

## Rediscovery of the Cuban Frogs *Eleutherodactylus cubanus* and *E. turquinensis* (Anura Leptodactylidae)

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**ABSTRACT** – Two species of Cuban frogs discovered in 1936 but not collected since then have been rediscovered. *Eleutherodactylus cubanus* Barbour is a very small leaf-litter species and *E. turquinensis* Barbour and Shreve is an aquatic species associated with mountain streams. Both apparently are restricted to intermediate elevations in the Sierra Maestra of eastern Cuba. *Eleutherodactylus cubanus* has a clutch size of one and resembles another small Cuban species, *E. limbatus* Cope. The affinities of *E. turquinensis* apparently are with several other riparian species of Cuba (*E. cuneatus* Cope, *E. sierramaestrae* Schmidt, and *E. toa* Estrada and Hedges).

### INTRODUCTION

In June 1936, Philip J. Darlington made collections of anurans on Pico Turquino in the Sierra Maestra of eastern Cuba. Several species discovered at or near a locality on the south slope, Cueva del Aura, were described by Barbour and Shreve (1937). Two of these species, *E. cubanus* (the original name *E. parvus* Barbour and Shreve was preoccupied by *Hylodes parvus* Girard and replaced by *E. cubanus*; Barbour, 1942) and *E. turquinensis*, have not been collected since then despite many visits to Pico Turquino and the Sierra Maestra during the last 60 years (Schwartz, 1985). A notation in Hedges (1993) that these two species had been collected during 1989-1990 was based on misidentified specimens: *E. cubanus* resembles an undescribed species, and *E. turquinensis* is very similar to its sympatric sibling *E. sierramaestrae* (see below). Until now, these two species have been the only Cuban amphibians that have not been seen in recent years (Hedges, 1993). Between 30 June and 4 July 1994, we encountered both species in the Sierra Maestra. A single specimen of *E. cubanus* was collected on the north slope of Pico Turquino and *E. turquinensis* was found at three localities on the north and south slopes of the Sierra Maestra (Fig. 1).

### *Eleutherodactylus cubanus* Barbour

The new locality for *E. cubanus* is El Joaquín (1300-1400 m)—a field station within Parque Nacional Sierra Maestra on the trail (north slope) to Pico Turquino (Fig. 1). The trail begins at El Naranjo (850 m), a parking area several km south of Santo Domingo, and heads to the east for about 10-12 km (4-5 h) to El Joaquín; the trail eventually bends to the south along Estribo Turquino before reaching Pico Real (1972 m), which is the summit of Pico Turquino. The single specimen of *E. cubanus* (Fig. 2) was collected while turning rocks and dead leaves during the day in the moist cloud forest habitat at El Joaquín. Night collecting in that area yielded other species (*E. albipes* Barbour and Shreve, *E. sp. nov.*, *E. sierramaestrae*, and *E. turquinensis*) but not *E. cubanus*.

The specimen of *E. cubanus* (CZACC uncatalogued) is an adult female (0.18 g) with a single enlarged egg, and it agrees with the original description. The coloration in life, not provided in the original description, was reddish-brown dorsally, with lighter tan dorsolateral areas, a narrow light tan middorsal stripe with two dark brown sacral spots, and a very dark brown lateral region from the tip of the snout to the groin region. The two front limbs were bright red above and below, except for

