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A New Species of Frog of the *Eleutherodactylus ricordi* Group from Central Cuba

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INTRODUCTION

During the summer of 1957, under the auspices of the National Science Foundation and with the competent assistance of Messrs. John R. Feick, William H. Gehrmann, Jr., and Richard Thomas, large collections of *Eleutherodactylus* were made in the western and central portions of Cuba. As mountains afford maximum cover, in the form of broadleaf forests, for these leptodactylid frogs, the mountain masses of the Sierra de Trinidad in Las Villas Province and the Sierra de Cubitas and Sierra de Najasa in Camagüey Province were visited, as well as many low areas in these provinces. In the Sierra de Trinidad a long series of *Eleutherodactylus greyi* Dunn was collected. In the Sierra de Cubitas, large numbers of moderate-sized to large frogs were taken which at the time of capture were assumed to be this same species. Study of these series, as well as individuals from the base of the Sierra de Trinidad and from the Sierra de Najasa, shows that there are in reality two very distinct species involved, both of which have been previously identified as *E. greyi*. In addition, the new species is represented in the collections by two geographic races.

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which they are affiliated, and for access to the collections in their care: Mr. Charles M. Bogert and Dr. Richard G. Zweifel, the American Museum of Natural History (A.M.N.H.); Mr. E. Milby Burton and Miss Emma B. Richardson, Charleston Museum (Ch.M.); Dr. Norman E. Hartweg, Museum of Zoology, University of Michigan (U.M.M.Z.); Dr. Ernest Williams and Mr. Benjamin Shreve, Museum of Comparative Zoölogy (M.C.Z.); Dr. Doris M. Cochran, United States National Museum (U.S.N.M.). Dr. Frederick A. Shannon (F.A.S.) has allowed me to borrow a small collection of Cuban eleutherodactyls which has proved to be significant in the present study. Mr. Robert W. Hussey has graciously examined the type of *E. greyi*. Finally, Messrs. Feick, Gehrman, and Thomas, as well as Srs. Alfredo Alvarez Mola and Octavio Noda, have my sincere thanks for the courtesies extended to me and help in the collecting of the material on which the present report is based.

Eleutherodactylus greyi Dunn

Eleutherodactylus greyi was described by Dunn (1926, p. 213) on the basis of 50 specimens from the Sierra de Trinidad and Soledad, the latter being the type locality. Soledad is situated at the western base of the Sierra de Trinidad, and Dunn had available to him nine specimens (including the type) from this locality. In the same publication (p. 211) Dunn remarked that *greyi* was "quite common" at Soledad. Mrs. Dunn has sent me Dunn's personal copy of this 1926 paper, in which he had corrected "quite common" to "uncommon." This correction is quite in line with my own experience at Soledad, as I have taken only a single *greyi* at the type locality, despite extremely favorable weather conditions for frogs. In fact, other than the type, eight paratypes, and three other individuals, there appear to be no other specimens of *greyi* from the type locality or its immediate environs.

On the other hand, *E. greyi* is abundant in the Sierra de Trinidad at higher elevations (2000 feet), such as at Topes de Collantes. Here, as at Soledad, it is an inhabitant of mesic situations along streams, where rocks and outcroppings are prevalent, in dense broadleaf forest. It is my opinion that elevation does not play an important part *per se* in the distribution of *greyi*, but rather that *greyi* occupies mesic *monte*, with a rocky substrate, whether at a high or a low elevation.

At San José del Lago, in northeastern Las Villas, *greyi* was found in the same sort of situation as in the Sierra de Trinidad, but not at so high an elevation (800 feet). Nearby, near Yaguajay, these frogs were taken on rocks at the edge of a river, again in dense forest. In the

Sierra de Cubitas, they were found at a moderate elevation (1000 feet) within the Cueva de los Indios; this cave is situated in virgin *monte*.

In summary, *E. greyi* is now known from the provinces of Las Villas and Camagüey; it occurs both at high and low elevations, but is much more common at higher elevations; its habitat is mesic forest with rocky outcroppings, cliffs, or *seboruco*, and especially where there is well-shaded talus.

I have examined the following specimens: *Las Villas*: Soledad, 11 (A.M.N.H. No. 60950; M.C.Z. Nos. 11131, 11529–11534, 12670; F.A.S. Nos. 5010–5011); western edge, Trinidad Mountains, eight (M.C.Z. Nos. 12065–12069; U.M.M.Z. No. 63970, three); Buenos Aires, Trinidad Mountains, five (M.C.Z. Nos. 21921–21925); Planta, four (M.C.Z. Nos. 11065–11068); Hoyo Colorado, one (M.C.Z. No. 10614); Mina Carlota, near Cumanayagua, 25 (M.C.Z. Nos. 11485–11510); 4 kilometers west, 12 kilometers north, of Trinidad, 55 (A.M.N.H. Nos. 60954–60986, 60988–61009); Topes de Collantes, three (A.M.N.H. Nos. 61010–61012); cliffs at San José del Lago, 13 (A.M.N.H. Nos. 61016–61028); 1.2 miles south of Yaguajay, four (A.M.N.H. Nos. 61030–61032, 61034). *Camagüey*: Cueva de los Indios, Paso de la Trinchera, 6.5 miles northwest of Banao, 10 (A.M.N.H. Nos. 61064–61067, 61069–61071, 61073–61075); cave entrance near Banao, five (M.C.Z. Nos. 30357–30359, 30364, 30366); cave near Banao, one (M.C.Z. No. 30367); just south of Jaronú, one (M.C.Z. No. 30370).

