STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 86.

GEOGRAPHIC VARIATION IN TWO SPECIES OF HISPANIOLAN ELEUTHERODACTYLUS,

with notes on Cuban members of the *ricordi* group.

by

ALBERT SCHWARTZ
(Miami)

SHREVE & WILLIAMS (1963) have discussed at some length the relationships between several named forms of West Indian *Eleutherodactylus*, including *E. pictissimus* Cochran and *E. weinlandi* Barbour. The former had been long known from only the type specimen from the Massif de la Hotte on the Tiburon Peninsula of Haïti, and the latter from the Península de Samaná and extreme eastern and northern República Dominicana. Extensive Haitian collections amassed by Dr. ERNEST E. WILLIAMS for the Museum of Comparative Zoölogy (MCZ) and large lots of specimens collected by the writer and parties in the years 1962 and 1963 have elaborated the distribution of these two species, and have made it possible to ascertain geographic variation in both. In addition to my own collections, I have been able to study those of the American Museum of Natural History (AMNH), Museum of Comparative Zoölogy, United States National Museum (USNM), and the Museum of Zoology, University of Michigan (UMMZ); for the privilege of examining these specimens I wish to thank Mr. CHARLES M. BOGERT and Miss MARGARET BULLITT, Dr. ERNEST E. WILLIAMS, Dr. DORIS M. COCHRAN, and Dr. CHARLES F. WALKER and Mr. GEORGE R. ZUG. Miss PATRICIA A. HEINLEIN, and Messrs. RONALD F. KLINIKOWSKI, DAVID C. LEBER, DENNIS R. PAULSON, and RICHARD THOMAS have been enthusiastic assistants in my Hispaniolan ndeavors, and they deserve my most sincere thanks for their help.

The figures in the present paper are the work of Mr. LEBER and Mr. KLINIKOWSKI, who again have made significant contributions to the effort.

CUBAN **ricordi** GROUP

SHREVE & WILLIAMS (1963, p. 332–334) discussed the relationships of the following Antillean forms: *pictissimus* Cochran, *lentus* Cope, *weinlandi* Barbour, *ricordi ricordi* Duméril & Bibron, and *bresslerae* Schwartz. Since I have had no field experience with *lentus*, and since I firmly believe that such experience is an absolute necessity when dealing with *Eleutherodactylus*, I will not mention it further. Before proceeding, a discussion of *E. ricordi* and its Cuban races is necessary.

SHREVE (1945, p. 117) first restricted the name *Eleutherodactylus ricordi* to a series of frogs taken at various localities in the Sierra Maestra and Gran Piedra ranges of Oriente Province, Cuba. The justification for this action is that these highland specimens agree best with the rather detailed description by DUMÉRIL & BIBRON, and I concur with this action completely. At the same time, SHREVE regarded *planirostris* Cope and *casparii* Dunn as races of *ricordi*, the former a widespread lowland form in Cuba, Isla de Pinos, various Bahama islands, and elsewhere in the West Indies, and the latter restricted to the Sierra de Trinidad in Cuba. Since that time, two other races of *ricordi* have been described: *rogersi* Goin from the Bahamas and *goini* Schwartz from the highlands of western Cuba. Presently, the named forms above (*planirostris, casparii, rogersi, goini*) are all arranged as subspecies of *E. ricordi*.

I have long doubted that *ricordi* and *planirostris* were conspecific. *E. ricordi* is a large (females, snout-vent length to 40 mm), robust, complexly and vividly patterned frog, whereas Cuban *planirostris* is much smaller (females, snout-vent length to 27 mm). My original doubts concerning the relationships of these two forms were pleasantly verified when, at several localities in the Sierra de Gran Piedra, both *planirostris* and *ricordi* were taken precisely at the same locality, as well as by the collection of *planirostris* altitudinally higher than *ricordi* in the same region. This evidence makes it clear

that *planirostris* should be removed from the species *ricordi*, and that the latter is a monotypic species known from the highlands of southern Oriente.

With the above change of nomenclature, we have the forms *casparii*, *rogersi*, and *goini* left associated with *planirostris*. Of these, I feel that *rogersi* is correctly so associated. That *casparii* is a distinct form is unquestionable (see SCHWARTZ, 1960, p. 24, for discussion); its relationship to *planirostris* is not so certain. All specimens of *casparii* in collections, as well as those which I have taken, have come from the southern and western sides of the Sierra de Trinidad; the north slope specimens (from 6 mi. S and 8 mi. S Manicaragua, Las Villas) are clearly *planirostris*. This would imply that *casparii* occurs only on the southern and western faces of the Sierra (and on the interior uplands as well?) and that *planirostris* occurs on the northern (and eastern?) faces; possibly such a situation exists, and there is no evidence to contradict it at present. A feature of *casparii* which would make it unique in *planirostris* (and indeed quite special among West Indian *Eleutherodactylus*) is the occasional green coloration on the dorsum. Everything considered, I see no reason to separate *casparii* from *planirostris* at this time, and *pro tem* maintain it as a race of the latter.

Likewise, the situation with *goini* is not clear, although the evidence of pattern and coloration may be pertinent. I stated (1960, p. 23) that "*goini* appears to be a giant *planirostris*". The differences between the two are mainly of size, since coloration and pattern are quite comparable; also the hindlimbs average greater in *goini* than in *planirostris*. SHREVE & WILLIAMS (1963, p. 332–334) suggested that *ricordi* (*sensu lato*) might be divisible into two species, one larger and including *ricordi*, *goini*, and *bresslerae*, and the other smaller, including *planirostris* and *acmonis*. I do not believe that *goini* should be associated with *ricordi* (*sensu stricto*) but should be regarded as a large race of *planirostris* which occurs only in the massif of western Cuba.

The association of *acmonis* Schwartz with *planirostris* I likewise find untenable. I stated (1960, p. 45) that it was possible that *acmonis* was a local derivative of *planirostris* on the Yunque uplands; since that time, two specimens of this species were taken at

a locality 14.6 mi. WSW Maffo, Oriente Province, Cuba. This locality lies on the northern slope of the Sierra Maestra in south central Oriente, and is not associated with the Yunque uplands. It is thus evident that *acmonis* is more widely spread than previously thought. Also, since both *acmonis* and *planirostris* were taken at the same precise locality (the type locality of the former), they are not to be regarded as racially related. Consequently, I maintain *E. acmonis* as a species distinct from *E. planirostris*.

One other Cuban form, *bresslerae*, has been suggested as a member of the *ricordi* (or large species) assemblage on Cuba. I agree with this allocation, but do not feel that this species should be regarded as a race of *ricordi*. Despite the fact that the two are apparently allopatric and basically somewhat alike in pattern, and despite their obvious membership in the *ricordi* group, *bresslerae* is a stockier frog than *ricordi*, has a different style of coloration (much like *weinlandi* from Hispaniola, as SHREVE & WILLIAMS have pointed out), and slightly larger size in females at least (female *bresslerae* to 46 mm snout-vent; male *bresslerae* to 30 mm, male *ricordi* to 35 mm).

Eleutherodactylus pictissimus

(Fig. 89)

Turning to the Hispaniolan species *pictissimus* and *weinlandi*, which are quite closely related to *ricordi* and *bresslerae* of Cuba, SHREVE & WILLIAMS have shown clearly that the former is rather widespread in southwestern Haïti, occurring from Jérémie and Les Cayes on the west to Port-au-Prince and Furcy on the east. *E. weinlandi* has been known (COCHRAN, 1941, p. 51) from various localities in the República Dominicana, as well as from three localities in Haïti, one of which (Furcy) has been now relegated to the range of *pictissimus* (SHREVE & WILLIAMS, 1963, p. 332); of the two remaining Haitian localities, the specimen from Moron is *pictissimus*. The specimen from "within 25 miles of Port-au-Prince" is presently indeterminate, but it is likely that it was a *pictissimus* rather than *weinlandi*. All previous localities for *weinlandi*, with one exception, are from northeast Hispaniola, ranging from the Samaná Peninsula onto the south shore of the Bahía de Samaná, and thence

west to 25 km S Puerto Plata and Jarabacoa (MERTENS, 1939, p. 30). The single anomalous record is that of MERTENS (1939, p. 30) for the entrance of Santa Anna Cave near Ciudad Trujillo (= Santo Domingo); there are no other published records for the species on the south coast, although it does occur there sparingly, as will be shown beyond.

