

# A NEW COLOMBIAN FROG OF THE GENUS *ELEUTHERODACTYLUS* FROM THE NORTHERN CORDILLERA OCCIDENTAL

por

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## Resumen

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Se describe una nueva especie del género *Eleutherodactylus* de elevaciones medias en la vertiente occidental de la Cordillera Occidental, al occidente de Antioquia, Colombia. Esta especie, con *E. bellona* y *E. mars* forman parte del grupo *bellona*; las tres especies son alopátricas y ocupan un área muy pequeña en la cordillera al occidente de Antioquia y la zona adyacente de Risaralda; para cada especie se muestra su autapomorfia.

**Palabras clave:** Especie nueva, Especiación, Sistemática.

## Abstract

A new frog of the genus *Eleutherodactylus* is named from intermediate elevations of the western flank of the Cordillera Occidental in western Antioquia, Colombia. The new species, with *E. bellona* and *E. mars*, are united in the *bellona* species group. The three species are allopatric and occupy a small area of the cordillera in western Antioquia and adjacent Risaralda. Each species exhibits autapomorphies.

**Key words:** New species, Speciation, Systematics.

## Introduction

The genus *Eleutherodactylus* is very diverse in both the Cordillera Occidental and Cordillera Central of Co-

lombia in contrast to the relatively impoverished Cordillera Oriental and Cordillera de Mérida (Lynch, 1998, Lynch & Suárez-Mayorga, 2004). Lynch (1992) named the peculiar, because it exhibits cranial co-ossification,

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*E. bellona* from western Antioquia. **Lynch & Ruiz-Carranza** (1996) named *E. mars* (also with cranial co-ossification) from nearly Risaralda and proposed that *E. bellona* and *E. mars* were sister species. Here we describe a third species, also from western Antioquia, of this small cluster of frogs and propose that the three form a clade.

### Materials and methods

Terminology follows **Lynch & Duellman** (1997). In the description below, the following abbreviations are used: E-N, eye to nostril distance, HW, greatest head width, IOD, interorbital distance, SVL, snout-vent length. All specimens are housed in the Amphibian collection of the Instituto de Ciencias Naturales (acronym, ICN).

*Eleutherodactylus polemistes* sp. nov. (Figs. 1-2)

**Holotype:** ICN 18808, adult male, one of a series collected 11 November 1988 by M. C. Ardila-R, M. Barrera-R, H. López-A, O. Montenegro, and P. M. Ruiz-C.

**Paratypes:** ICN 18809-10, collected with holotype and ICN 18807, from quebrada La Penca, 2300 m (very near the type-locality).

**Type-locality:** Colombia, ANTIOQUIA: Municipio de Urrao, vereda La Clara, quebrada Cañahonda, 2320 m.

**Etymology:** Fieldwork in western Antioquia has been impossible for some time owing to the competing bands of insurgents resident in those forests. Both of the described species were named in allusion to a God and Goddess of war—and, continuing with the same allusion, we name the third species, *polemistes*, Greek, meaning warrior.

**Diagnosis:** (1) Skin of dorsum bearing numerous small tubercles, that of venter areolate; no dorsolateral folds; (2) tympanum higher than long, its length 27–32 % eye length; (3) snout relatively short, subacuminate in dorsal view, rounded in profile; *canthus rostralis* rounded, concave; (4) upper eyelid narrower than interorbital distance; no cranial crests; skin of head not co-ossified to skull bones; (5) vomerine odontophores oval; (6) males with vocal slits, no nuptial pads; (7) first finger shorter than second; all fingers with round disks; (8) fingers bear lateral keels; (9) ulnar tubercles present; (10) conical tubercle on heel; indistinct outer tarsal tubercles present; (11) inner metatarsal tubercle oval, 6 times size of round outer; few supernumerary plantar tubercles; (12) toes with lateral fringes and expanded disks, no webbing; Toe V very long; (13) brown above with darker brown markings; venter brown in males, cream in females, with brown spots;