The new species, which is described below, has been moderately well represented in collections up to the present time, but specimens have erroneously been identified as *E. greyi*. The two are rather similar superficially, but *greyi* reaches a larger size, has relatively longer legs and longer fourth toe, and differs in pattern as well as in habitat. Two distinct populations of this new species are herein recognized. I take great pleasure in naming the species after Mr. Richard Thomas, who was instrumental in collecting, with Messrs. Gehrman and Feick, the large series from Camagüey.

Eleutherodactylus thomasi, new species

DEFINITION: An *Eleutherodactylus* of the *ricordi* group with three glandular areas (one at angle of jaws, second above the insertion of the forelimb, and the third anterior to the hind limb insertion), enlarged digital discs on all fingers, those on fingers 3 and 4 larger than those on fingers 1 and 2, vomerine teeth in two very long, slightly arched series and laterally appressed closely to the posterior margin of the choanae,

tan dorsum with more or less prominent dorsal spotting, and a well-defined brown interocular bar.

The population of *E. thomasi* may be readily differentiated into two distinct subspecies on the basis of coloration and pattern, proportions, and adult size.

***Eleutherodactylus thomasi thomasi*, new subspecies**

TYPE: A.M.N.H. No. 61054, an adult female, from 6.5 miles northwest of Banao, Paso de la Trinchera, Sierra de Cubitas, Camagüey Province, Cuba, taken August 18, 1957, one of a series collected by J. R. Feick, W. H. Gehrmann, Jr., R. Thomas, and A. Schwartz. Original number 4092.

PARATYPES: (All from Camagüey Province, Cuba). A.M.N.H. No. 61041, 5.5 miles northwest of Banao, Paso de Lesca, Sierra de Cubitas, August 16, 1957, A. Schwartz; A.M.N.H. Nos. 61042–61043, Olla de Bonnet, Sierra de Cubitas, August 17, 1957, A. Schwartz, R. Thomas; A.M.N.H. Nos. 61044–61053, 61055, 61056, 61058–61063, same data as type; A.M.N.H. Nos. 61068, 61072, 61076, Cueva de los Indios, Paso de la Trinchera, 6.5 miles northwest of Banao, August 19, 1957, J. R. Feick, R. Thomas; M.C.Z. Nos. 30360–30363, 30365, cave entrance near Banao, R. Ruibal; 30368–30369, cave just south of Jaronú, August 1, 1957, Molina and R. Ruibal.

DISTRIBUTION: Known from the Sierra de Cubitas and Sierra de Najasa in Camagüey Province, and the Sierra de Jatibonico in northeastern Las Villas Province. Specimens from the last locality are intermediate between the nominate form and the more southern and western subspecies.

DEFINITION: An *Eleutherodactylus* of the *ricordi* group characterized by moderate size (average snout–vent length in females, 41 mm.; in males, 25 mm.), tan to gray dorsal coloration overlain by indistinct and diffuse dark blotches or spots, dark interocular bar, and relatively long hind limbs (femur/snout–vent ratio, 43.0–50.4 in females, 46.8–50.8 in males).

DESCRIPTION OF TYPE: An adult female, with the following measurements (all measurements in millimeters): snout–vent length, 43.4; distance from snout to posterior border of tympanum, 16.5; greatest width of head, 16.7; longitudinal diameter of tympanum, 3.0; longitudinal diameter of eye, 5.5; naris to eye, 5.7; femur, 20.3; tibia, 22.2; fourth toe, 18.9. Head only slightly broader than distance from snout to posterior border of tympanum; snout decidedly truncate, with nares prominent at anterior end of canthus rostralis; diameter of eye slightly