It is tempting to combine *pictissimus* and *weinlandi;* they are very much alike in several features, notably size and pattern, but not in coloration. Of the pair, it is likely that *pictissimus* is the south island cognate of *weinlandi,* and presently the distributional picture is such that the former is completely restricted to the south island, the latter to the north island. However, recent collections in the República Dominicana reveal that this basic picture is not so diagrammatic as supposed; *pictissimus* does indeed occur on the north island not only along the southern coast as far east as Boca de Yuma, but also ranges north of the Cordillera Central. Also, *weinlandi* has two subspecies in the República Dominicana, and there must be some degree of geographic overlap between the ranges of the two species. *E. pictissimus* on the Península de Barahona and in the Cul-de-Sac-Valle de Neiba region is a pale frog, quite different from populations to the west; these more eastern frogs may be called

Eleutherodactylus pictissimus apantheatus, new subspecies

(Fig. 90)

Type: MCZ 43195, an adult female, from 6.5 mi. northeast of Jimaní, INDEPENDENCIA PROVINCE, REPÚBLICA DOMINICANA, taken 23 July 1963, by Richard Thomas. Original number X9505.

Paratypes: AMNH 71977–81, UIMNH (University of Illinois Museum of Natural History) 55587–90, 3.3 mi. NE La Ciénaga, BARAHONA PROVINCE, REP. DOMINICANA, 22 July 1963, A. Schwartz, R. Thomas; ASFS X9615–20, 4.7 mi. E Cabral, Barahona Prov., 24 July 1963, P. A. Heinlein, R. F. Klinikowski, R. Thomas; KU (Museum of Natural History, University of Kansas) 79807–10, USNM 150927–30, 3.3 mi. NE La Ciénaga, Barahona Prov., 24 July 1963, A. Schwartz, R. Thomas; CM (Carnegie Museum) 38973–78, 2 km SW Paraiso, Barahona Prov., 1 August 1963, P. A. Heinlein, R. F. Klinikowski; AMNH 44677–78, Enriquillo, Barahona Prov., 4 October 1932, W. G. Hassler; AMNH 44523, El Proprio Esfuerzo, del Monte's Finca, above Barahona, 2550′, Barahona Prov., 2 August 1932, W. G. Hassler.

Diagnosis: A subspecies of *Eleutherodactylus pictissimus* characterized by faded coloration and possibly smaller adult size of females.

Description of type: An adult female with the following measurements (in millimeters) and ratio: snout-vent length, 31.3; head length, 11.7; greatest width of head, 12.1; longitudinal diameter of tympanum, 2.5; longitudinal diameter of eye, 4.1; naris to anterior corner of eye, 3.9; femur, 14.4; tibia, 14.7; fourth toe, 13.8; tibia/snout-vent length, 46.7. Head slightly broader than distance from snout to posterior border of tympanum; snout truncate with nares prominent at anterior end of canthus rostralis; diameter of eye slightly longer than distance from naris to anterior corner of eye; interorbital space 3.8, about equal to diameter of eye; diameter of tympanum much less than diameter of eye, distance from tympanum to eye equal to about one third diameter of tympanum.

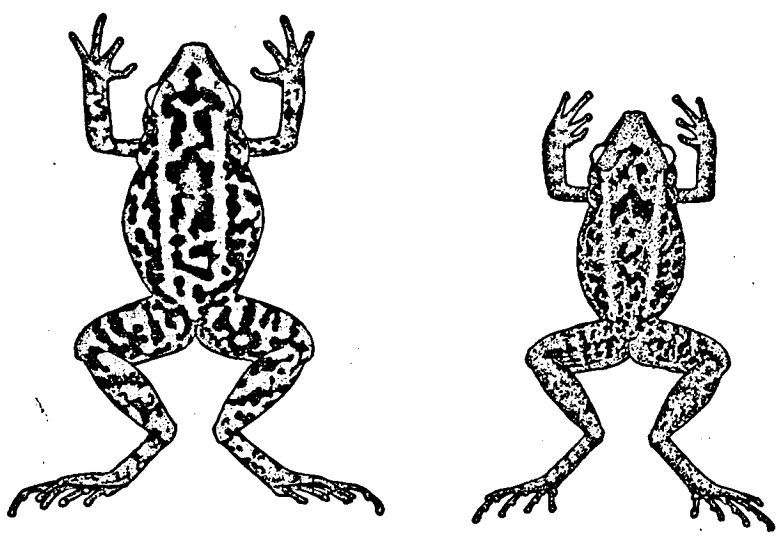

Fig. 89. *Eleutherodactylus pictissimus pictissimus*, ASFS X3272, adult female, Grotte de Counou Bois, 1 mi. SW Camp Perrin, Dépt. du Sud, HAITI; snout-vent length 36.5 mm.

Fig. 90. *Eleutherodactylus pictissimus apantheatus*, type, MCZ 43195, adult female, 6.5 mi. NE Jimaní, Independencia Province, REPÚBLICA DOMINICANA; snout-vent length 31.2 mm.

Digital discs present, weakly developed, largest on digits three and four, that of digit three largest and equal to about one quater size of tympanum. Fingers relatively short, unwebbed, 3–4–2–1 in order of decreasing length; subarticular tubercles well developed, prominent, and pale gray. Toes relatively short, all with slight basal webbing, 4–3–5–2–1 in order of decreasing length, subarticular tubercles large, prominent, gray. Heels do not touch when femora are held at right angles to body axis. Dorsum smooth except for about five low rounded warts between angle of jaw, forelimb insertion and tympanum; throat and venter smooth, belly discs fairly well developed with moderately prominent pectoral and abdominal folds. Dorsal surfaces of all limbs smooth; posterior faces of thighs with low rounded pavement-like granules. Inguinal glands inconspicuous but present. Tongue rather small, ovate, entire, free behind, its greatest width equal to about one third that of floor of mouth. Vomerine teeth in two long arched series extending from well outside the choanae and adpressed against the posterior margin of the choanae, the two series separate from each other by a distance equal to the diameter of a choana.

Coloration of type: Dorsal ground color tan, overlaid with a pattern of black in a complex and relatively inconspicuous reticulum. A pair of dorsolateral lines, inconspicuous in life, including a middorsal zone which posteriorly is rather uniformly covered with a black reticulum and anteriorly has a prominent scapular chevron preceded by a fragmented interocular bar with two irregular postocular blotches (Fig. 90). Snout grayish, finely stippled with dark brown. A broad dark line over the lores from naris to eye; sides heavily marbled with black. All limbs marbled or mottled above with black on a tan ground; thighs with obscure transverse bars and concealed surfaces heavily marbled with black. Belly pale creamy with brown stippling on throat, sides of abdomen, underside of thighs, and less heavy stippling on underside of forelimbs and crura.

