

**A new species of *Eleutherodactylus* from Honduras related to
Eleutherodactylus bransfordii (Anura: Leptodactylidae)**

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Abstract.—A new species of *Eleutherodactylus* is described from northeastern Honduras. It is a member of the *E. rhodopis* group, differing from its closest congeners *E. stejnegerianus* of Pacific slope of Costa Rica and western Panama, by having definite toe webbing and a larger thenar tubercle, and *E. bransfordii* of Nicaragua to Panama, in lacking nuptial thumb pads in males and having a smaller thenar tubercle.

A few years ago, the senior author (Savage 1981) referred a single specimen (LACM 45200) of small frog from northeastern Honduras to *Eleutherodactylus bransfordii* (sensu Savage & Emerson 1970) of Nicaragua, Costa Rica and Panama. Subsequently, in 1986 and 1992–1994, examples of frogs of this general morph were collected by L. D. Wilson, J. R. McCranie and M. Espinal. Examination of these animals, plus a recently collected specimen in the Florida Museum of Natural History, showed several differences from typical *E. bransfordii* and led us to re-evaluate the placement of the LACM specimen as well. Further study convinced us that the Honduran material was conspecific but represented an undescribed species distinct from *E. bransfordii*.

Methods

All measurements are in millimeters and were made with dial calipers with the aid of a dissecting microscope. Abbreviations used are: SVL (standard length), HL (head length; tip of snout to angle of jaw), HW (head width; greatest width), SL (snout length; anterior border of eye to nostril), TL (tibia length; one end of tibia to other, in-

cluding covering tissues), FL (foot length; distance from posteriormost portion of inner metatarsal tubercle to tip of fourth toe), TPL (tympanum length), EL (eye length), DW (third finger disc width). Snout outline and profile terminology follows Heyer et al. (1990), finger and toe disc, disc pad and subarticular tubercle shape terminology follows Savage (1987), and color codes used for some of the color notes in life follow Smithe (1975). Museum acronyms follow Leviton et al. (1985).

Eleutherodactylus lauraster, new species Figs. 1–2

Holotype.—USNM 344826, adult male, from above the Quebrada El Piñol (15°07'N, 86°43'W), Parque Nacional La Muralla, Departamento de Olancho, Honduras, elevation 1200 m, collected 21 July 1993 by Mario Espinal and James R. McCranie. Original field number LDW 9997.

Paratypes.—Honduras: Olancho: USNM 344827–28, adult females, from the type locality, 1180–1200 m; ROM 18095–96, adult males, 18097–98, adult females, from near the Río Seco, in the Sierra de Agalta, NNW of Catacamas, 990–1000 m; UF



Fig. 1. Adult female paratype of *Eleutherodactylus lauraster* (USNM 344830), SVL 19.7 mm.

90217, adult female, from the Sierra de Agalta, ca. 9 km N Santa María del Real, 1200 m; LACM 45200, adult female, from ca. 0.5 km SE San José del Río Tinto, 330 m; Gracias A Dios: USNM 344829–30, adult females, from the confluence of Quebrada Waskista and Río Wampú, 85 m.

Diagnosis.—A small species belonging to the *Eleutherodactylus rhodopis* group (Savage 1987), characterized by tiny males and slightly larger females that is distinguished from its close allies, *Eleutherodactylus bransfordii* and *E. stejnegerianus* by having finger I definitely shorter than II and definite basal webbing between the toes. From the former, it further differs in having the thenar tubercle definitely smaller than the palmar tubercle and in lacking nuptial thumb pads in adult males (thenar and palmar tubercles about the same size and nuptial pads present in adult male *E. bransfordii*). Although *E. lauraster* and *E. stejnegerianus* lack male nuptial pads, the latter species has even smaller thenar tubercles than the Honduran form, being equal to or

smaller than the basal subarticular tubercle on fingers II–III.