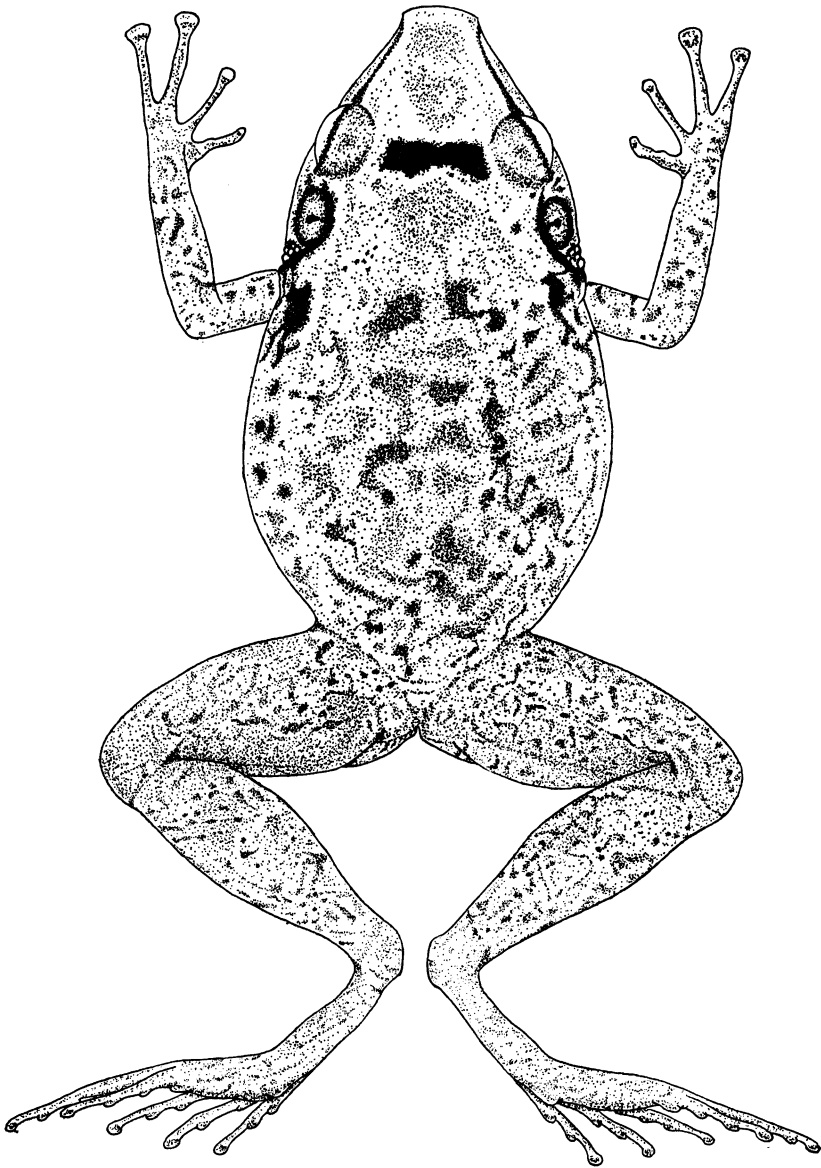


FIG. 1. *Eleutherodactylus thomasi thomasi*, type, A.M.N.H. No. 61054, adult female, snout-vent length, 43.4 mm. Drawn by Sandra L. Bressler.

less than distance from naris to anterior corner of eye; interorbital space 5.8, greater than diameter of eye; diameter of tympanum much less than diameter of eye, distance from tympanum to eye about half of diameter of tympanum; tympanum oval, its vertical diameter (3.8) greater than its horizontal (3.0). Digital discs present, those on fingers 3 and 4 distinctly larger than those on fingers 1 and 2, disc of third finger equal to about one-third of size of tympanum. Fingers long and slender, unwebbed, 3-4-2-1 in order of decreasing length; subarticular tubercles well developed, gray. Toes moderately long and slender, unwebbed, 4-3-5-2-1 in order of decreasing length. Heels do not touch when femora are held at right angles to body axis. Dorsum extremely and minutely shagreened, almost rugose, with a raised median line from snout to just above vent; upper eyelids with many minute tubercles. Large, low, rounded tubercles between the angle of the jaw, tympanum, and forelimb insertion, the largest and posteriormost of which is distinctly glandular; a second glandular prominence, larger than the first, located above the insertion of the forelimb; a third large glandular area on the side, just anterior to the hind limb insertion. Throat and belly smooth, with belly disc very well developed. Dorsal surfaces of forelimbs and hind limbs covered with low rugosities. Posterior and ventral surfaces of thighs covered with large, flattened, indistinct, pavement-like granules. Tongue oval, free behind, its greatest width equal to about three-quarters of that of floor of mouth. Vomerine teeth in two very long, slightly arched series, beginning at outer margin of choanae and extending almost to the midline of roof of mouth; each series closely appressed to the posterior margin of the choana at the lateral shorter section of the series, and the two series separated medially by a distance less than the diameter of a choana.

COLORATION OF TYPE: (Based on field notes from life). Dorsum pale tan, mottled with brown. A pair of poorly defined, and not particularly more prominent, diffuse, brownish, scapular spots; a prominent brown interocular bar; a bold brown canthal stripe from snout through naris to anterior corner of eye, absent from upper eyelid, and continuing from posterior corner of eye through and above dorsal sixth of tympanum, and thence ventrally to insertion of forelimb; an accessory brown blotch, beginning on the same level as the postocular line but separated from it by about the diameter of the tympanum, beginning above the insertion of the forelimb and extending slightly posteriorly, where it becomes obscured by heavily brown lateral mottling; dorsal surface of forelimbs and hind limbs much flecked and mottled with brown; digits a uniform tan; concealed surfaces of thighs tan, uni-

colored with dorsal ground color; venter pearly white, with scattered brown chromatophores along sides and on ventral surfaces of limbs; throat only slightly more darkly pigmented than remainder of venter; three glandular areas with a tinge of yellow in preserved specimen.