Variation: Fifteen male paratypes show the following measurements and ratios: snout-vent length, 25.8 (21.6–33.1); head length, 9.9 (8.3–12.5); head width, 10.3 (8.4–13.2); diameter of tympanum, 2.1 (1.9–2.8); diameter of eye, 3.5 (2.8–4.4); naris to eye, 3.2 (2.5–4.3); femur, 11.9 (9.8–16.2); tibia, 12.9 (10.2–17.3); fourth

toe, 11.6 (9.2–14.8); tibia/snout-vent length, 49.8 (46.8–52.3). The type and the only other adult female paratype measure: snout-vent length, 30.7 (30.0–31.3); head length, 11.5 (11.2–11.7); head width, 11.6 (11.2–12.0); diameter of tympanum, 2.5 (2.5); diameter of eye, 4.0 (3.9–4.1); naris to eye, 3.9 (3.8–3.9); femur, 13.7 (13.0–14.4); tibia, 13.9 (13.1–14.7); fourth toe, 13.0 (12.2–13.8); tibia/snout-vent length, 45.2 (43.7–46.7). From the above measurements, it may be seen that males reach a larger size than females. I consider this an artifact of the very few adult females available in the sample.

The series is rather uniform in coloration and pattern. All show the reduced dorsal pattern of the type, and some have the pattern even more obscure, especially of that area between the two faint dorsolateral stripes. The hindlimbs and concealed surfaces may be more finely stippled than in the type. The series from La Ciénaga was noted in life as having the dorsal ground color tan to reddish-tan with fairly prominent dorsolateral lines, and concealed surfaces of hindlimbs cream overlaid with black; another series from the same locality had the dorsal ground color tan to yellow with the concealed surfaces whitish overlaid with black or dark gray. The pale bellies have varying amounts of lateral stippling and the throats may not be so heavily nor uniformly stippled as that of the type.

Comparisons: From *E. p. pictissimus*, *E. p. apantheatus* differs principally in intensity of pigmentation (see Fig. 89). In the nominate form the dorsum is usually very heavily marbled with black or dark brown, and consequently the dorsolateral lines are very prominent, being set off by the delimiting darker dorsal markings. The scapular chevron is present but in most specimens its identity is obliterated by the remainder of the dorsal pattern, and it does not stand out as a separate pattern element. Within the range of the nominate form, there seems to be some geographical variation in pattern; specimens from Camp Perrin and the vicinity of Les Cayes are often much more boldly marked than are those from the environs of Jérémie on the north coast of the Tiburon Peninsula. I am unwilling to differentiate these two populations nomenclatorially. The largest specimen of *E. p. pictissimus* I have examined is an

adult female with a snout-vent length of 41.4, from Camp Perrin; the largest specimen from Jérémie is a female with a snout-vent length of 39.4. A Jérémie male is the largest male *p. pictissimus* at hand with a snout-vent length of 33.9, slightly larger than the largest male *apantheatus*. Tibia/snout-vent ratios in the Camp Perrin and Jérémie series average, respectively 48.0 and 49.5 for males and 46.3 and 49.7 for females. The same ratios are 49.8 for male *apantheatus* and 45.2 for female *apantheatus*. There appears to be no consistency in these ratios for the various populations involved, and the lack of suitable series of female *apantheatus* hampers any meaningful comparisons.

Distribution: *E. p. apantheatus* is known from the Cul-de-Sac-Valle de Neiba plain and from the east coast of the Península de Barahona (Fig. 95). It is not uncommon in the steep ravines in the latter area and specimens were collected at night on rocks in a moist stream bed and during the day under the same rocks. The type was taken under palm trash in a moderately mesic palm "oasis", a vegetational feature which occurs sporadically over the Valle de Neiba and is associated with intermittent flooding.

E. p. pictissimus occurs throughout the Tiburon Peninsula of Haïti east to Thiotte near the south shore (Fig. 95); the subspecies may well be taken on the southern slopes of the Sierra de Baoruco, since Thiotte is quite close to the border between Haïti and República Dominicana. On the north side of the Tiburon, the easternmost locality whence the nominate form is known is the vicinity of Miragoâne. Specimens from Ça Ira, Dufort, Diquini, Morne de Cayette, Morne Calvaire, and Port-au-Prince are all clearly intergrades between *pictissimus* and *apantheatus*. Of the small series from Port-au-Prince all but one are much closer to *apantheatus* than to *pictissimus*, and I would have little hesitancy in assigning all Port-au-Prince material to the new subspecies. It is possible that the exceptional Port-au-Prince specimen (USNM 117141) was not taken at or even near Port-au-Prince, in which case this city should be regarded as within the range of *apantheatus*.

Specimens examined: *E. p. pictissimus*: HAITI, DÉPT. DU SUD, Île à Vache, western end, ASFS (Albert Schwartz Field Series) X3553–55; camp Perrin, ASFS

X2526–27, X2671, X2683, X2749–50, X2813–16, X3099–06, MCZ 33282–91; 5 mi. from Camp Perrin, MCZ 36746–47; Grotte de Counou Bois, 1 mi. SW Camp Perrin, ASFS X3254–65, X3272–73; Les Cayes, ASFS X3712–13, X3370–71; 4.5 mi. NW Les Cayes, ASFS X3802–11; 1 mi. NW Les Cayes, ASFS X3822; Place Nègre, nr. Jérémie, MCZ 33296–98; Carrefour Sanon, nr. Jérémie (not mapped), MCZ 33818–19, 37574–85; Fond Rouge Daye, nr. Jérémie (not mapped), MCZ 37565; Bozo, nr. Jérémie (not mapped), MCZ 37566–69; La Source, nr. Jérémie (not mapped), MCZ 37570; Mayette, nr. Jérémie, MCZ 37571; Perine, nr. Jérémie (not mapped), MCZ 37572–73; Marfranc, MCZ 33743–49; Moron, USNM 60626; Fond des Nègres, MCZ 35194; Mingrete, nr. Miragoâne (not mapped), MCZ 35195; Pemel, nr. Miragoâne (not mapped), MCZ 35196; Butête, nr. Miragoâne, (not mapped), MCZ 35197–98; Tardieu, northeast foothills, Mt. La Hotte (= Pic Macaya), MCZ 19846; DÉPT. DE L'OUEST, Ça Jaqueline, nr. Jacmel (not mapped), MCZ 34500; Thiotte, nr. Saltrou, MCZ 36095–96; Furcy, USNM 121018, MCZ 3123, 31820.

Intergrades between *E. p. pictissimus* and *E. p. apantheatus*: DÉPT. DE L'OUEST, Ça Ira, MCZ 34489–99; 5 km S Dufort, MCZ 33281; Morne de Cayette (not mapped), MCZ 33293–94; Diquini, USNM 140216–17; cave at Diquini, USNM 117287; Morne Calvaire, 1 mi. SW Pétionville, 2300′, ASFS X1303; Port-au-Prince, USNM 117141, 118835, 120968, AMNH 55737; vicinity of Port-au-Prince, AMNH 44009–10.

Specimens of *E. pictissimus* from the region near Azua in the República Dominicana represent a very distinct form, which, in allusion to the very xeric region which this population occupies, may be called

Eleutherodactylus pictissimus eremus, new subspecies

(Fig. 91)

Type: MCZ 43196, a gravid female, from 9.7 mi. east of Azua, AZUA PROVINCE, REPÚBLICA DOMINICANA, taken 24 June 1963, one of a series collected by Ronald F. Klinikowski, Albert Schwartz, and Richard Thomas. Original number X8057.

Paratypes: ASFS X8058–61, AMNH 71982–86, AZUA PROVINCE, REP. DOMINICANA, same data as type; USNM 150931–3, 16.5 mi. S San José de Ocoa, 500′, PERAVIA PROV. 24 August 1963, R. Thomas.

Diagnosis: A subspecies of *Eleutherodactylus pictissimus* distinguished by extreme reduction of dorsal pattern, so that the most prominent feature is the dark scapular chevron on a light background.