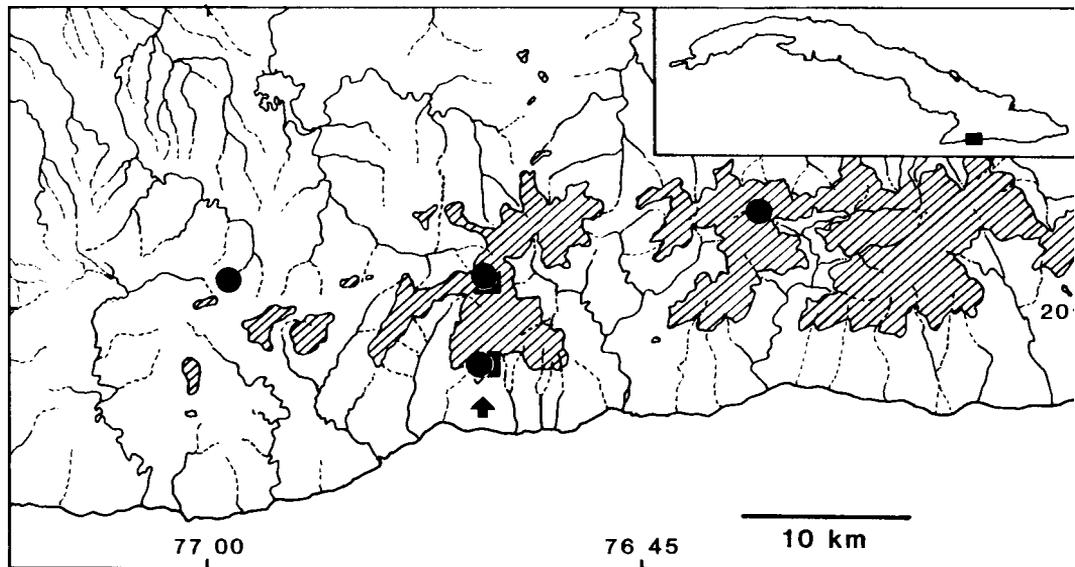


FIG. 1. Localities of *E. cubanus* (squares) and *E. turquinensis* (circles). The arrow indicates the type locality for both species, Cueva del Aura (1060 m, Santiago de Cuba Province). The other localities, all from Granma Province, are reported herein (left to right): 1.4 km N Minas del Frío (845 m; *E. turquinensis*), El Joaquín (1300-1400 m; both species), and El Manguito (1110 m; *E. turquirzermis*). Crosshatching indicates area above 1000 m elevation.

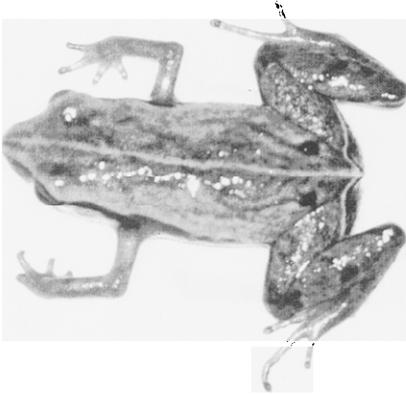
brown digital tips; the chin was reddish-tan mottled with white; the belly and underside of the hindlimbs were dark brown with an infusion of reddish-tan chin color anteriorly, and with some white flecking. The eye color was dark brown with a coppery tinge above.

*Eleutherodactylus turquinensis*  
Barbour and Shreve

The three new localities for *E. turquinensis* (USNM 348802-805) are small mountain streams at intermediate elevations (845-1400 m) in the Sierra Maestra (Fig. 1). Mountain streams at lower and higher elevations were unsuccessfully searched for *E. turquinensis* on this and previous expeditions. At the three localities, the species was observed in large numbers clinging to wet rocks directly in the splash zone or underwater. When disturbed, the frogs typically dove underwater to escape. El Manguito is a largely abandoned mining community at the headwaters of the Río Peladeros, which flows south to the Caribbean. The valley at El Manguito has been deforested, leaving only small secondary

growth of mostly bushes bordering the 1-2 m wide rocky stream. Horses and farm animals frequented the stream. The second locality is a small rocky stream (10-20 cm wide) in undisturbed cloud forest habitat just below (200 m by trail) El Joaquín (described above for *E. cubanus*) on the north slope of Pico Turquino; it is referred to as "La Aguada del Joaquín." At night, several males were found calling from crevices between rocks on the bank of the stream; some females were encountered sitting on rocks surrounding a small, sheltered, pool in the stream. The third locality is a small stream (about 1 m wide) 1.4 km N Minas del Frío on the north slope of the Sierra Maestra flowing into the Río Jibacoa. Males, females, and juveniles were found exposed on rocks in the stream during the day and at night. Some males called at night from concealed locations on the ground next to the stream, presumably to attract females to terrestrial egg-laying sites. A large adult female (USNM 348803; 45.1 mm SVL) has 24 enlarged eggs and a large adult male (USNM 348805; 36.7 mm SVL) has large black testes.

A



B

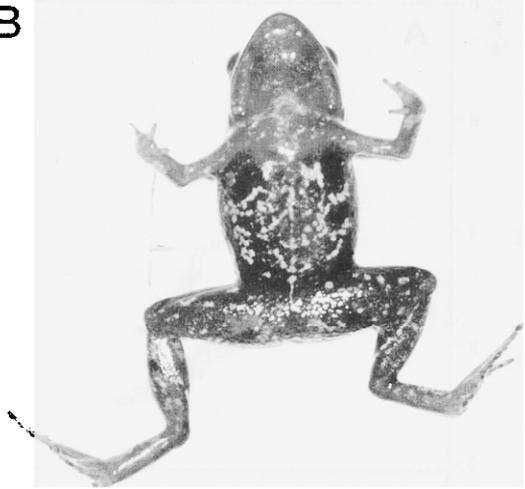


FIG. 2. *Eleutherodactylus cubanus*, adult female, from El **Joaquín** (1300-1400 m), Granma Province, Cuba: (A) dorsal view, (B) ventral view.