VARIATION: There are 15 females (other than the type), 12 males, and five juvenile specimens of *E. t. thomasi* available for study. Measurements of the 15 largest females (including the type) are: snout-vent, 40.6 (37.6–43.4); head length, 15.5 (14.3–16.5); head width, 15.5 (14.1–16.7); tympanum, 2.9 (2.5–3.3); eye, 5.3 (4.5–6.0); naris to eye, 5.5 (4.9–6.1); femur, 18.7 (17.0–20.3); tibia, 19.8 (17.6–22.2); fourth toe, 16.5 (14.5–18.9). Two of the females (snout-vent lengths, 42.6 and 40.8) are gravid. The 10 largest males have the following measurements: snout-vent, 25.3 (24.5–26.3); head length, 10.3 (9.8–10.8); head width, 9.9 (9.2–10.4); tympanum, 2.3 (2.1–2.4); eye, 3.7 (3.0–4.1); naris to eye, 3.4 (3.0–3.8); femur, 12.2 (11.5–13.0); tibia, 12.4 (11.5–13.2); fourth toe, 11.0 (9.6–11.7). The juveniles range in snout-vent length from 14.0 to 21.5. Sexual differences include the smaller adult size of the males, with proportionately smaller dimensions of body parts. The naris to eye distance is greater than the diameter of the eye in females and is less than the diameter of the eyes in males. Adult males, when compared with juvenile females of the same snout to vent length, have relatively larger tympana.

Structurally, both males and females resemble the type closely. The dorsum is always shagreened, the venter smooth, and the belly disc unusually well developed for Cuban eleutherodactyls. The vomerine teeth are always in long, arched series, closely appressed to the choanae laterally, and approaching each other medially, as in the type. The three glandular areas are prominent in most specimens, especially if the ground color is very light tan.

Chromatically, there is much variation. There are 16 females, 12 males, and five juveniles from the Sierra de Cubitas and Sierra de Najasa which are discussed separately from the series from the Sierra de Jatibonico and associated *lomas* in northern Las Villas and Camagüey provinces. The majority of the central Camagüey series resembles the type in coloration and pattern; exceptions to this are slightly darker (more gray) dorsal ground color, more or less prominence of the dorsal spotting, and scattered orange flecks on the dorsum. The interocular bar is a constant feature, but even it may be somewhat more reduced than in the type. In several specimens, the scapular spots are very reduced or even absent, especially in the adult males. The throat may be darkly and uniformly (not mottled) pigmented with brown

chromatophores; the margins of the lower lips are usually spotted, although this condition is absent in the type. Three of the females show indications of dorsolateral stripes, which in life were relatively prominent and more brightly (yellowish or reddish) colored than the dorsal ground color. The degree of dorsal spotting varies greatly, and some specimens (A.M.N.H. No. 61048) are almost unicolored tan dorsally, whereas others (A.M.N.H. No. 61056) are more heavily spotted, although in these more heavily spotted individuals the entire aspect of the frog is one of diffuse rather than distinct spotting. A single male (A.M.N.H. No. 61052) has banded hind limbs and is thus exceptional in the entire series. The type specimen is almost precisely intermediate between the extremes in degree of dorsal spotting and coloration.

From the Sierra de Jatibonico there are available six females and one juvenile as follows: *Las Villas*: 1.2 miles south of Yaguajay, two (A.M.N.H. Nos. 61029, 61033); *Camagüey*, Loma de Cunagua, 12 miles east of Morón, two (A.M.N.H. Nos. 61035, 61036); Loma de Cunagua, 14 miles east of Morón, three (A.M.N.H. Nos. 61037, 61039, 61040). These specimens are quite close in coloration and pattern to the Sierra de Cubitas material but show a strong tendency for more prominent spotting on the posterior dorsum, more pronounced interocular bar, and a bit more well-defined scapular dark areas. In size the adult females are close to the central Camagüey specimens, and resemble them in the length of the femora, although No. 61039 has relatively short femora for the more western subspecies. As the Sierra de Jatibonico is intermediate geographically between the Sierra de Cubitas (occupied by the nominate subspecies) and the Sierra de Trinidad, it may not be inappropriate to regard these specimens as intergrades between the two forms involved. The pattern of the series taken as a whole is intermediate between the two races, and the variable length of the femur likewise adds weight to this allocation. The single specimen from the Sierra de Najasa (A.M.N.H. No. 61301, *Camagüey*, 3.8 miles south, thence 5.1 miles west of Ecuador) agrees well with the series from the Sierra de Cubitas.