**Figura 1.** *Eleutherodactylus polemistes*, ICN 18807, male, 28.0 mm SVL. Photo by Pedro M. Ruiz-C.

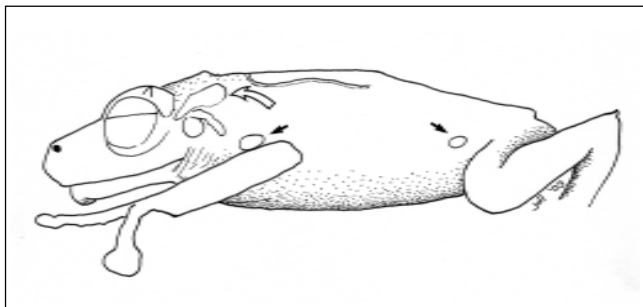


**Figura 2.** *Eleutherodactylus polemistes*, ICN 18808, holotype. Photo by Pedro M. Ruiz-C.

posterior surface of thighs brown; (14) adults small, three males 27.2–28.0 mm SVL, one female 33.2 mm SVL.

The two white flank glands or tubercles (see description and Figs. 1-3) seen in *E. polemistes* are not known for any other frog—certainly not for any *Eleutherodactylus* seen by the first author. *Eleutherodactylus polemistes* is readily distinguished from *E. bellona* and *E. mars* because each of them has co-ossified skin on the head and lacks a conical tubercle on the heel.

**Description:** Head broader than body, broader than long; HW 39.3–42.7 % SVL in males, 40.1 % in one female; snout slightly subacuminate in dorsal view, rounded in lateral profile, nostrils protuberant, directed dorsolaterally; *canthus rostralis* rounded but evident and concave; loreal region weakly concave, sloping gradually

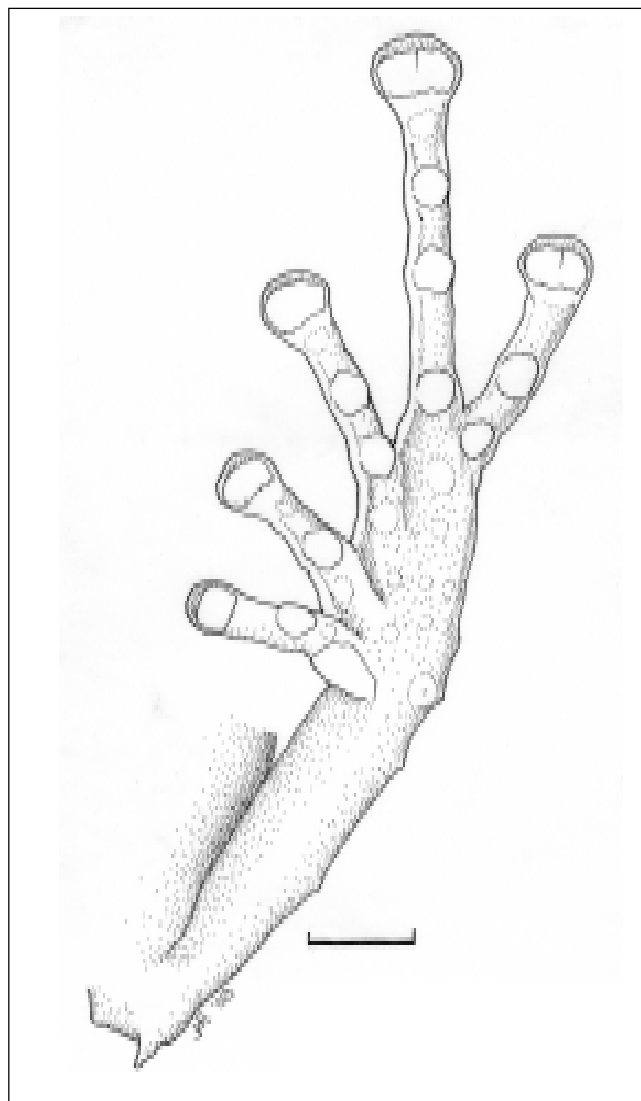


**Figure 3.** Drawing of *Eleutherodactylus polemistes*, ICN 18807, in lateral profile. Arrows indicate the white glands above the arm and above the groin (an autapomorphy of the species).