The coloration in life for *E. turquinensis*, also not provided in original description, was a mottled tan, brown, greenish-brown, or orange-brown dorsal ground color with darker brown markings (Fig. 3); hindlimb bars were narrow or wide and variable in number; and a scapular chevron-like marking was sometimes present. The entire dor-

sal surface of the head of some individuals was brick red, and this color also was present on the limbs of some individuals. The white venter usually had extensive dark brown stippling or spots, and the eye color was greenish-gray.

The species most easily confused with *E. turquinensis* is *E. sierramaestrae*. Both are sim-



FIG. 3. *Eleutherodactylus turquinensis*, adult female, from 1.4 km N Minas del **Frío**, 845 m, Granma Province, Cuba.

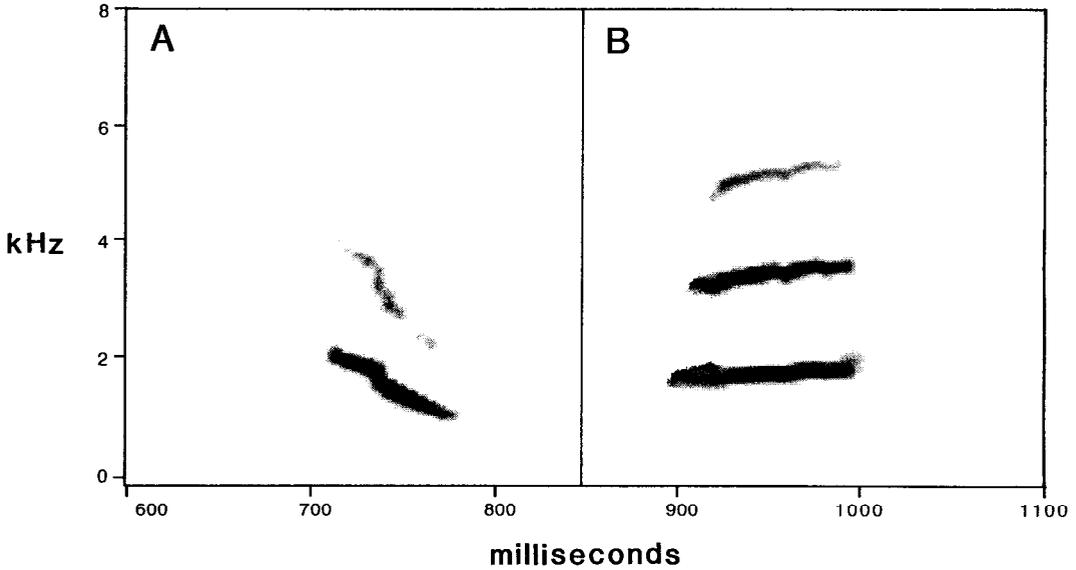


FIG. 4. Calls of two sympatric species of *Eleutherodactylus* from the Sierra Maestra of eastern Cuba: (A) *E. sierramaestrae* (Santiago de Cuba Province, Pico Mar Verde "Pico Cardero" on S.W. slope of Pico Turquino, 1230 m); (B) *E. turquinensis* (Granma Province, 1.4 km N Minas del Frío, 845 m). Analysis was performed with Canary software (Cornell University) using a wide-band (350 Hz) filter.

ilar in size, general shape, and frequently have a dark, mottled dorsal color pattern. In addition, both were syntopic at each of the three new localities, and Darlington mentioned their co-occurrence at Cueva del Aura (Barbour and Shreve, 1937). As noted in the original description, *E. turquinensis* is distinguished from *E. sierramaestrae* by having more webbing on the feet, a smoother dorsum (but still tuberculate), and more rounded digital disks. These features are found in other members of the aquatic ecomorph of West Indian *Eleutherodactylus* (Hedges, 1989a, b) and apparently are adaptations to a stream-dwelling lifestyle. *Eleutherodactylus sierramaestrae* frequents the banks of streams and even dives into the water when disturbed, but it is more terrestrial in habits than *E. turquinensis* (as was also observed by Darlington). An additional morphological character that we noted in the field was that the heels of *E. turquinensis* do not overlap, and usually do not contact when the folded legs are held at right angles to the body axis, whereas they overlap in *E. sierramaestrae*, which has longer legs. *Eleutherodactylus turquinensis* also has a shorter snout than *E.*

*sierramaestrae*, and fingers II and IV are of equal length, whereas finger IV is distinctly longer than II in *E. sierramaestrae*. The call of *E. turquinensis* is a "chirp" similar to *E. sierramaestrae* (Fig. 4). The calls differ in that *E. turquinensis* has a slightly rising quality whereas the call of *E. sierramaestrae* descends sharply in frequency. Otherwise, the dominant frequency and call duration is similar.