Description of type: A gravid female with the following measurements and ratio: snout-vent length, 31.3; head length, 11.4; greatest width of head, 11.6; longitudinal diameter of tympanum, 2.5; longitudinal diameter of eye, 4.4; naris to anterior corner of

eye, 3.7; femur, 13.4; tibia, 14.6; fourth toe, 12.7; tibia/snout-vent length, 46.6. Head slightly broader than distance from snout to posterior border of tympanum; snout truncate with nares prominent at anterior end of canthus rostralis; diameter of eye longer than distance from naris to anterior corner of eye; interobital space 4.1, slightly less than diameter of eye, distance from tympanum to eye equal to about one quarter diameter of tympanum. Digital discs present, weakly developed, largest on digits three and four, that of digit three largest and equal to about one quarter size of tympanum. Fingers relatively short, unwebbed, 3–4–2–1 in order of decreasing length; subarticular tubercles well developed, prominent, pale gray. Toes relatively short, all with slight basal webbing, 4–3–5–2–1 in order of decreasing length, subarticular tubercles large, prominent, gray. Heels touch when femora are held at right angles to body axis. Dorsum smooth except for about three glandular warts between angle of jaw, tympanum, and forelimb insertion; throat and venter smooth, belly disc faintly defined. Dorsal surfaces of all limbs smooth; posterior faces of thighs with low rounded pavement-like granules. Inguinal glands inconspicuous but present. Tongue moderate, ovate, entire, free behind, its greatest width equal to about one half that of floor of mouth. Vomerine teeth in two long arched series, the left series not extending beyond the choana, the right series extending slightly beyond, the two series adpressed to their respective choanae and separated from each other by a distance equal to one quarter the diameter of a choana.

Coloration of type: In life, dorsal ground color yellowish-tan with brown markings; a prominent dark brown scapular chevron, canthal line, and supratympanic line; dorsolateral lines present, fairly conspicuous but unicolor with dorsal ground color; posterior dorsum faintly stippled or marbled in a diffuse fashion with dark brown, fading out posterior to scapular chevron which is made thus even more prominent; an irregular and diffuse interocular brown bar; snout almost immaculate yellowish-tan; hindlimbs yellowish-tan, marbled and stippled on crus and pes; thighs with irregular transverse barring; concealed surfaces gray with a diffuse darker reticulum (Fig. 91). Belly opalescent, with some light stippling on throat, sides of abdomen, and inferior surfaces of crura,

which are darker than rest of underparts. Sides rather heavily marbled with dark brown.

Variation: Five adult male paratypes have the following measurements and ratios: snout-vent length, 26.2 (23.5–27.7); head length, 9.9 (9.4–10.7); head width, 10.2 (9.4–11.1); diameter of tympanum, 2.3 (2.1–2.5); diameter of eye, 3.6 (3.4–3.7); naris to eye, 3.5 (3.1–3.8); femur, 11.7 (10.0–14.1); tibia, 12.9 (10.7–14.1); fourth toe, 11.6 (9.8–12.8); tibia/snout-vent length, 49.3 (45.5–51.6). The type and only other adult female paratype have the following measurements: snout-vent length, 31.0 (30.7–31.3); head length, 11.1 (10.9–11.4); head width, 11.3 (11.0–11.6); diameter of tympanum, 2.3 (2.0–2.5); diameter of eye, 4.2 (4.0–4.4); naris to eye, 3.7 (3.6–3.7); femur, 13.2 (12.9–13.4); tibia, 13.8 (12.9–14.6); fourth toe, 12.6 (12.5–12.7); tibia/snout-vent length, 44.3 (42.0–46.6).

In both coloration and structure the paratypes resemble the type very closely. A feature, which the type lacks but which is demonstrated in lighter colored specimens, is the relative prominence of a post-axillary concentration of dark pigment, which, when combined visually with the scapular chevron, gives the impression of a tripartite collar. In general, the body pattern is faint and faded in all specimens, and what pattern remains is often of a very finely and faintly vermiculate nature. In light colored specimens, the scapular chevron is set off posteriorly by a pale area as described for the type; specimens with a darker ground color do not show this condition so distinctly. The asymmetrically placed vomerine teeth of the type are atypical; usually the tooth rows extend slightly beyond the choanae.

The dorsal ground color of the paratypes in life varied from yellowish-tan to tan, overlaid with the brown to black pattern; the concealed surfaces were recorded as pinkish to gray. The belly likewise varied from pinkish to gray with an opalescent aspect. The iris was golden above.

Comparisons: From *E. p. pictissimus*, the Azua race differs in pattern; *E. p. eremus* never shows the heavy and bold dark pattern of the nominate form. Neither sex of *eremus* is known to reach the large size of *E. p. pictissimus*, although there are presently too few adult specimens of *eremus* to be conclusive. From *E. p. apantheatus*,

eremus differs in continuing the reduction of pattern, which is apparent in the former form, to a much greater degree. The scapular chevron, which is obvious in *apantheatus*, is even more prominent in *eremus*, and the remainder of the dorsal pattern is much more reduced. Since there are so few adult specimens of these forms, no comments concerning size or differences in proportions can be made.

Distribution: *E. p. eremus* is known from only two localities in the Llanos de Azua (Fig. 95); these plains are extremely xeric lowlands with moderate relief in the rain-shadow of the Cordillera Central and associated southern ranges. The series from the type locality was taken under heaps of palm trash in a moderately mesic and well-shaded coconut-palm grove; the series from south of San José de Ocoa was collected in palm trash in a fence row of coconut-palms adjacent to a moist field. Probably *eremus* is widespread in this entire region wherever there is any more or less permanent moisture. The known range of *eremus* is separated from that of *apantheatus* by a distance of about 85 kilometers; it is likely that these two races intergrade between Azua and Barahona, even though this region is one of extremely high temperature and little rainfall with completely xeric vegetation.

In extreme eastern Hispaniola, there occurs a separate and apparently disjunct population of *E. pictissimus* which, because of its separation from the remainder of the populations, may be called

Eleutherodactylus pictissimus probolaeus, new subspecies

(Fig. 92)

Type: MCZ 43197, an adult male, from 0.5 mi. northwest of Boca de Yuma, La Romana Province, República Dominicana, taken 2 September 1963, by Albert Schwartz. Original number V963.

Paratypes: ASFS V964, La Romana Province, República Dominicana same data as type; MCZ 43198, same locality as type, 31 August 1963, R. Thomas.

Diagnosis: A subspecies of *Eleutherodactylus pictissimus* characterized by a pattern of broad dark interocular bar, broad dark scapular chevron, and broad dark sacral blotch, with a reticulate dark dorsal pattern.

Description of type: A calling male with the following measurements and ratio: snout-vent length, 26.2; head length, 10.8; greatest width of head, 11.7; longitudinal diameter of tympanum, 2.6; longitudinal diameter of eye, 3.9; naris to anterior corner of eye, 3.5; femur, 12.1; tibia, 13.3; fourth toe, 11.6; tibia/snout-vent length, 50.8. Head distinctly broader than distance from snout to posterior border of tympanum; snout truncate with nares prominent at anterior end of canthus rostralis; diameter of eye longer than distance from naris to anterior corner of eye; interorbital space 4.0, equal to diameter of eye; diameter of tympanum much less than diameter of eye, distance from tympanum to eye equal to about one third diameter of tympanum. Digital discs present, weakly developed, largest on digits three and four, that of digit three largest and equal to about one quarter size of tympanum. Fingers moderately long, unwebbed, 3–4–2–1 in order of decreasing length, subarticular tubercles well developed, prominent, pale gray. Toes relatively short, all with slight basal webbing, 4–3–5–2–1 in order of decreasing length, subarticular tubercles large, prominent, gray. Heels touch

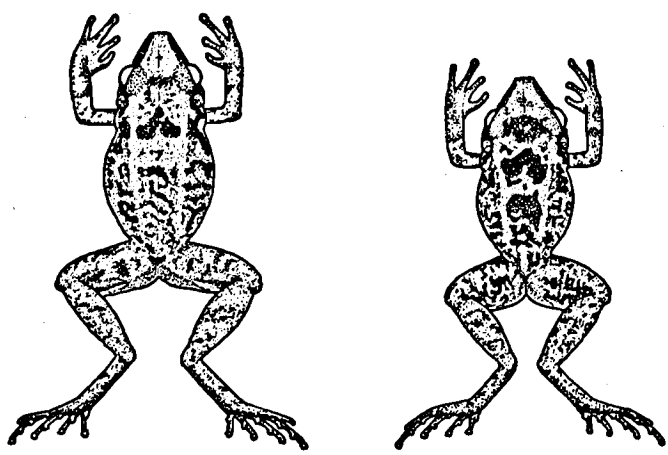

Fig. 91. *Eleutherodactylus pictissimus eremus*, type, MCZ 43196, adult female, 9.7 mi. E Azua, Azua Province, REPÚBLICA DOMINICANA; snout-vent length 31.3 mm.