COMPARISONS: *Eleutherodactylus thomasi* is a member of the *ricordi* group as defined by Dunn (1926, p. 210). To this group at present are assigned 11 species and their subspecies, as follows: *ricordi* (*ricordi*, *planirostris*, *casparii*), *atkinsi* (*atkinsi*, *orientalis*), *pinarensis*, *greyi*, *brevipalmatus*, *sierramaestrae*, *turquinensis*, *cuneatus*, *gundlachi*, *etheridgei*, and *zugii*. Of these species, *thomasi* differs from *atkinsi*, *gundlachi*, and *zugii* by lacking red in the groin or on the hind limbs;

thomasi is much larger than the minute *zugii* (maximum size, 19.2 mm.), and adult female *atkinsi* are approximately the same size as adult female *thomasi*. *Eleutherodactylus gundlachi* also differs from *thomasi* in the pattern of the hind limbs, which show three transverse bands in the former and are spotted in the latter. From *etheridgei*, *thomasi* differs in having a different dorsal pattern and a tan (rather than purplish) concealed surface of the hind limbs, as well as in being of larger size (maximum size of *etheridgei*, 19.0 mm.). The species *greyi*, *brevipalmatus*, *sierramaestrae*, and *turquinensis* are all large, and all reach a much larger size than that of *thomasi*. In so far as known, only *greyi* occurs sympatrically with *thomasi*; *brevipalmatus*, *sierramaestrae*, and *turquinensis* occur only in Oriente Province. The new species differs from *greyi* (maximum size, 63.7 mm.) in being of much smaller size, having shorter femora, shorter fourth toe, and unspotted throat. The two species resemble each other in dorsal pattern (at least in the nominate form of *thomasi*) very closely; both are spotted dorsally and have an interocular bar. In *greyi* the scapular spots are less well defined and blend into the dorsal diffuse spotting. In addition, many specimens of *greyi* in life have a rusty suffusion on the dorsal surface of the hind limbs (and occasionally on the body as well); this condition has not been observed in *thomasi*. The snout of *greyi* is more acuminate than that of *thomasi*, and the general habitus of the two forms is distinctly different. The heavily mottled throat of *greyi* will serve to distinguish the two species without difficulty.

Compared to the three large Sierra Maestran species, *thomasi* differs in being of smaller size and in its pattern. Occasional specimens of *sierramaestrae* resemble *thomasi* in distinctness of dorsal spotting, but, in general, adults of *sierramaestrae* are very dark, with a pair of light sacral blotches, heavily spotted, mottled, or flecked sides of belly and under sides of hind limbs, and dark cross bands on the thigh (Schwartz and Ogren, 1956, p. 95). From *turquinensis*, *thomasi* differs in lacking the dermal flange on the toes and webbing on the hind feet. The status of *E. brevipalmatus* is not clear, but *thomasi* appears to differ from it in lacking webs on the hind feet and in its dorsal pattern.

The species *pinarensis* is inadequately known. The situation is also somewhat anomalous, as the type is from the Isla de Pinos; this is an adult female (snout-vent length, 39.2 mm.) and is, as far as I can determine, the only specimen of this species from the Isla de Pinos. The remainder of the known specimens of *pinarensis* are from Pinar del Río Province, with the exception of two from Habana. As known to me from Pinar del Río, *pinarensis* differs from *thomasi* in being of smaller size

and in having transverse banding on the entire dorsum. Much additional material of *pinarensis* from the Isla de Pinos and western Cuba is necessary before the evaluation of these frogs can be made intelligently.

From *ricordi* and its subspecies, *thomasi* differs in being of larger size when adult and in the usual absence of dorsolateral light lines. These two species occur sympatrically, and the larger size and diffuse spotting of *thomasi* serve to distinguish it at once from *ricordi planirostris*, the subspecies with which *thomasi* occurs.

From all the above species of the *ricordi* group, *thomasi* can be differentiated by the presence of the three glandular areas, two above the forearm and one at the groin. None of the above species, as far as known, possesses these structures, although it is possible that fresh specimens of *etheridgei* will show them. The only Cuban species having glandular areas is *cuneatus*. Both this form and *thomasi* are comparable in size, but *cuneatus* is a distinctly longer legged species and in coloration differs radically from *thomasi*. The dorsum of *cuneatus* is very rugose, and the W-shaped scapular fold will serve at once to distinguish it from *thomasi*. Although both *cuneatus* and *thomasi* have glandular areas, *cuneatus* possesses an additional area on the posterior face of the thigh; such an area does not occur in *thomasi*.