Summary of characteristics.—Snout nearly rounded to rounded in dorsal aspect, rounded in profile; top of head flat; canthus rounded, distinct; loreal region concave; nostrils directed laterally, situated at a point about two-thirds distance between anterior border of eye and tip of snout; supratympanic fold distinct, narrowly obscuring upper edge of tympanum, tympanum otherwise prominent; narrow discs on fingers III–IV, with slightly pointed disc covers and swollen to cuspidate pads; no nuptial thumb pads; relative length of fingers $I < II < IV < III$; heels smooth to rugose, lacking tubercles; subarticular tubercles of hands and feet ovoid, projecting, usually obtuse in profile; six accessory palmar and numerous plantar tubercles; thenar tubercle definitely smaller than palmar tubercle, also somewhat narrower and raised, larger than basal subarticular tubercles under fingers II–III; palmar tubercle ovoid; discs on all toes, those on toes III–IV with slightly pointed

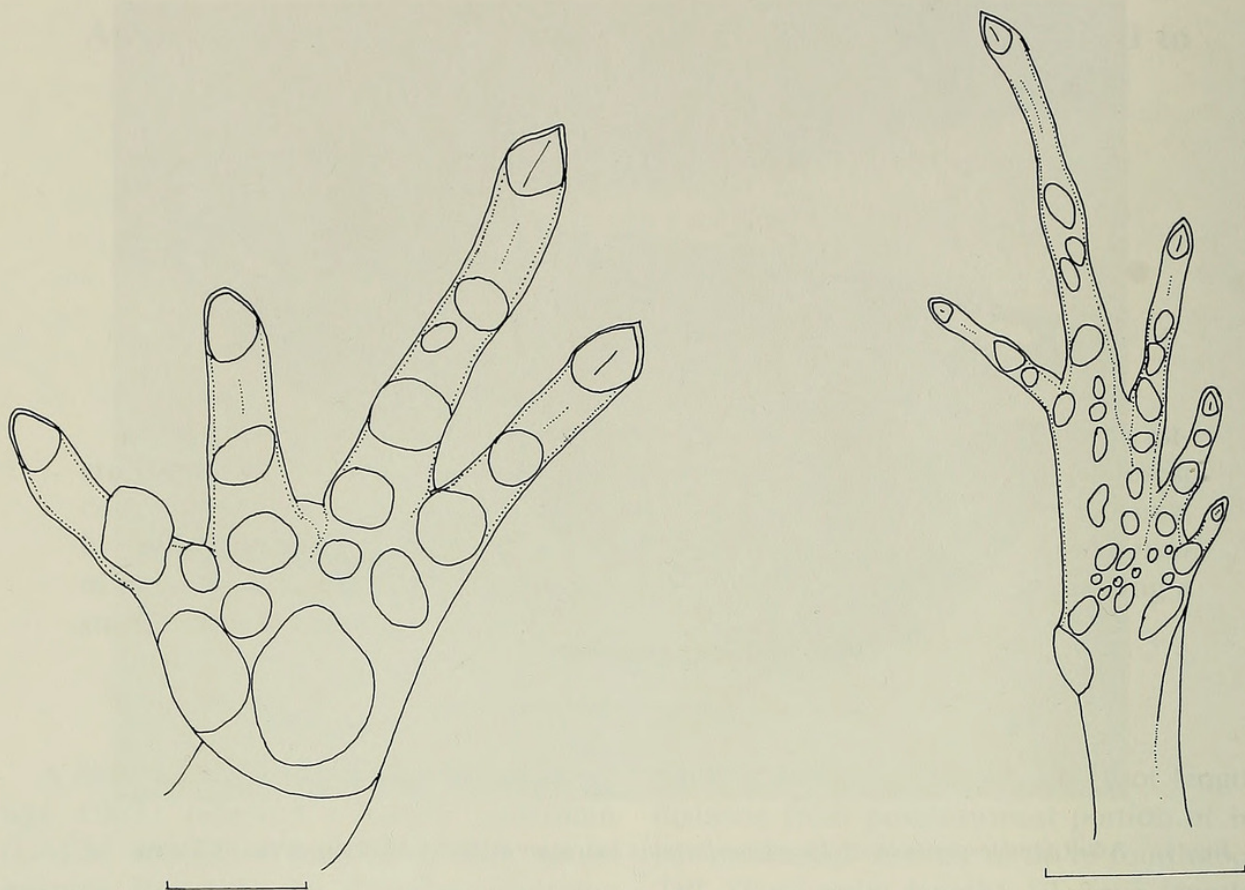


Fig. 2. *Eleutherodactylus lauraster*. Left: hand of adult female paratype (USNM 344828), scale = 1 mm; right: foot of adult male holotype (USNM 344826), scale = 3 mm.

disc covers and swollen to cuspidate pads; inner metatarsal tubercle elliptical in outline, projecting in profile; outer metatarsal tubercle rounded, projecting; relative length of toes $I < II < V < III < IV$; basal webbing between toes; inner tarsal fold weak; skin on dorsal surface of body smooth to tuberculate (tubercles and/or rugosity usually more obvious posteriorly), that of upper eyelids rugose and tuberculate, that of belly and ventral surfaces of thighs coarsely areolate; a distinct small inguinal gland present; prevomerine tooth patches on elevated, somewhat triangular ridges between and behind choanae, each ridge separated by distance equal to or greater than size of either patch; vocal slits and sac absent.

Coloration in life.—An adult female, USNM 344827, was recorded as follows: dorsal surfaces of head and body Dark Drab (color 119B) with Hair Brown (119A) markings: dorsal surfaces of limbs Army