Fig. 92. *Eleutherodactylus pictissimus probolaeus*, type, MCZ 43197, adult male, 0.5 mi. NW Boca de Yuma, La Romana Province, REPÚBLICA DOMINICANA; snout-vent length 26.2 mm.

when femora are held at right angles to body axis. Dorsum smooth to very faintly granular, with about four low non-glandular warts at angle of jaw; throat and venter smooth, belly disc weakly developed. Dorsal surfaces of all limbs smooth; posterior faces of thighs with low rounded pavement-like granules. Inguinal glands absent. Tongue moderate, ovate, entire, free behind, its greatest width equal to about one half that of floor of mouth. Vomerine teeth in two long slightly curved series separated from each other by a distance equal to the diameter of a choana.

Coloration of type: Dorsal ground color tan with a pattern of three major dark brown areas: a wide and irregular blotch-like interocular bar, a broad wide scapular chevron, and a broad and irregular sacral blotch, the last two enclosed by an irregular pair of dorsolateral lines, the interblotch spaces with irregularly diffused reticulum of dark brown, especially posterior to the sacral blotch (Fig. 92). Dark brown canthal and supratympanic lines; heavy dark lateral reticulum, hindlimbs irregularly marbled with dark brown, concealed surfaces dark brown. Belly opalescent; underside of all limbs and throat heavily stippled with dark brown.

Variation: The type and two adult male paratypes show the following measurements and ratios: snout-vent length, 27.3 (26.1–29.5); head length, 11.3 (10.3–12.7); head width, 11.4 (11.0–11.7); diameter of tympanum, 2.7 (2.4–3.0); diameter of eye, 4.1 (3.9–4.5); naris to eye, 3.7 (3.5–4.2); femur, 12.4 (11.7–13.5); tibia, 14.0 (13.3–15.2); fourth toe, 11.7 (10.7–12.9); tibia/snout-vent length, 51.3 (50.8–51.7). Females unknown.

The two paratypes agree very closely with the type in coloration and pattern; one has a darker ground color than the other two but still shows the three-blotched pattern very clearly. The major difference between the type and paratypes is in the degree of dorsal rugosity. One paratype is very heavily rugose dorsally, and also shows a median dorsal raised line. The paratypes lack inguinal glands as does the type. The ventral coloration in the paratypes was greenish-opalescent in life; the iris was gray in life.

Comparisons: *E. p. probolaeus* differs from all other races of *E. pictissimus* in its distinctive dorsal pattern of three dorsal blotches. In size, male *probolaeus* are known to exceed only *eremus* in snout-vent length.

Although there is no demonstrable difference in tibia/snout-vent length ratio between *probolaeus* and the remainder of the races of *pictissimus*, there is a distinct impression that the former is shorter limbed than the other subspecies. Likewise the head shape seems slightly different, and the total impression is one of a frog which is shorter and stockier than the other forms of *pictissimus*. These differences are presently not demonstrable statistically.

All three *probolaeus* were collected while calling. The type locality is on a limestone ridge which parallels the coast near Boca de Yuma; this ridge supports a relatively luxuriant mesic forest. The frogs were taken while calling from branches of shrubs and *Bryophyllum* from two to eight feet above ground. The call is a brief trilling "brrrrt", at times followed by a series of notes which may best be rendered as "bzeut".

The wide geographic separation (Fig. 95) of *probolaeus* from the balance of the *pictissimus* populations, as well as the fact that it is vocal (we have never encountered calling males of the other races) and that it apparently lacks inguinal glands, makes it possible that this form should be regarded as a separate species. I have chosen what I consider a conservative course in regarding it as a subspecies of *E. pictissimus*. When more material is available from the southeastern República Dominicana, the precise relationship of *probolaeus* may be somewhat clearer. Certainly it is a very close relative of *pictissimus*, since the series *pictissimus-apantheatus-eremus-probolaeus* shows a rather neat sequence in pattern degeneration in the first three forms, with an intensification of the *apantheatus-eremus* pattern complex in the more eastern *probolaeus*.

One other isolated specimen of *E. pictissimus* requires comment. This is an immature individual from 19 km SE Martín García, 600', Santiago Rodríguez Province, República Dominicana. This locality is so widely separated from all other *pictissimus* localities that the occurrence of such a typically southern form is really surprizing at such a northern locality. Martín García lies on the north side of the Cordillera Central; the specimen was taken in a fairly mesic ravine cutting down into the xeric Valle de Cibao. I can visualize no geographic means of connection between the southern populations

of this frog and this single isolated individual from the north, unless there is a circuitous route through Haiti, or northward through the relatively low areas between Villa Altagracia and Santiago in the República Dominicana. At least the latter area is inhabited by the related *E. weinlandi*. The northern specimen (ASFS V1358) most closely resembles *E. p. apantheatus*, but subspecific allocation must await further data.

Eleutherodactylus weinlandi Barbour

(Fig. 93)

Eleutherodactylus weinlandi was described by BARBOUR (1914, p. 246) from a single specimen collected by M. ABBOTT FRAZAR at Puerto Plata, República Dominicana, in 1881. According to the original description, the specimen, which I have examined, possessed light and immaculate limbs. Recent collections of *E. weinlandi* from the República Dominicana indicate that there are two very clearly defined subspecies, one of which is restricted to the Península de Samaná and eastern Hispaniola, the other the north coast, Cordillera Septentrional, and parts of the Cordillera Central and the interior lowlands, and apparently extending into south-central Haïti. Of these two races, the Samaná subspecies is characterized by immaculate crura, whereas specimens from the remainder of the island have heavily marked crura (Fig. 93). The type locality of *weinlandi* falls within the latter area, and all fresh material from this vicinity has heavily marked crura.

The situation is thus equivocal. One must either assume that FRAZAR gave incorrect locality data for the type (and that it did come from the Samaná or eastern Hispaniola) or that either the type specimen is much faded and the crural markings have disappeared, or that it is an unusually marked individual. FRAZAR did collect on the Samaná in June, 1882, but apparently the time during which the type of *weinlandi* was taken (December 1881 and January 1882) was spent in Puerto Plata. Dr. WILLIAMS has checked the above information for me in the catalogues of the Museum of Comparative Zoölogy; he suggested (*in litt.*) that it would "be better to consider the type specimen misleading rather than the locality", and I agree.

On this basis, despite the characteristics of the type of *weinlandi*, I will describe the unmarked-legged frogs from eastern Hispaniola, and assume that the type is much faded or aberrant, realizing that this may well not be the proper course of action, and that the population without a name may be that in which the supposed "type locality" lies.

For the eastern population, which occupies in part the Península de Samaná, I propose the name

Eleutherodactylus weinlandi chersonesodes, new subspecies

(Fig. 94)

Type: MCZ 43203, a gravid female, from 8 kilometers west of Samaná, SAMANÁ PROVINCE, REPÚBLICA DOMINICANA, taken 2 November 1963 by Richard Thomas. Original number V1988.