REMARKS: The type and paratopotypes of *E. t. thomasi* were collected at night on and under large rocks and cliff fragments in *monte* at the Paso de la Trinchera in the Sierra de Cubitas. Juveniles at this locality were taken from the leaves of shrubs as much as 3 feet above the ground surface. The three specimens from Cueva de los Indios, which lies in the Paso de la Trinchera also, were collected with a large series of *E. greyi* within the entrance of the cave, under large rocks. The specimen from the Paso de Lesca was likewise taken on rocks near the entrance to a cave in *monte*, and the two frogs from the Olla de Bonnet were taken on exposed rocks near the top of the *olla* and in the crevice in the cliff face. The individual from the Sierra de Najasa was collected on rocks at night. That rocky areas are the typical habitat of *thomasi* is demonstrated also by the specimens from the Loma de Cunagua and Yaguajay. In both instances the frogs were taken from talus slides in dense *monte*, in the latter case the rocky slopes being immediately adjacent to a river in cut-over deciduous woods. Wherever *E. t. thomasi* was collected, the habitat was invariably rocky and in *monte*, and the conditions were usually moist. Elevation seems to play small part in the distribution of this species, although it appears to be a species of lowland and moderately high elevations (800 feet to 1000 feet) rather than one occurring at high elevations.

Specimens of *E. thomasi* from the region of the Sierra de Trinidad in southern Las Villas Province are distinctly different from the specimens from Camagüey, and for this more southern and western population, I propose the following name.

***Eleutherodactylus thomasi trinidadensis*, new subspecies**

TYPE: A.M.N.H. No. 61013, an adult female, from Finca Morales, 8 miles northwest of Trinidad, Las Villas Province, Cuba, taken July 31, 1957, by William H. Gehrmann, Jr., and Albert Schwartz. Original number 3451.

PARATYPES: A.M.N.H. No. 60951, Trinidad, Las Villas Province, July 24, 1957, native for A. Schwartz; A.M.N.H. No. 60952, Trinidad, Las Villas Province, July 25, 1957, A. Schwartz; A.M.N.H. No. 60953, Finca Morales, 8 miles northwest of Trinidad, Las Villas Province, July 27, 1957, J. R. Feick; A.M.N.H. Nos. 61014, 61015, same data as type; Ch.M. No. 55.1.65, Guajimico, 16 miles southeast of Soledad, Las Villas Province, December 20, 1954, L. H. Ogren; U.S.N.M. Nos. 137985-137990, 10 miles west of Trinidad, Las Villas Province, September 5-10, 1956, J. D. Hardy.

DISTRIBUTION: Known only from the western and southern base of the Sierra de Trinidad, and not from the mountain mass itself.

DEFINITION: A subspecies of *E. thomasi* characterized by prominently spotted dorsum, well-defined interocular bar and scapular blotches, prominent canthal and shoulder stripe, dusky venter, relatively shorter femora (see ratios below), and apparently smaller size in adult females (average, 38 mm.) and larger size in adult males (average, 28 mm.) when compared to *E. t. thomasi*.

DESCRIPTION OF TYPE: A gravid female, with the following measurements: snout-vent length, 38.7; distance from snout to posterior border of tympanum, 15.0; greatest width of head, 14.6; longitudinal diameter of tympanum, 3.2; longitudinal diameter of eye, 5.2; naris to eye, 5.0; femur, 16.4; tibia, 17.2; fourth toe, 15.0. Head slightly narrower than distance from snout to posterior border of tympanum; snout truncate, with nares prominent at anterior end of canthus rostralis; diameter of eye slightly more than distance from naris to anterior corner of eye; interorbital space, 3.8, less than diameter of eye; diameter of tympanum much less than diameter of eye, distance from tympanum to eye less than half of diameter of tympanum; tympanum almost circular, its vertical diameter (3.3) about equal to its horizontal (3.2). Digital discs present, those on fingers 3 and 4 distinctly larger than those on fingers 1 and 2, disc of third finger equal

to about one-third of size of tympanum. Fingers long and slender, unwebbed, 3-4-2-1 in order of decreasing length; subarticular tubercles well developed, gray. Toes moderately long and slender, unwebbed, 4-3-5-2-1 in order of decreasing length. Heels do not touch when femora are held at right angles to body axis. Dorsum smooth, with raised median line from snout to just above vent, its central section between scapular and sacral regions obscured; upper eyelid with many minute tubercles. Large, low, rounded tubercles between the angle of the jaw, tympanum, and forelimb insertion, the largest and posterior-most of which is distinctly glandular; a second glandular prominence, larger than the first, located above the insertion of the forelimb; a third large glandular area on the side, just anterior to the hind limb insertion. Throat and belly smooth, with belly disc well developed. Dorsal surfaces of forelimbs and hind limbs covered with low rugosities. Posterior and ventral surfaces of thighs covered with large, flattened, indistinct, pavement-like granules. Tongue oval, free behind, its greatest width equal to about two-thirds of that of floor of mouth. Vomerine teeth in two very long, slightly arched series, beginning at outer margin of choanae and extending almost to the midline of roof of mouth; each series closely appressed to the posterior margin of the choana at the lateral shorter section of the series, and the two series separated medially by a distance less than the diameter of a choana.

