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## A NEW FROG OF THE GENUS *ELEUTHERODACTYLUS* FROM EASTERN CUBA (ANURA: LEPTODACTYLIDAE)

ALBERTO R. ESTRADA<sup>1</sup> AND S. BLAIR HEDGES<sup>2</sup>

<sup>1</sup>*Instituto Investigaciones Forestales, Apartado Postal 5152, La Habana 5, Cuba*

<sup>2</sup>*Department of Biology, Pennsylvania State University, University Park, PA 16802, USA*

**ABSTRACT:** A new species of *Eleutherodactylus* is described from the Cuchillas de Moa in eastern Cuba. It is a member of the subgenus *Euhyas* and is most similar to *E. intermedius* of southern montane areas in eastern Cuba. The species differs from *E. intermedius* in being smaller (11.6-12.3 mm SVL, males; 13.0-14.0 mm, females) and having shorter digits, distinctive pattern features, and a different call.

**Key words:** Caribbean; West Indies; Systematics; Vocalization; Life history

THE biodiversity of the West Indies is rich in some groups and poor in others, as a result of a complex biogeographic history that has yet to be resolved (Hedges et al., 1992a; Williams, 1989). However, it is evident that on some islands, our knowledge of such basic information as the number of species is decidedly incomplete (Hedges, 1995). For example, the first representative of the anuran family Dendrobatidae from the West Indies was discovered only recently (Kaiser et al., 1994).

Cuba is one island for which our knowl-

edge of species diversity is poor in some groups, such as amphibians and reptiles. During the last few years, many new species of amphibians and reptiles have been discovered, especially in the eastern provinces. These include frogs (Estrada and Hedges, 1991; Hedges et al., 1992b), lizards (Estrada and Garrido, 1991; Garrido and Estrada, 1989; Garrido and Hedges, 1992; Hedges and Garrido, 1993; Thomas et al., 1992), and snakes (Hedges and Garrido, 1992a,b).

Recently, the senior author collected

anurans in the region of Monte Iberia, Cuchillas de Moa (Holguín Province), in extreme eastern Cuba. During this expedition, the goal of which was to determine the status of the ivory-billed woodpecker (*Camphiphilus principalis*), several small frogs were collected that clearly represent a new species of *Eleutherodactylus*.

#### MATERIALS AND METHODS

We use the following abbreviations: SVL = snout-vent length, HL = head length, HW = head width, TYM = tympanum width, EL = eye length, EN = eye-naris distance, IOD = interorbital distance, THL = thigh length, SHL = shank length, and FTW = fingertip (III) width. Museum abbreviations are CARE, collection of Alberto R. Estrada, Havana, Cuba; MNHNCU, collection of the Museo Nacional de Historia Natural, Cuba (Havana); and USNM, United States National Museum of Natural History. Measurements were taken with digital calipers (0.01 mm accuracy) and an ocular micrometer. In addition to the specimens of the new species listed in the description, we examined the following specimens of *Eleutherodactylus intermedius*: USNM 139342–343 (Cuba: Santiago de Cuba Province: Municipio Guamá; Pico Turquino, near Cueva del Aura) and USNM 500159 (Santiago de Cuba Province: Municipio Santiago de Cuba: Gran Piedra; Isabelica).

Calls were recorded with a Sony micro-cassette recorder and analyses were made with the use of Canary software (Cornell University). Terminology for call parameters follows Duellman and Trueb (1986).

#### *Eleutherodactylus tetajulia* sp. nov.

Fig. 1A

*Holotype*.—MNHNCU 662, an adult male from Arroyo Sucio (Anacleto) Arriba, on the western slope of Monte Iberia, Municipio Moa, Holguín Province, Cuba, 600 m, collected by Alberto Estrada on 19 April 1993.

*Paratypes*.—CARE 845 (male), CARE 846 (female), USNM 335654 (female; field number CARE 842), USNM 335655 (male,

field number CARE 843); all paratopotypes.