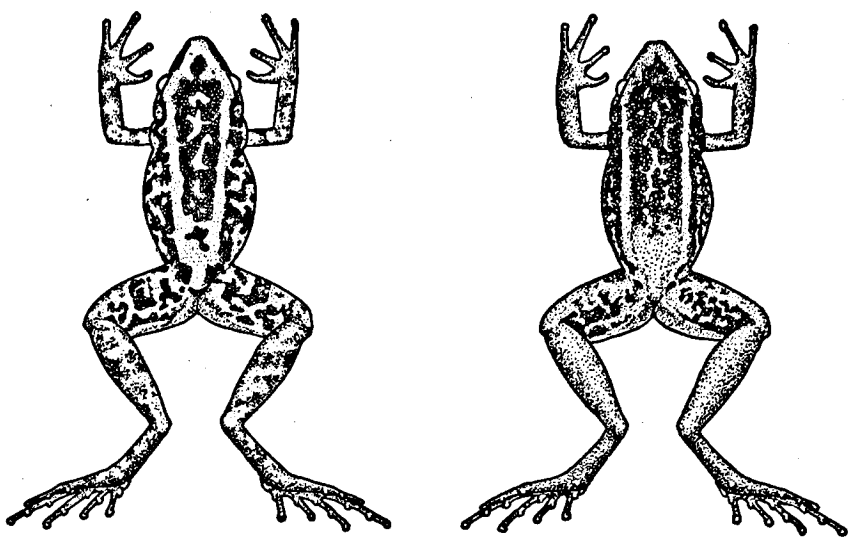

Fig. 93. *Eleutherodactylus weinlandi weinlandi*, ASFS V1868, adult female, 1 km N pass between Santiago and Puerto Plata, 2000′, Puerto Plata Province, REPÚBLICA DOMINICANA; snout-vent length 34.0 mm.

Fig. 94. *Eleutherodactylus weinlandi chersonesodes*, type, MCZ 43203, adult female, 8 km W Samaná, Samaná Province, REPÚBLICA DOMINICANA; snout-vent length 31.1 mm.

Paratypes (all from SAMANÁ PROVINCE, REPÚBLICA DOMINICANA): USNM 65706–08, Samaná and Laguna, March 1923, W. L. Abbott; USNM 66980, Samaná Peninsula, February 1924, J. King; USNM 74625, 74629–40, Río San Juan, March 1928, G. S. Miller, Jr.; UMMZ 92212 (2 specimens), Río San Juan, W. L. Abbott; USNM 74983–92, Samaná, 22 February 1928, G. S. Miller, Jr.; AMNH 34201–02, 1 mi. NW Samaná, 21 October 1929, W. G. Hassler; AMNH 34261, Rojo Cabo, 18 November 1929, W. G. Hassler; AMNH 34177–80, Las Flechas, 9 November 1929, W. G. Hassler; AMNH 34495–96, Laguna, 28 October 1929, W. G. Hassler; AMNH 34519, west of Samaná, 18 December 1929, W. G. Hassler; ASFS V1968–71, 6 km W Samaná, 1 November 1963, R. Thomas; ASFS V1989–93, same data as type; ASFS V2010, 14 km E Sánchez, 2 November 1962, R. Thomas.

Associated specimens: REPÚBLICA DOMINICANA, EL SEIBO PROVINCE, Boca del Infierno, USNM 74960–61; Caño Hondo, AMNH 3297–3301; Cueva de Caño Hondo, ASFS X9278–83; Sabana de la Mar, AMNH 34199, 44133; 3.5 mi. S Sabana de la Mar, ASFS X7971–74; Las Cañitas, USNM 65709; 3.3 mi. SW Miches, 450′, ASFS X7911–13; 1.4 mi. SE Miches, ASFS X9341; LA ROMANA PROV., 24.8 mi. ESE Miches, ASFS X7893; 3.2 mi. W Higüey, ASFS V751–57; 4.7 km NW La Enea, ASFS V948.

Diagnosis: A subspecies of *Eleutherodactylus weinlandi* characterized by immaculate to very lightly stippled crura.

Description of type: A gravid female with the following measurements: snout-vent length, 31.1; head length, 11.9; greatest width of head, 11.9; longitudinal diameter of tympanum, 2.7; longitudinal diameter of eye, 4.0; naris to anterior corner of eye, 3.1; femur, 14.0; tibia, 15.8; fourth toe, 14.0. Head as broad as distance from snout to posterior border of tympanum; snout truncate with nares prominent at anterior end of canthus rostralis; diameter of eye longer than distance from naris to anterior corner of eye; interorbital space 3.2, less than diameter of eye; diameter of tympanum much less than diameter of eye, distance from tympanum to eye equal to about one quarter diameter of tympanum. Digital discs present, small, largest on digits three and four, that of digit three the largest, and equal to about one quarter size of tympanum. Fingers rather long, unwebbed, 3–4–1–2 in order of decreasing length; subarticular tubercles well developed, prominent, pale gray. Toes relatively long, all with slight basal webbing, 4–3–5–2–1 in order of decreasing length, subarticular tubercles large, prominent gray. Heels overlap greatly when femora held at right angles to body axis. Dorsum smooth, with about four nonglandular warts between angle of jaw, tympanum, and forelimb insertion; throat and venter smooth, belly disc feebly developed.

Dorsal surfaces of all limbs smooth; posterior faces of thighs with low pavement-like granules. Inguinal glands absent. Tongue large, slightly nicked, free behind, its greatest width equal to about three quarters that of floor of mouth. Vomerine teeth in two long arched series, extending from outside the choanae and practically adpressed against them, the two series separated from each other by a distance equal to slightly less than the diameter of a choana.

Coloration of type: Anterior dorsal ground color yellowish-tan, almost completedly obliterated by chocolate brown marbling, so that only a very fine dorsal tan reticulum and a pair of tan dorsolateral tan lines remain, the lines beginning at the nares and progressing thence along the canthus rostralis, the outer margin of the upper eyelids and down the back toward the groin, where they are lost in the posterior chestnut dorsal ground color; forelimbs chestnut, variously stippled with brown; hindlimbs chestnut with concealed surfaces boldly marbled with chocolate so that a fine chestnut reticulum is left; anterior face of thigh, dorsal surface of crus and pes chestnut, crura with a very faint dark brown stippling on the posterior faces, without any indication of crossbarring (Fig. 94); pes lightly stippled grayish brown; belly creamy, throat stippled brown; undersides of crura irregularly blotched with chocolate, underside of thighs and pes as well as forelimbs lightly stippled with brown.

Variation: Nine males (paratypes and associated specimens) show the following measurements: snout-vent length, 25.3 (21.8–27.6); head length, 9.7 (8.4–11.0); head width, 9.6 (7.6–11.0); tympanum, 2.1 (1.8–2.5); eye, 3.7 (3.2–4.1); naris to eye, 2.7 (2.3–3.1); femur, 12.2 (10.6–14.3); tibia, 13.4 (11.3–15.1); fourth toe, 11.9 (9.9–14.7); thirty-one females (paratypes and associated specimens) measure: snout-vent length, 29.3 (24.5–34.9); head length, 11.0 (9.2–13.8); head width, 10.8 (8.5–13.7); tympanum, 2.4 (1.8–2.9); eye, 4.1 (3.5–5.1); naris to eye, 3.3 (2.7–4.2); femur, 13.7 (10.8–18.0); tibia, 14.8 (12.6–17.6); fourth toe, 13.0 (11.0–15.3). Structurally the major difference between the type and other specimens of *chersonesodes* is that many have inguinal glands, whereas the type apparently lacks them. Often, however, if there is a heavy deposition of pigment in the groin area, as is the case of the type, the glands are

greatly obscured and difficult or impossible to see. In less heavily pigmented specimens, the glands are conspicuous.