Brown (219B) with Sepia (219) crossbands; Sepia stripe extending from nostrils to eyes and continuing posteriorly from eyes to above point of insertion of forelimbs; posterior surfaces of thighs mottled pale brown and yellowish cream; ventral surfaces of head and body pale yellow with minute white flecks; ventral surfaces of thighs and groin pale yellow; iris copper with dark reticulations. Another adult female (USNM 344828) was recorded as follows: dorsal surfaces of head and body Cinnamon-Drab (219C) with Sepia (219) markings; dorsal surfaces of limbs Vinaceous Pink (221C) with Sepia crossbands; iris gold with indistinct gold reticulations; rest same as that recorded for USNM 344827. A third adult female (USNM 344830) was recorded as follows: dorsal surfaces of head and body Mahogany Red (132B) with a slightly darker middorsal hourglass-shaped figure and interocular bar; dorsal surfaces of limbs

slightly paler than dorsum with dark Mahogany Red crossbands; posterior surfaces of thighs pale brown; all ventral surfaces and groin region flesh-colored; iris pale gold with black reticulations.

Color in preservative.—Dorsal surface of body pale to dark brown with small, scattered darker brown spots or blotches present dorsally and dorsolaterally in all but darkest specimens; dorsal surfaces of limbs pale to medium-brown with darker brown crossbands; a distinct, dark brown facial and supratympanic stripe usually present; ventral surfaces of head and body pale cream-colored, with numerous, although usually widely separated, brown punctations present on chin and throat, a few brown punctations may also be present on chest region and laterally on belly; ventral surfaces of thighs pale cream-colored, lightly to heavily punctated with brown; posterior surfaces of thighs brown, although less densely punctated pale areas usually present.

Measurements and proportions of holotype.—SVL 17.9; HL 7.9; HL/SVL 0.441; HW 5.8; HW/SVL 0.324; SL 1.7; EL 2.2; SL/EL 0.773; TL 10.1; TL/SVL 0.564; FL 9.1; FL/SVL 0.508; TPL 2.0; TPL/EL 0.909; DW 0.2; DW/TPL 0.100.