COLORATION OF TYPE: (Based on field notes from life). Dorsum pale tan, with dark brown spots, largest anteriorly and becoming smaller posteriorly. A pair of large, well-defined, brown, scapular spots; a prominent dark brown interocular bar; snout with diffuse brownish mottling; a bold brown canthal stripe from snout through naris to anterior corner of eye, absent from upper eyelid, and continuing from posterior corner of eye above tympanum (where it sends a narrow vertical bar ventrally across the tympanum to the point of columellar attachment), and expanding immediately posterior to tympanum into a wide brown band, straight-edged above and scalloped below, and extending posteriorly about halfway along side of body to become lost by fragmentation in a series of lateral brown spots, indistinguishable from the dorsal spotting; dorsal and ventral surfaces of forelimbs and hind limbs heavily dotted with brown not arranged into bands; concealed surfaces of thighs mottled dark brown; digits dusky, with faint brownish mottling; venter white, heavily and uniformly overlain on throat, chest, and belly with dense brown chromatophores; under surface of limbs likewise overlain with brown chromatophores; edge of lower jaw slightly more darkly pigmented than throat and very indis-

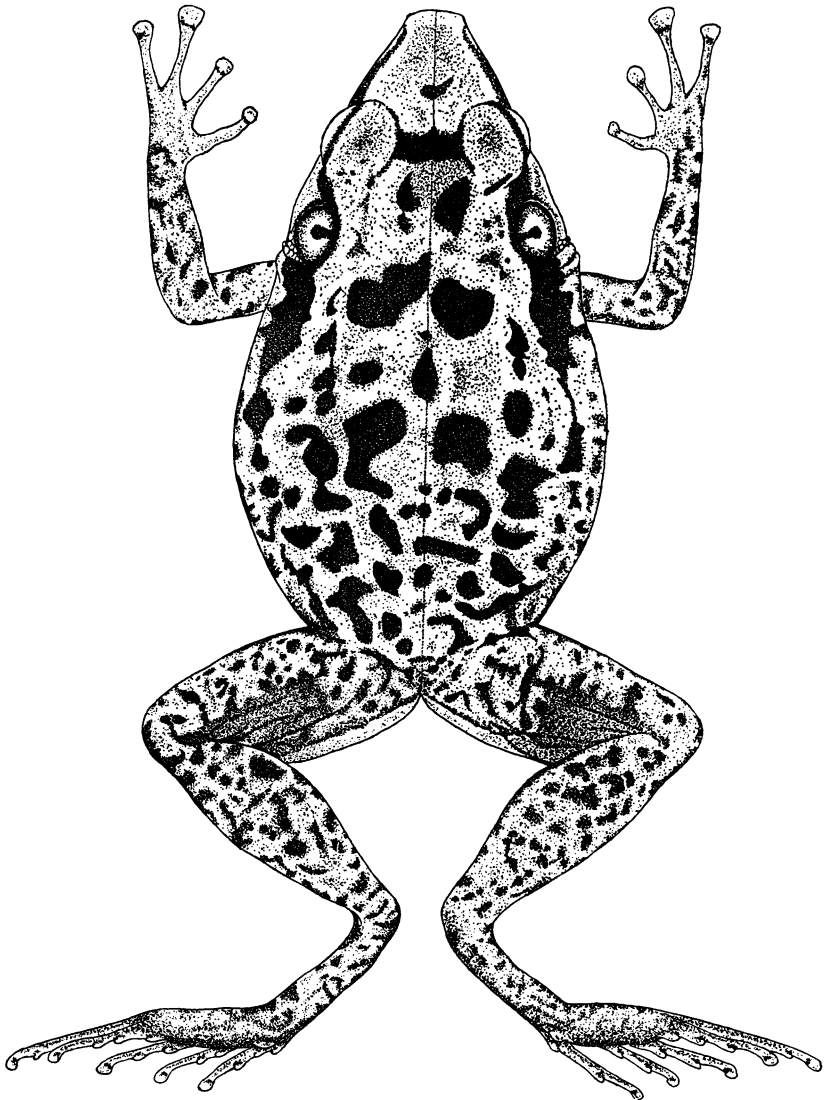


FIG. 2. *Eleutherodactylus thomasi trinidadensis*, type, A.M.N.H. No. 61013, adult female, snout-vent length, 38.7 mm. Drawn by Sandra L. Bressler.

tinctly mottled; three glandular areas with a faint tinge of yellow in preserved specimen.