to slightly flared lips; E-N 81.6-91.7 % eye length; IOD broader than upper eyelid, flat, no cranial crests but frontoparietal bones textured; upper eyelid bearing conical tubercle as well as smaller rounded tubercles, its width 85.2-92.6 % IOD in males, 57.9 % in one female; supratympanic fold low, somewhat obscured by projecting textured squamosals; tympanum higher than long, separated from eye by distance slightly less than tympanum length, its length 26.8-32.4 % eye length; two postrictal tubercles; choanae round or oval, not concealed by palatal shelf of maxillary arch; vomerine odontophores median and posterior to choanae, each about size of a choanae, narrowly separated, each bearing slightly slanted row of 3-5 teeth; tongue oval, its posterior border not notched, posterior  $\frac{1}{2}$  not adherent to floor of mouth; vocal slits lateral to tongue; vocal sac subgular.

Skin of dorsum bearing numerous low warts, ridge in form of inverted U on upper back, another in form of T over sacrum and urostyle; flanks bearing fewer but larger flattened warts; two pale warts (or glands) on each flank, one just dorsal to insertion of arm, other just anterodorsal to groin (Fig. 3); venter areolate but also bearing larger warts admixed with smaller granules; pair of subconical subanal warts; no anal sheath; upper surfaces of limbs smoother than dorsum; series of 4 low ulnar tubercles; palmar tubercle bifid, much larger than oval thenar tubercle; supernumerary palmar tubercles present; subarticular tubercles round, nonconical; fingers bearing lateral fringes; disks of outer fingers about twice as wide as digit below disk, round apically; disks of inner fingers smaller, round; all disks bear ventral pad, completely defined by circumferential grooves; first finger shorter than second; no nuptial pad in males.

Conical tubercle on heel (Fig. 4); outer tarsal tubercles indistinct; inner metatarsal tubercle oval, its length twice



**Figure 4.** Underside of foot and tarsus of *Eleutherodactylus polemistes*, ICN 18809.

its width, about six times size of round outer metatarsal tubercle; few supernumerary plantar tubercles; subarticular tubercles round, nonconical; toes bearing lateral fringes, no webbing; disks of toes round, smaller than those of outer fingers; tip of Toe V reaches to middle of distal subarticular tubercle of Toe IV; when flexed hindlimbs held perpendicular to sagittal plane, heels overlapping; shank 53.2-58.0 % SVL.

**Coloration in ethanol:** Dorsum brown with darker brown or reddish-brown markings; some dorsal ridges cream; inner fingers cream; bars of thighs and tarsi complete, those on arms and shanks incomplete; underside of

shank brown banded with cream; all have a white wart immediately dorsal to arm insertion and another antero-dorsal to groin (ICN 18807 has small white spots over much of the flanks); venter brown in males, cream in female, all spotted with brown; brown inverted chevron across anterior edge of throat.

**Coloration in life:** Dorsum brown to dark olive with dark brown or black spots; dorsal spots edged with yellow or orange; flanks brown to olive with dark brown spots; flanks of ICN 18807 were described as bearing white flecks; venter dark brown with large whitish flecks in males; pale brown to brownish olive with black granules in female; limb bars dark brown or black edged with yellow or whitish-yellow; iris red above, bronze below and a black horizontal stripe (M. C. Ardila-Robayo fieldnotes).