Measurements and proportions of paratypes.—(Females following and separated from males by a comma; means in parentheses) SVL 16.8–17.2 (17.0), 14.6–22.3 (18.5); HL/SVL 0.413–0.417 (0.415), 0.383–0.438 (0.411); HW/SVL 0.351–0.355 (0.353), 0.312–0.350 (0.331); SL/EL 0.720–0.870 (0.795), 0.650–0.909 (0.780); TL/SVL 0.558–0.583 (0.571), 0.503–0.578 (0.541); FL/SVL 0.517–0.530 (0.524), 0.431–0.544 (0.488); TPL/EL 0.800–0.826 (0.813), 0.500–0.682 (0.591); DW/TPL 0.100–0.105 (0.103), 0.091–0.188 (0.140).

Etymology.—The specific name proposed is a noun in apposition to honor our colleague Larry David Wilson. It derives from the Latin *laurus* = laurel, the source of the name Lawrence, and the diminutive suffix - *aster*, in allusion to his first name

and his stature as herpetologist laureate for Honduras.

Natural history notes.—*Eleutherodactylus lauraster* is known from between 85–1200 m in the Lowland Moist Forest and Premontane Wet Forest formations of Holdridge (1967). Specimens were collected on the forest floor, while active both during the day and at night. Two adult females with ovarian eggs (ROM 18098, USNM 344830) were collected 12 August and 28 July, respectively.

Referred specimen.—Honduras: Gracias A. Dios: USNM 344831, juvenile, from the confluence of Quebrada Waskista and Río Wampú, 85 m.

Discussion

Eleutherodactylus lauraster is assigned to the *Eleutherodactylus rhodopis* group (*sensu* Savage 1987). The characterization of the group as published by Savage (1987) now requires some modification. Firstly, a lapsus led to a statement implying that the members of this group have “an inner tarsal tubercle or two” (Savage 1987:49). The correct verbiage is “an inner tarsal tubercle or two may be present,” as this feature only occurs in *Eleutherodactylus rhodopis*. Secondly, a weak inner tarsal fold is found in *E. bransfordii*, *E. lauraster*, *E. podiciferus* and *E. stejnegerianus*. Finally, the absence of toe webbing may no longer be used to define the group, since *E. lauraster* has basal webs on the toes and weak webs are sometimes present in some lower Central American forms. The remaining characters used by Savage (1987) to define the group remain valid, with the exception of the *mandibularis* muscle condition (see below).

Lynch (1993) concluded that the *depressor mandibularis* muscle condition found in this group was misinterpreted by Savage (1987). Lynch (1993) generally rejected the systematic significance of differences in the characters of the *depressor mandibularis* utilized by Savage (1987) as modified from Starrett (1968). This is not the place to re-

spond to Lynch's arguments, which will be addressed elsewhere. However, he did confirm that examples of the five species of the *E. rhodopis* group that he examined share the DFSQdAT (as pointed out by Starrett, 1968, contra Savage 1987). This feature is unique among *Eleutherodactylus* belonging to the Middle American clade (sensu Lynch 1986) or "subgenus *Craugaster*."

All other members of the *Craugaster* clade diagnosed by the synapomorphy of having only the *externus superficialis adductor mandibularis* (e) present, have dfsq, DFsqat, or DFSQAT conditions of the *adductor*. The jaw muscle formula for the *E. rhodopis* group is corrected to DFSQdAT + e and is diagnostic. Lynch (1993) reported this formula for *Eleutherodactylus bransfordii*, *E. hobartsmithi*, *E. mexicanus*, *E. pygmaeus*, and *E. rhodopis*. We add *E. lauraster*, *E. podiciferus*, and *E. stejnegerianus* to that list. We predict that the remaining species of the *E. rhodopis* group (*E. jota*, *E. saltator*, and *E. sartori*) also have the same jaw muscle configuration.

The status of populations placed in *Eleutherodactylus bransfordii* Cope (1886) by Savage & Emerson (1970) are in a state of flux. Miyamoto (1983) pointed out that in Costa Rica, Pacific slope samples differ significantly in allozyme features from Atlantic versant frogs and revived the name *Eleutherodactylus stejnegerianus* Cope (1893) for them. Morphological features have now been determined to distinguish between these forms as well (see diagnosis of *Eleutherodactylus lauraster* and the key below).