Chromatically, the paratypes and associated specimens of *chersonesodes* are rather stable; the dorsal ground color anteriorly varies from a yellowish-cream to a yellowish-tan, and posteriorly some shade of rich reddish-brown is the rule. The degree of dorsal markings varies somewhat, with some specimens having the area between the dorsolateral lines almost solid chocolate with little indication of the pale ground color as vermiculations; some (for example, ASFS X7971) have the inter-dorsolateral line area heavily stippled with the ground color. The hindlimb pattern is also variable, especially as to the extent of chocolate on the concealed surfaces. Many specimens have the thighs rather well covered with dark brown, whereas in others there is a chestnut strip along the anterior face of the thigh. The crura never show any crossbanding, the most extreme condition being some vague stippling, although even this is absent from most specimens. The pale belly and heavily stippled throat are common features in the series.

Comparisons: There is no difference in size or proportions between *w. weinlandi* and *w. chersonesodes*. Strangely, there are many less specimens of the nominate form in collections than of the new subspecies. Excellent drawings of *chersonesodes* are those in COCHRAN (1941, p. 49) and SCHMIDT (1921, p. 8), whereas MERTENS (1939, pl. 15) shows a photograph of a near-topotype of *E. w. weinlandi*. Measurements of six male *w. weinlandi*: snout-vent length, 23.9 (21.2–27.4); head length, 9.2 (8.0–10.4); head width, 9.3 (7.9–11.0); tympanum, 2.1 (1.8–2.5); eye, 3.4 (3.0–3.8); naris to eye, 2.7 (2.2–3.2); femur, 11.2 (9.2–13.6); tibia, 11.9 (10.2–15.1); fourth toe, 10.6 (8.7–12.7); thirteen females measure: snout-vent length, 32.1 (27.2–35.8); head length, 11.9 (10.2–13.2); head width, 11.6 (9.8–13.2); tympanum, 2.5 (2.2–2.8); eye, 4.1 (3.5–4.8); naris to eye, 3.7 (2.9–4.2); femur, 14.7 (12.1–16.2); tibia, 16.1 (14.9–17.8); fourth toe, 14.1 (12.4–15.9). Tibia/snout-vent length ratios for the two populations are: *weinlandi* males, 49.8 (41.9–55.1), females, 50.4 (46.6–54.0); *chersonesodes* males, 52.9 (48.3–55.7), females, 50.9 (45.5–55.1).

The two subspecies differ from one another principally in the degree of crural banding; in *weinlandi* the crura are usually boldly

banded, but in some specimens the bands are broken and fragmented and form at times as much as a complete reticulum over the entire crus and pes. The band of posterior ground color which lies along the anterior face of the thigh in *chersonesodes* is absent in *weinlandi*, the entire thigh being banded, marbled, or mottled with chocolate. Seldom does *weinlandi* have the dorsum so completely covered with chocolate marbling as does *chersonesodes*, and thus the dorsum of *weinlandi* shows more ground color and appears to be more definitely blotched, rather than with a fine yellowish-tan reticulum. Ventrally there is no difference between the two races. I have the impression also that the hindlimb and posterior dorsal ground color are less intense in *chersonesodes* than in *weinlandi*, the hues in the latter tending more toward reddish-orange rather than reddish-brown.

Remarks: There are four specimens which are of special interest. There is an old specimen (MCZ 24289) from 12 miles north of Port-au-Prince, Haïti, which SHREVE & WILLIAMS (1963, p. 332) referred questionably to *E. pictissimus*. It is a juvenile, and I regard it as *weinlandi*. Such a locality for *weinlandi* seems most unusual, since it appears to be separated from the main body of the population by several hundred miles. However, two fresh specimens from the Dominican provinces of San Juan and San Rafael tend to fill in the gap, especially when it is known that *E. weinlandi* occurs in numbers much farther west than previously supposed. These three specimens, then, form a rather nice linear series along the Sierra de Neiba and its Haitian affiliate, the Montagnes du Trou d'Eau; presumably *E. weinlandi* is to be found in these mountains, and probably elsewhere in the uplands of central Haïti.

A fourth specimen (ASFS X9321) is from 12 km NE La Romana, La Romana Province, Rep. Dom. This individual was the only one collected in a very mesic ravine in an otherwise rather xeric area, presently planted in sugar cane. The frog in no chromatic way resembles *chersonesodes*, which is to be expected in this region, and has the heavily barred and marbled crura and thighs of *w. weinlandi*. It is from an isolated locality, as far as *weinlandi* is concerned, which lies as well between the ranges of *pictissimus eremus* and *pictissimus probolaeus* and is much closer to the known range of the latter. *E. w. chersonesodes* was collected at La Enea, about 30 kilometers to the

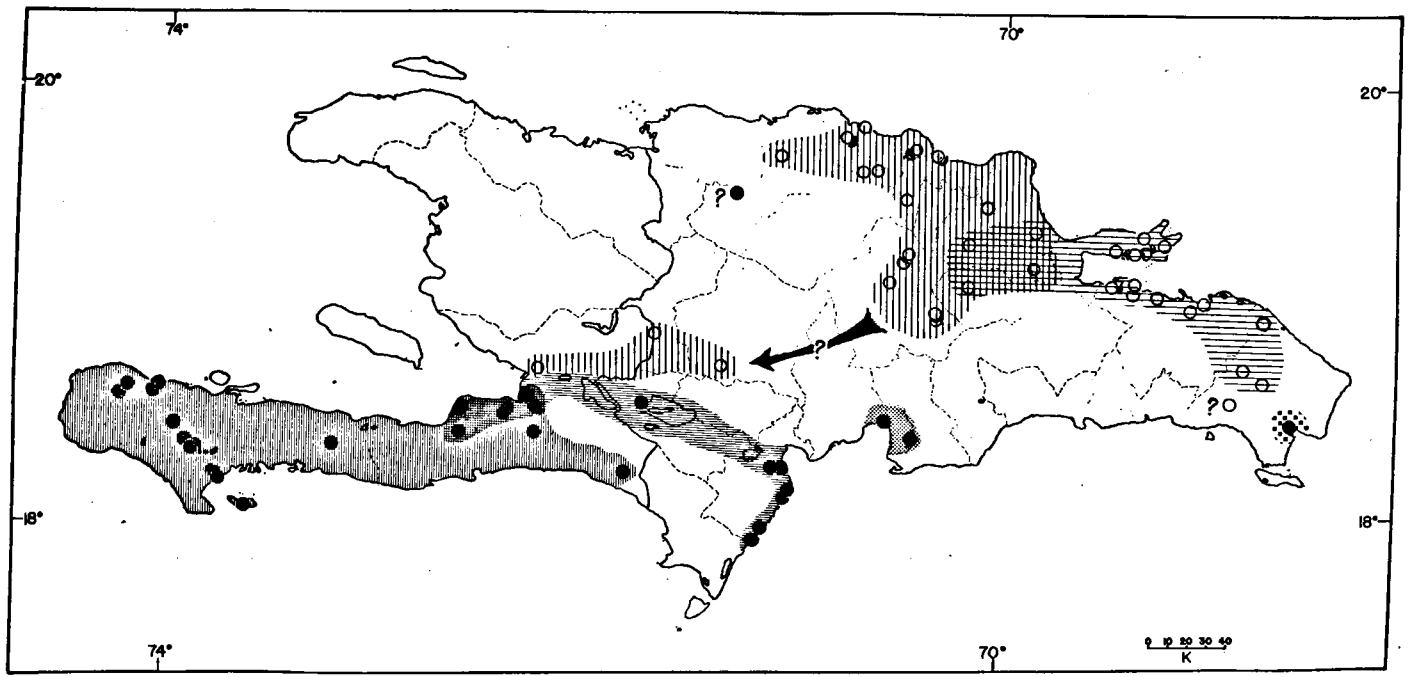

Fig. 95. Distribution of *E. pictissimus* and *E. weinlandi* in Hispaniola. — *E. pictissimus* localities represented by solid circles, *E. weinlandi* by hollow circles; subspecies represented by shading as follows: *E. p. pictissimus*, vertical narrow lines; *E. p. apantheatus*, horizontal narrow lines; *E. p. eremus*, fine dots; *E. p. probolaeus*, coarse dots; *E. w. weinlandi*, coarse vertical lines; *E. w. chersonesodes*, coarse horizontal lines. Overlap of symbols represents areas of intergradation. Questioned locality dots are specimens of each species which are unassignable to subspecies at present; questioned arrow indicates occurrence of *E. w. weinlandi* in western República Dominicana and Haïti but without knowledge of area of connection between this western population and the more eastern populations.