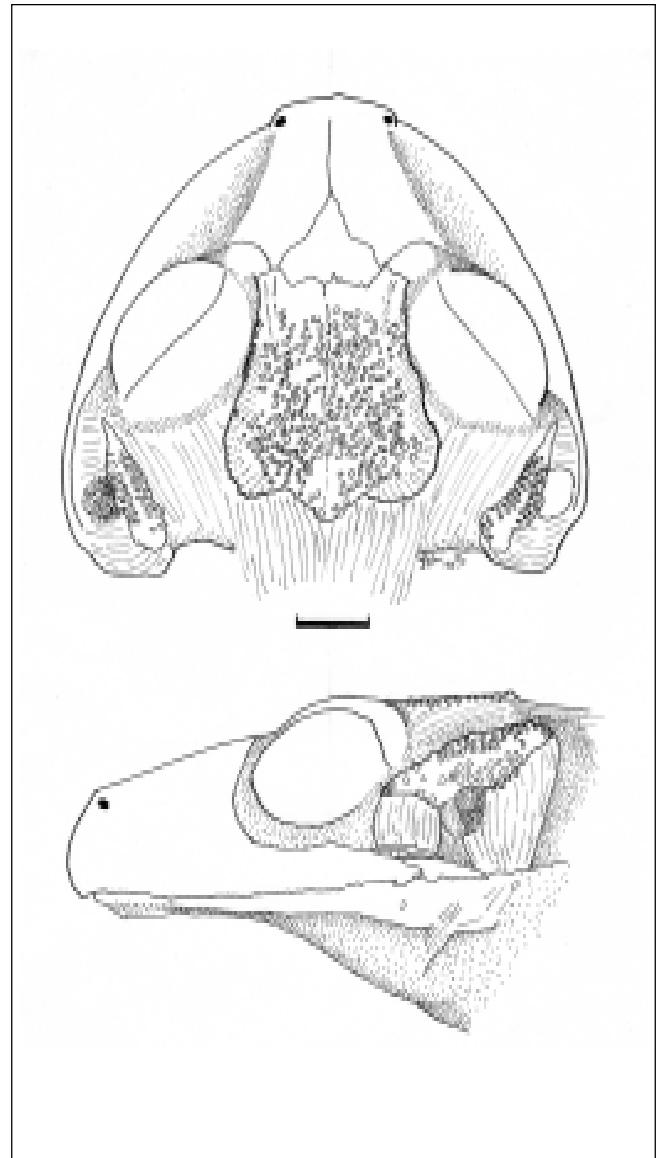
**Anatomy:** The skin of the head was carefully separated from underlying tissue of the female paratype in order to access certain features of the cranium because the squamosal and frontoparietal bones suggested some useful information could be found there (Fig. 3)—the posterior end of the frontoparietals projects above the nape and the squamosal is outlined as a “structure” dorsal to the supratympanic fold and tympanum. The mandibular ramus of the trigeminal nerve passes lateral to the *m. adductor mandibulae* (condition S) and the *m. depressor mandibulae* originates on the squamosal (condition SQ) (Fig. 5). The frontoparietals and the zygomatic and otic rami of the squamosal bear bony protuberances (Fig. 5). The frontoparietals are like those of *E. bellona* (Lynch, 1992) and *E. mars* (Lynch & Ruiz-Carranza, 1996) except that *E. bellona* has cranial crests. The bony knobs seen upon the squamosal are not seen in either *E. bellona* or *E. mars*.

The white flank “warts” (Fig. 3) seem to actually be glands when cut transversely and examined under high magnification under a stereoscope. With only four specimens available, it seems premature to make a histological preparation.

**Natural history:** Little is known. All four specimens are adults and appear to be in reproductive condition. All four were found in patches of primary forest, closely associated with streams.