*Diagnosis*.—*Eleutherodactylus tetajulia* is considered to be a member of the subgenus *Euhyas* (Hedges, 1989), because the left lobe of the liver is long and pointed, the venter is smooth to weakly rugose, vomerine odontophores are long, and the digital tips are not enlarged. It is most closely related to *E. intermedius* with which it shares a moderately small body size, small digits, stocky body shape, and multiple-note call. It differs from *E. intermedius* in having a smaller body size (11.6–12.3 mm SVL, males; 13.0–14.0 mm SVL, females, in *E. tetajulia*; 15.1–16.4 mm SVL, males; 14.7–20 mm SVL, females, in *E. intermedius*; Barbour and Shreve, 1937), shorter digits, a loreal region that slopes more abruptly, an absence of vertical white bar on tip of snout, and a call with a higher frequency (3.8–3.9 kHz in *E. tetajulia* versus 2.9–3.0 in *E. intermedius*), shorter note interval (69–94 ms versus 155–182 ms), and shorter note duration (20–25 ms versus 35–53 ms). Another small leaf-litter species, *E. limbatus*, is superficially similar, but it has a pointed snout, sharply defined dorsolateral lines, and lacks vomerine teeth.

*Description*.—Head as wide as body, width equal to length; snout subacuminate in dorsal view, subacuminate in lateral view, projecting beyond lower jaw; nostrils weakly protuberant, directed dorsolaterally; canthus rostralis rounded, slightly concave in dorsal view; loreal region slightly concave, sloping gradually; lips not flared; upper eyelid bearing small, rounded tubercles; interorbital space without tubercles; supratympanic fold weakly defined, concealing upper edge of tympanic annulus; tympanum moderate sized, round, separated from eye by a distance less than its own diameter; one postrictal tubercle, enlarged, subconical; choanae moderate sized, round, partially concealed by palatal shelf of maxillary arch when roof of mouth is viewed from below; vomerine odontophores medial and posterior to choanae, each larger than a choana, curved and angled posteromedially, separated narrowly at midline; tongue longer than wide, pos-

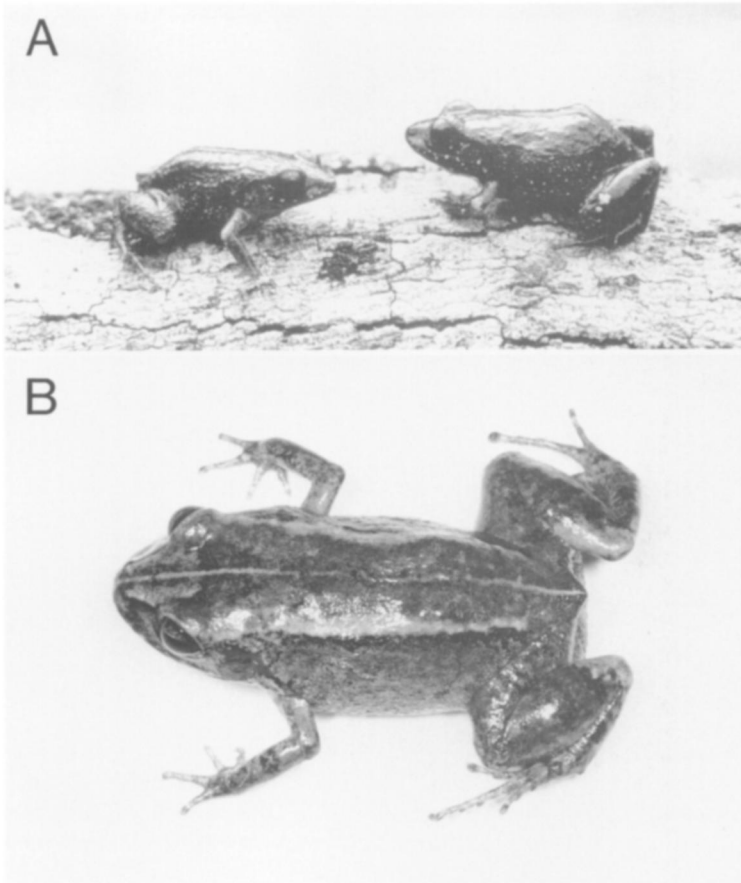


FIG. 1.—Cuban frogs of the genus *Eleutherodactylus*: (A) *E. tetajulia* (male on left, female on right), from the type locality (600 m) in Holguín province; (B) *E. intermedius* (female) from Isabelica, Gran Piedra, Santiago de Cuba Province (1150 m).

terior edge without notch, posterior two-thirds not adherent to floor of mouth; males with vocal slits; males with submandibular vocal sac.