north of the La Romana locality. There is only one other southern Dominican locality for *weinlandi*, that of MERTENS (1939, p. 30) from the mouth of Santa Anna Cave near Santo Domingo. This locality lies about 100 kilometers to the west of the La Romana locality. The specimen from Santa Anna was described in detail by MERTENS but unfortunately the condition of hindlimb banding was not mentioned. It is possible that *w. weinlandi* occurs along the southern coast from Santo Domingo east to the La Romana area, where it once again meets *chersonesodes* coming south from the Bahía de Samaná region. For the moment I do not assign the La Romana specimen to either form.

It is pleasantly unusual to have intergradient specimens in *Eleutherodactylus*, and *weinlandi* is that pleasant exception. A series of nineteen specimens from four localities in east-central República Dominicana show very neatly the area of intergradation between *weinlandi* and *chersonesodes* (Fig. 95). In these specimens, the crural pattern is quite variable, some having (in a single series) both unmarked and more or less banded crura. Geographically the specimens are from precisely that area where one would expect intergradation to occur.

Specimens examined: *E. w. weinlandi*: REPÚBLICA DOMINICANA, VALVERDE PROVINCE, 8 km N La Cruz de Guayacanes, 1400′, (ASFS V1237); PUERTO PLATA PROV., 8 km E Imbert, 1100′, (ASFS V1690); Puerto Plata (MCZ 2050, MCZ 23526); Pico Isabel de Torres (MCZ 22477); 25 km S Puerto Plata (USNM 107596, MCZ 23548–50 plus two untagged specimens); 11 km SE Sosúa (ASFS V1718–19); 1 km N pass between Santiago and Puerto Plata, 2000′ (ASFS V1868–69); ESPAILLAT PROV., 4 km W Sabaneta de Yásica (ASFS V1699–701); 6 km SE Sabaneta de Yásica (ASFS V1697); 9 km W Sabaneta de Yásica (ASFS V1713); 2 km SW José Contreras, 2000′ (ASFS V1886); DUARTE PROV., Loma Quita Espuela (MCZ 23525); LA VEGA PROV., 17 km NE Jarabacoa (ASFS V1931–32); 13 km SW La Vega, 1400′ (ASFS V1734); 3 km NW La Vega (ASFS V1782); 1.2 mi. SE Monseñor Nouel, 700′ (ASFS X8128); "75 km N Santo Domingo, road to Santiago" = vicinity of Piedra Blanca (AMNH 44018, AMNH 44021); SAN JUAN PROV., 7 km W Vallejuelo, 2600′ (ASFS V392); SAN RAFAEL PROV., 5 km S Elías Piña, 2200′ (ASFS V415); HAÏTI, DÉPT. DE L'OUEST, 12 mi. N Port-au-Prince (MCZ 24289).

Intergrades between *E. w. weinlandi* and *E. w. chersonesodes*: REPÚBLICA DOMINICANA, DUARTE PROV., 9 km NW Pimentel (ASFS V1820–22); 3 km NE Villa Riva (ASFS V1827–32); MARÍA TRINIDAD SÁNCHEZ PROV., 2 km S El Factor (ASFS V1853–59); SÁNCHEZ RAMÍREZ PROV., 4.4 km E Cotuí (ASFS V627–29).

Discussion

The two species *E. pictissimus* and *E. weinlandi* have roughly complementary ranges; the former I consider a south island frog, the latter a north island species.

E. pictissimus has been able to cross the Cul-de-Sac-Valle de Neiba plain and invade the southern República Dominicana, whereas *E. weinlandi* is restricted to the north island and has been unable to cross the plain, in fact occupying the uplands (Sierra de Neiba-Montagnes du Trou d'Eau) which form the northern border of the Cul-de-Sac. The two species are nowhere known to be sympatric. However, there is evidence that the ranges of the two must overlap somewhere. The taking of the single *pictissimus* in northern República Dominicana and of *weinlandi* at Santo Domingo and La Romana (the latter two localities between the races *p. eremus* and *p. probolaeus*) shows that in at least two areas these two species occur (or did occur) sympatrically. *E. pictissimus* is able to exist under much more rigorous conditions than *weinlandi* (as witness the occurrence of the former in the Cul-de-Sac and in the Llanos de Azua). Although *pictissimus* is usually regarded as a lowland species, it is equally at home in the mountains (at Furcy, for example) although it apparently is not so abundant at these higher elevations. The ability of *pictissimus* to exist on Ile-à-Vache (where it was encountered in some numbers under palm trash and escaped by jumping down crab holes in the mud) suggests great tolerance of xeric (in this case semi-saline) conditions since the palms were immediately adjacent to extensive mangrove stands and the undergrowth of the palm grove was often halophytic. In fact, the very occurrence of an *Eleutherodactylus* on an off-shore island in the West Indies is quite unusual.

E. weinlandi is distinctly a denizen of mesic situations – cacao groves, wet pine woods, mesic coconut-palm groves, and rain forest. Although it occurs in the lowlands, it is regularly in situations which are wet; in the mountains it is often associated with streams and wet stream banks. It is likely that this intolerance to dry situations has prevented *weinlandi* from crossing the Cul-de-Sac, where *pictissimus*, which is far more tolerant of xeric conditions, has been

able to cross and to become established along the southern portion of the República Dominicana and even as far east as the Boca de Yuma region (assuming that *probolaeus* is a subspecies of *pictissimus*). In those areas where the two species occur together, it is possible that *weinlandi* is restricted to the more mesic portions of the habitat whereas *pictissimus* may be able to exist in more severe niches.

REFERENCES

BARBOUR, THOMAS, 1914. A contribution to the zoogeography of the West Indies, with especial reference to amphibians and reptiles. *Mem. Mus. Comp. Zoöl. 44* (3), p. 210–359, 1 pl.

COCHRAN, DORIS M., 1941. The herpetology of Hispaniola. *Bull. U.S. Nat. Mus. 177*, p. i–vii, 1–398, 12 pls., 120 figs.

MERTENS, ROBERT, 1939. Herpetologische Ergebnisse einer Reise nach der Insel Hispaniola, Westindien. *Abh. Senckenberg. Naturf. Ges. 449*, p. 1–84, 10 pls.

SCHMIDT, KARL P., 1921. Notes on the herpetology of Santo Domingo. *Bull. Amer. Mus. Nat. Hist. 44* (11), p. 7–20, 12 figs.

SCHWARTZ, ALBERT, 1960. Nine new Cuban frogs of the genus Eleutherodactylus. *Reading Public Mus. Art Gallery (Sci. Publ.) 11*, p. 1–50, 6 figs.

SHREVE, BENJAMIN, 1945. Application of the name Eleutherodactylus ricordii. *Copeia 2*, p. 117.

SHREVE, BENJAMIN & WILLIAMS, ERNEST E., 1963. The herpetology of the Port-au-Prince region and Gonave Island, Haiti. Pt. II. The frogs. *Bull. Mus. Comp. Zoöl. 129* (5), p. 301–342, 5 figs.