## Discussion

In most frogs of the genus *Eleutherodactylus* (as well as in other frog species), the lateral margins of the frontoparietals are parallel or the brain case is wider anteriorly than near the posterior margins of the orbits (Figs. 95-97, 99, and 102 in Lynch, 1971). In frogs of the



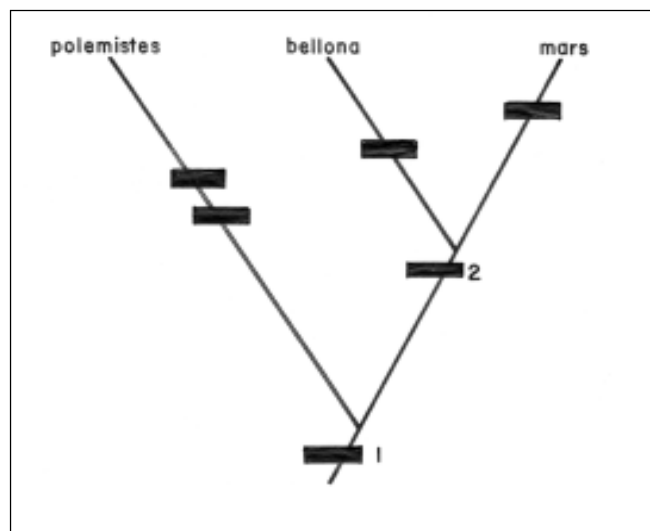
**Figura 5.** Dorsal and lateral views of skinned head of *Eleutherodactylus polemistes*, ICN 18810, scale equals 2 mm.

subgenus *Syrrhophus*, the braincase and the posterior margin of the orbits is broader than at the anterior margin (Figs. 106-107 in Lynch, 1971). Ornamentation of the frontoparietals occurs in relatively few species of *Eleutherodactylus* and takes the form of lateral or parasagittal crests or bony protuberances. In these cases, the tops of the frontoparietal bones, instead of being rounded, are flattened with obvious keels separating a frontoparietal table from the ascending processes of the frontoparietals.

In *E. bellona*, the only species studied ontogenetically, the frontoparietal table expands laterally near the posterior end of the table from an initial condition of the sides being parallel (Lynch, 1992), permitting the argument that the lateral expansion of the posterior part of the frontoparietal table is a derived condition. Out-group comparison results in the same conclusion. Thus, we suggest that this feature is a synapomorphy for the *E. bellona* species group, composed of three species—*E. bellona*, *E. mars*, and *E. polemistes*. A second synapomorphy is the co-ossification of the skin of the head and the underlying bones, shared by *E. bellona* and *E. mars*. Autapomorphies include: cranial co-ossification in males (*E. mars*), thick cranial crests (*E. bellona*), ventral expansion of the zygomatic and otic rami of the squamosal (*E. polemistes*), and white glands above the insertions of the limbs (*E. polemistes*). The discovery of these autapomorphies lends credence to some of the arguments of Mishler & Theriot (2000) without supporting the extreme counter position (Willmann & Meier, 2000: 113-114).

Lateral expansion of the frontoparietal table occurs in other species of *Eleutherodactylus*, for example in the *E. curtipes* group but there, the lateral expansion occurs above the mid-level of the orbits (Lynch, 1979, 1995, Lynch & Duellman, 1997) and this condition is seen in a wide assortment of frog species.

The fully resolved cladogram (Fig. 6) permits us to examine this clade relative to ideas in speciation (Lynch, 1999). Firstly, all three species are allopatric (or perhaps parapatric)



**Figura 6.** Cladogram for the species of the *Eleutherodactylus bellona* species group. Autapomorphies and synapomorphies are mentioned in text.

yet all occur in a very small (about 10-15 Km X 150 Km) geographic area on the northern part of the Cordillera Occidental. The presence of autapomorphies in each species is inconsistent with the expectations of peripatric speciation but not with those for vicariance (or dichopatric) speciation. The known geographic distributions of both *E. mars* and *E. polemistes* are small, surely reflecting the lack of adequate fieldwork, in comparison to that of *E. bellona*, small in contrast to many frog distributions but perhaps not for most northern Andean *Eleutherodactylus* (Lynch, 1998, 1999, Lynch & Duellman, 1997). Using Lynch's (1999:153) simple means of identifying different ecological subunits, *E. bellona* is scored as BC, *E. mars* as B, and *E. polemistes* as C—providing another case of ecological shifts associated with speciation. The brief distances between known distributions suggests that there has been no extinction of populations in the core of the distribution of this small clade of frogs.

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