#### DISCUSSION

The field notes of Darlington for *E. turquinensis* (reported in Barbour and Shreve, 1937) agree with our findings that this species appears to be restricted to streams of intermediate elevations, rather than streams near sea level or on the higher peaks. *Eleutherodactylus cubanus* also appears to be an intermediate-elevation species. Perhaps a restricted elevational distribution explains the fact that neither species has been collected during the last 60 years. The type locality of both species, Cueva del Aura (1060 m), is on the "old trail" to Pico Turquino that began at Potrerillo on the south coast and is no longer used. The present trail leading to Pico Tur-

quino from the south side begins at Las Cuevas and goes by La Esmajagua and Pico Mar Verde before reaching Pico Cuba and Pico Real (Schwartz and Hedges, 1991). The two larger streams on the new trail, one near La Esmajagua (560 m) and the other at a camp just below Pico Cuba (1720 m), yielded no *E. turquinensis* in 1989 during day and nighttime searches. It is possible that those two streams surpass the elevational range of the species. Likewise, this may explain the absence of *E. cubanus* from extensive collections made on Pico Cuba and Pico Real (1700–1974 m); only minor collecting was made along the trail at intermediate elevations during the 1989 expedition.

The phylogenetic relationships of these two species are not well known. Barbour and Shreve (1937) pointed out similarities between *E. cubanus* and three other Cuban species: *E. albipes*, *E. intermedius* Barbour and Shreve, and *E. varleyi* Dunn. For *E. turquinensis*, they suggested a close relationship to *E. sierramaestrae* and *E. brevipalmatus* Schmidt (= *E. sierramaestrae*). Later, Schwartz (1958) essentially agreed with these associations and, using the four species groups established by Dunn (1926) for Cuban *Eleutherodactylus*, placed *E. cubanus* in the *dimidiatus* group (along with *E. albipes* and *E. intermedius*) and *E. turquinensis* in the *ricordi* group (along with *E. sierramaestrae*). Shreve and Williams (1963) moved *E. cubanus* to the *varleyi* group and added a Hispaniolan species (*E. glanduliferoides* Shreve). Schwartz (1964) later concurred with this new arrangement. Joglar (1989) moved *E. cubanus* to the *unistrigatus* group, apparently because of its short vomerine odontophores, although short (or absent) odontophores often are seen in small frogs. In defining subgenera within *Eleutherodactylus*, Hedges (1989b) did not have molecular data for *E. cubanus* or *E. turquinensis* but was able to allocate those two species to the subgenus *Euhyas*, a western Caribbean group, based on correlated morphological characters (e.g., liver shape, skin texture, size of digital tips, presence or absence of a vocal sac). He also noted that the Hispaniolan members of the *varleyi* group possessed glandular areas and other characters associat-

ing them with the *bakeri* series of Hispaniola, so he redefined the *varleyi* group to include only the two Cuban species *E. cubanus* and *E. varleyi*. The species *E. turquinensis* was left unassigned to group or series within the subgenus.

No additional data have been published bearing on the relationships of *E. cubanus* or *E. turquinensis*. However, the similarity in body size and shape of *E. cubanus* and *E. limbatus* (e.g., Barbour and Shreve, 1937: Plate 2) suggests a possible close relationship between these two species not previously noted (both also have a clutch size of one). Also, the resemblance of *E. turquinensis* to *E. sierramaestrae* strongly suggests a close relationship between those two species (as noted by Darlington and others), and in turn with the other riparian species of Cuba, *E. cuneatus* and *E. tea*.

*Acknowledgments.* —We thank the other members of the joint Penn State/Cuba 1994 herpetological expedition to Oriente for their assistance: Emilio Alfaro and Tony Perez-Asso (Museo Nacional de Historia Natural de Cuba), and Richard Thomas (University of Puerto Rico). Collecting and export permits were kindly granted by the government of Cuba. The senior author was supported by grants from the National Science Foundation (BSR 8906325 and BSR 9123556).

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