Eleutherodactylus bransfordii and *E. stejnegerianus* are essentially allopatric but overlap geographically at a few sites along low passes near the continental divide in northern Costa Rica. In addition, Miyamoto's (1983) allozyme evidence indicated that a third cryptic species occurred with *E. stejnegerianus* at some Costa Rican localities. The status of this form and its relations to the other recognized species continue under investigation.

Eleutherodactylus lauraster is somewhat

intermediate in characters between *E. bransfordii* and *E. stejnegerianus* but differs from both in having a short thumb. It most closely resembles the latter species in having a reduced thenar tubercle and in lacking nuptial pads in adult males. However, neither of these features is conclusive evidence of close relationship. Because ongoing work on the karyology of this group by S. H. Chen gives promise of resolving the phylogeny of the cluster of *bransfordii*-like species, any conclusions based on the few morphological features separating the recognized forms remain premature.

The recognition of *Eleutherodactylus lauraster* brings the number of species referred to the *E. rhodopis* group to eleven. The following key may be used to identify the included taxa.

Key to the Frogs of the *Eleutherodactylus Rhodopis* Group

- 1a. No inner tarsal tubercles 2
- 1b. One or two distinct inner tarsal tubercles (Atlantic slope: San Luis Potosí, Mexico, to western Honduras; Pacific slope: Oaxaca, Mexico, to El Salvador) *E. rhodopis*
- 2a. A thenar and 1 palmar tubercle; nuptial pads and/or vocal slits present or not in adult males ... 3
- 2b. A thenar and 2 palmar tubercles that may be partially fused; no nuptial pads or vocal slits in adult males 9
- 3a. No inner tarsal fold; no vomerine teeth; no nuptial pads or vocal slits in adult males 4
- 3b. A definite inner tarsal fold; vomerine teeth present 5
- 4a. A row of tubercles along outer edge of tarsus (Central Mexico from Colima to Guerrero, and the state of Mexico) ... *E. hobartsmithi*
- 4b. No row of tubercles on outer edge of tarsus (Atlantic slope: tropical

- Mexico; Pacific slope: Jalisco, Mexico, to Guatemala) *E. pygmaeus*
- 5a. No enlarged calcar on heel; no ulnar or outer tarsal folds 6
- 5b. An enlarged triangular calcar on heel; ulnar and outer tarsal folds present (western Panama) ... *E. jota*
- 6a. Heel smooth to granulate; tubercles on underside of hand projecting 7
- 6b. One to 3 enlarged heel tubercles; tubercles on undersides of hands low and rounded; no nuptial pads but vocal slits present in adult males (uplands of Costa Rica and western Panama) *E. podiciferus*
- 7a. Thenar and palmar tubercles about same size, larger than subarticular tubercles on fingers II–III; nuptial pads present but no vocal slits in adult males (Atlantic slope from Nicaragua to central Panama) *E. bransfordii*
- 7b. Thenar tubercle much smaller than palmar tubercle, no nuptial pads or vocal slits in adult males 8
- 8a. Definite basal toe webbing present; finger I definitely shorter than finger II; thenar tubercle larger than basal subarticular tubercle under finger III (Atlantic slope of eastern Honduras) *E. lauraster*
- 8b. No toe webbing or slight webs present basally only between toes II–IV; fingers I and II equal; thenar tubercle equal to basal subarticular tubercle under finger III (Pacific slope from Costa Rica to western Panama) .. *E. stejnegerianus*
- 9a. Inner metatarsal tubercle much larger than outer 10
- 9b. Metatarsal tubercles subequal in size (Pacific slope of Chiapas, Mexico) *E. sartori*
- 10a. Outer edge of tarsus with row of small tubercles (uplands of southern Mexico, west of Isthmus of Tehuantepec) *E. mexicanus*
- 10b. Outer edge of tarsus smooth (uplands of Guerrero and western Oaxaca, Mexico) *E. saltator*

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