Skin of dorsum weakly rugose, without dorsolateral folds; skin of flanks slightly more rugose; skin of venter smooth, with discoidal folds; anal opening not extended in sheath; supra-axillary glandular areas present; ulnar tubercles absent; palmar tubercle single, larger than oval and elevated thenar tubercle; several moderate-sized subconical, supernumerary tubercles; subarticular tubercles of fingers oval and subconical; weak lateral ridge on finger; Finger III with slightly expanded tip; fingertips pointed, triangular pad on ventral surface of fingertip; circumferential groove

bordering distal two-thirds of finger pad; width of largest pad (III) one-fourth that of tympanum; first finger shorter than second when adpressed; heel tubercles absent; no tubercles along outer edge of tarsus; metatarsal tubercles elevated, inner (oval) twice size of outer (subconical); no supernumerary plantar tubercles; subarticular tubercles of toes oval and subconical; toes unwebbed; weak lateral ridge on toe; Toes III–V with expanded tips; toetips pointed; triangular pad on ventral surface of toetip; circumferential groove bordering distal two-thirds of toe pad; heels not touching when legs flexed at right angles to sagittal plane.

In life, dorsal ground color coppery-brown with a dark brown middorsal hour-

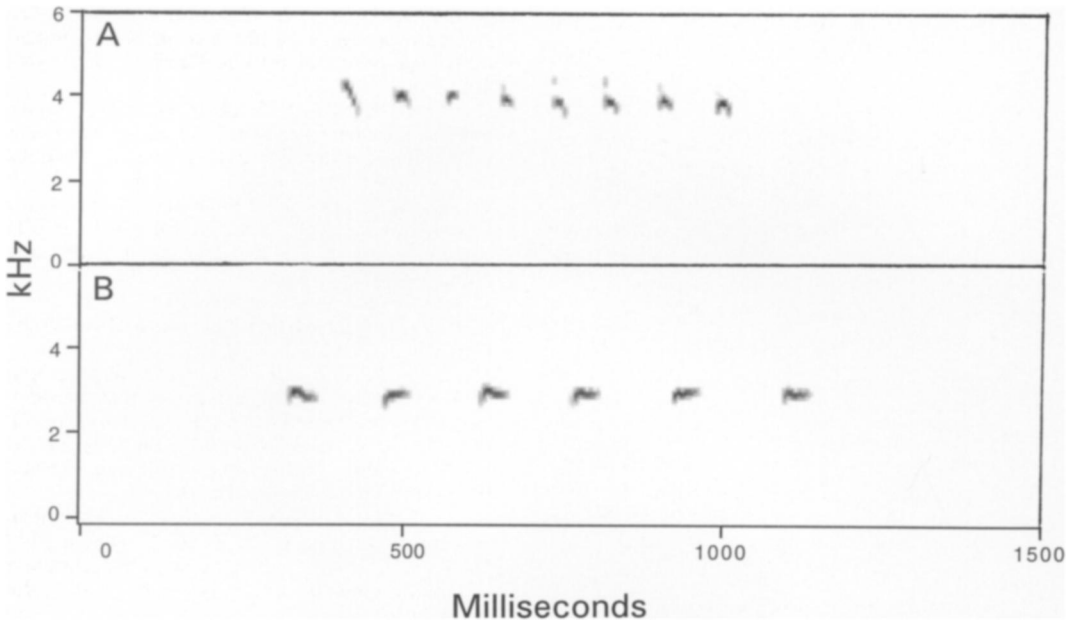


FIG. 2.—Audiospectrograms (narrow-band filter) of Cuban *Eleutherodactylus*: (A) *E. tetajulia*, from the type locality (600 m) in Holguín province; (B) *E. intermedius* from Isabelica, Gran Piedra, Santiago de Cuba Province (1150 m).

