.

Tadpole coloration in preservative: Body uniformly dark brown above; venter slightly paler than dorsum; caudal musculature with numerous brown flecks on a cream background; dorsal and ventral fins milky, with moderately large brown spots.

NATURAL HISTORY.—*Colostethus molinarii* is known from the Venezuelan Andean localities of Cascada de Bailadores and Las Playitas, at elevations of 1800 and 2270 m, respectively. Adults and juveniles of the new species were collected under rocks along fast moving streams at both localities; they were especially numerous in the spray zone of the highest waterfall at Cascada de Bailadores. The tadpole was collected in a quiet pool in the stream at this latter locality. Larvae of *Hyla platydactyla* Boulenger and an adult specimen of *Hyla jahni* Rivero were also collected at Cascada de Bailadores. No other species of anurans have been found sympatrically with *C. molinarii,* but nocturnal collections were not made at either locality.

Cascada de Bailadores lies below the lower edge of the cloud forest. The stream at Las Playitas is surrounded by grasslands used for pasture. Both places lie within the region classified as Low Mountain Forest ("Bosque Seco Montano Bajo") by Ewel, Madriz and Tosi (1976).

ETYMOLOGY.—The name is a patronym for Jesús Molinari, in acknowledgment for his invaluable help and unmatched companionship in the field. The specific name is used as a noun in the genitive case.

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