VARIATION: There are six females (other than the type), four males, and three juveniles of *E. t. trinidadensis* available for study. Measurements of seven females (including type) are: snout-vent, 37.5 (35.3-

39.5); head length, 14.3 (13.5–15.0); head width, 13.9 (12.8–14.6); tympanum, 3.1 (3.0–3.2); eye, 4.9 (4.6–5.2); naris to eye, 4.8 (4.5–5.0); femur, 16.2 (15.4–16.9); tibia, 16.7 (16.1–17.2); fourth toe, 14.8 (14.3–15.5). Besides the type, two females (snout–vent length, 38.7 and 39.5) are gravid. Three males (with the exception of the snout–vent measurement which includes four males) have the following measurements: snout–vent, 27.8 (26.7–28.3); head length, 10.9 (10.3–11.6); head width, 10.3 (9.7–10.7); tympanum, 2.6 (2.3–3.1); eye, 3.7 (3.3–4.2); naris to eye, 3.6 (3.5–3.7); femur, 12.8 (12.2–13.2); tibia, 13.2 (13.0–13.4); fourth toe, 11.6 (11.2–12.3). The juveniles range in snout–vent length from 15.0 to 24.3. Sexual differences include the smaller adult size of the males, with proportionately smaller dimensions of body parts and the larger relative size of the tympanum in males.

In structure all specimens resemble the type closely, except that one (U.S.N.M. No. 137990) has the dorsum distinctly and prominently shagreened, as well as very coarse granules along the sides. Most adults have some rugosities on the dorsum and thus are more granular than the type. This condition appears not to be an artifact of the preservation but rather a variable character in this subspecies.

As far as color is concerned, the series is relatively uniform. The dorsal ground color is tan; A.M.N.H. No. 60951, a male, was noted as having a light tan dorsum (pl. 13, F5; color designation from Maerz and Paul, 1950). In all but the smallest juvenile, the dorsal spotting is brown, bold, and prominent against the lighter ground color, and the individual spots are clearly defined. The scapular blotches and interocular bar are always clearly defined and never obsolescent. The hind limbs are spotted dorsally, and the concealed surfaces may be dark brown, especially towards the knee. The ventral surface is usually stippled with brown, although this condition is somewhat variable; if the belly lacks a heavy overwash of brown, at least the throat is heavily and uniformly stippled with brown. No specimen shows any indication of dorsolateral stripes.

COMPARISON: *Eleutherodactylus t. trinidadensis* requires comparison primarily with the nominate form. From *E. t. thomasi*, the Las Villas subspecies differs strikingly in dorsal pattern. Whereas in *thomasi* the dorsal pattern is very obscure, and those spots that are shown are diffuse, the pattern in *trinidadensis* is made up of boldly displayed spots with clear-cut edges. The interocular bar and scapular blotches are likewise prominent in *trinidadensis*, and the canthal stripe is likewise bold and much better delineated. The usual brown stippled

venter of *trinidadensis* is different from the usually pearly white venter of *thomasi*, although this character is variable.

The femora are relatively shorter in *trinidadensis* than in *thomasi*; this is obvious on inspection, but the following ratios of femur/snout-vent length $\times 100$ demonstrate it quantitatively: 15 female *thomasi*, 46.2 (43.0–50.4); seven female *trinidadensis*, 43.3 (42.4–44.8); 10 male *thomasi*, 48.3 (46.8–50.8); three male *trinidadensis*, 45.6 (44.0–47.1). Conclusions concerning the size of the two races are made difficult in that such a small number of *trinidadensis* is available. However, females do not appear to reach quite so large a size in *trinidadensis* (largest, 39.5; largest *thomasi*, 43.4), and male *trinidadensis* appear to reach a larger size than male *thomasi* (largest, 26.3; largest *trinidadensis*, 28.3). Additional specimens of *trinidadensis* may show that these size data are incorrect.

The comparisons given above between *E. t. thomasi* and the remainder of the *ricordi* group apply with equal propriety to *trinidadensis*. The only known Cuban *Eleutherodactylus* that can be confused with *trinidadensis* is *E. r. ricordi*. This form occurs in the Sierra Maestra and is thus not sympatric with *trinidadensis*. Both are spotted dorsally; however, they may be distinguished by the presence of the three glandular areas in *trinidadensis*.

REMARKS: *Eleutherodactylus t. trinidadensis* is an inhabitant of rocky situations but apparently occurs in far less mesic regions than the nominate race. The type locality is a region of much eroded and pocketed limestone near the coast. The flora is broadleaf scrub growing on red soil which fills the pockets among the outcroppings. The type and two paratopotypes were taken in and about the entrance of a large cave at the type locality; a third paratopotype was collected hopping about at night on the dry earth in the scrub. Of the two specimens from Trinidad, a juvenile was taken hopping on artificial rock steps after a heavy rain, and an adult was collected from beneath trash on a rocky hillside. The specimen from Guajimico (Schwartz and Ogren, 1956, p. 94) was taken from a cave as well. The rainfall of non-montane areas in the Trinidad-Sancti Spiritus Subregion (Marrero, 1951, pp. 498–507) averages 125 cm. annually; this is below the average for the island of Cuba as a whole. I feel that the coastal area occupied by *trinidadensis* has even less precipitation than the average recorded for the plains of this subregion; certainly the vegetation and ground conditions indicate as much. That a frog can persist under such unfavorable conditions is made possible by the fact that these lepto-

dactylids apparently utilize caves and their associated rocky areas as a diurnal retreat and forage in the open only at night.

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