glass-shaped blotch; narrow black interocular bar; dark brown horseshoe-shaped sacral marking, with coppery color inside; black supratympanic and groin bars; flanks coppery-red; loreals purple, forearms reddish-brown; arms brown with a black bar; thigh with three black bars; shank with three dark brown cross bars; venter purple with white markings (based on MNHNCU 662). In preservative, dorsal ground color tan; brown triangular interocular bar; two dark brown suprascapular blotches; dark brown sacral marking; flanks brown; loreals dark brown; forearms tan with two brown bars; arms tan with a brown bar; dorsal surface of thigh pale brown with two faint bars; shank with three dark brown bars; venter tan with white and brown markings (based on MNHNCU 662).

**Measurements.**—The measurements (in mm) of the male holotype, the two male paratypes, and the two adult females are: SVL, 12.2, 12.3, 11.6, 13.0, 14.0; HL, 4.5, 5.1, 4.6, 5.5, 4.9; HW, 4.3, 4.5, 4.3, 5.2, 4.0; TYM, 0.8, 0.9, 0.5, 1.1, 1.0; EL, 1.5, 1.8, 1.7, 1.8, 1.5; EN, 1.1, 1.1, 1.0, 1.3, 1.2; THL, 4.9, 5.4, 5.1, 6.0, 6.0; SHL, 4.8, 5.4, 5.0, 5.7, 5.9; FTW, 0.2, 0.2, 0.2, 0.2, 0.2; and TTW, 0.2, 0.2, 0.2, 0.3, 0.2.

**Etymology.**—The name *tetajulia*, a noun in apposition, refers to Las Tetas de Julia (the breasts of Julia), two prominent peaks on Monte Iberia near the type locality.

**Natural history.**—The type series was collected at night while the frogs were active on leaf litter of the secondary hardwood forest on the western slope of Monte Iberia. The region is humid and receives high rainfall (>1600 mm/year). Two individuals (male and female) were collected along with six eggs from within a hole formed by the decayed center of a tree fern about 10 cm above the ground. The eggs probably were from another female, because the female collected (USNM 335654) was gravid. The male was calling at the time that they were collected. This observation of a male and female together with eggs is unusual in *Eleutherodactylus*, and a similar observation was made in the sister species *E. intermedius* (Estrada, 1992). However, it may be interpreted as either male and female parental care, or simply male parental care. Males of other species of *Eleutherodactylus* have been observed calling while guarding clutches (S. B. Hedges, personal observation). The

frogs were calling during the day and night from concealed locations on the forest floor.

The call of *Eleutherodactylus tetajulia* consists of a series of 4–13 ( $\bar{x} = 9.4 \pm 1.69$ ;  $n = 5$ ) evenly spaced “chirps,” somewhat similar to the call of *E. intermedius* (Fig. 2). However, the dominant frequency of *E. tetajulia* (3.8–3.9 kHz;  $n = 10$ ) is higher than that of *E. intermedius* (2.9–3.0 kHz;  $n = 7$ ); the note interval is shorter in *E. tetajulia* (69–94 ms versus 155–182 ms), and the note duration is shorter in *tetajulia* (20–25 ms versus 35–53 ms). Also, a major difference between these two species is the number of notes per call. Typically, *E. intermedius* gives a single note per call and only occasionally breaks into the multiple-note call shown in Fig. 2B. On the other hand, all of the many calls of *E. tetajulia* heard by the senior author were multiple-note calls, similar to that shown in Fig. 2A.

**Distribution.**—*Eleutherodactylus tetajulia* is known only from the type locality whereas *E. intermedius* is known from montane areas in the southern portion of eastern Cuba (Schwartz and Henderson, 1991). The nearest locality of *E. intermedius* to Monte Iberia (*E. tetajulia*) is in the Sierra de Imias approximately 40–45 km to the south.

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