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Frogs of the *Hyla eximia* Group in Mexico, with Descriptions of Two New Species

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ABSTRACT: Six Mexican forms of the genus *Hyla* are recognized as belonging in the *eximia* group. These are *Hyla eximia* Baird; *H. euphorbiacea* Günther; *H. lafrentzi* Mertens and Wolterstorff; *H. regilla* Baird and Girard; *H. cárdenasi* sp. nov.; and *H. wrightorum* sp. nov. Cope's species *H. gracilipes* is referred to the synonym of *H. eximia,* while *H. smithii,* placed in synonymy of *eximia* by Kellogg (1932), is regarded as a good species belonging in a different group. *Hyliola bocourti* Mocquard is referred to the synonymy of *Hyla euphorbiacea* Günther.

IN MY endeavor to identify correctly a collection of Mexican Hylid frogs, I found considerable difficulty in properly allocating several forms, obviously related to the small *Hyla eximia* Baird, but which differed from this species in numerous characters. After a review of the literature (which appears to be somewhat confused), and an examination of the types of *Hyla eximia* and *H. gracilipes,* I have arrived at certain conclusions differing from those of certain former workers.

The literature offered the following names for these forms occurring in Mexico or adjoining territory (forms related so as to warrant their association into a species group which is here designated as the *eximia* group): *Hyla eximia* Baird, *Hyla euphorbiacea* Günther, *Hyla gracilipes* Cope, *Hyliola bocourti* Mocquard, *Hyla regilla* Baird and Girard and *Hyla lafrentzi* Mertens and Wolterstorff.

A critical examination of the cotypes of *Hyla gracilipes* and the cotypes of *H. eximia* shows them to belong in what I am forced to regard as a single species (*H. eximia*), since I can discern no constant structural characters or character which will serve to separate

the forms. Unfortunately most of the color characters have long since disappeared from these specimens.

The description of *Hyliola bocourti* Mocquard, based on specimens from Upper Vera Paz, Guatemala, agrees with the brief description of *Hyla euphorbiacea* to the extent that it is, at least tentatively, being placed in the synonymy of that species.

The collection made by Dr. Hobart M. Smith and myself in Mexico contains about 272 specimens of the group. This material for study has been augmented by an examination of more than 150 specimens in the National Museum, a collection of some fifteen specimens in Cornell University, and certain specimens in the collection of the University of Michigan, to the authorities and curators of which institutions my heartiest thanks are given.

This extensive material consists of six species, one of which, *Hyla regilla*, occurring in Baja California and western United States, is not considered in this paper. Three of the species are recognized under the published names *Hyla eximia*, *Hyla euphorbiacea*, and *Hyla lafrentzi*. Two are regarded as new, and are described under the names, *Hyla wrightorum* and *Hyla cárdenasi*.

KEY TO MEXICAN SPECIES OF THE *Hyla eximia* GROUP

A. Skin granular above or somewhat pustulate. 42 mm. Baja California and California.
Hyla regilla Baird and Girard, p. 422

AA. Skin smooth or minutely corrugate.

B. Posterior, and to a lesser extent, anterior region of the femur and groin with blackish or brownish reticulation enclosing rounded or irregular yellow-cream spots. 37 mm. Oaxaca and (? south to Guatemala).
Hyla euphorbiacea Günther, p. 426

BB. Posterior and anterior thigh regions with sparce, equally distributed pigmentation, lacking yellow-cream spots.

C. Tibiotarsal articulation brought forward reaches to near the eye.*

D. Diameter of eye equal or greater than length of snout; snout bluntly rounded. Uniform greenish without distinct marks on side of head and body. Eyelid greater than interorbital distance. 39 mm. Puebla ..... *Hyla cárdenasi* sp. nov., p. 430

DD. Diameter of eye distinctly less than length of snout; snout rather oval; distinct band on head and side, light-edged above; eyelid less than interorbital width. 35 mm. Southern México from Puebla and Morelos to Durango and ? San Luis Potosí.
Hyla eximia Baird, p. 423

CC. Tibiotarsal articulation brought forward reaches the nostril or slightly beyond the tip of snout.

D. Larger form, green with the lateral band on head and side, and spots on sacral region, edged with silvery white; the front side of the tibia blackish, bordered by a white line above, continued on foot. 50 mm. Veracruz and Morelos.
Hyla lafrentzi Mertens and Wolterstorff, p. 433

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* NOTE.—If specimens are somewhat dried or shrivelled, or the body is distended with eggs, the relationship of body length to leg length (as shown by bringing the leg forward) is often difficult to determine. In such cases the tibiotarsal articulation may fail to reach as far forward as indicated in the key.

DD. Somewhat smaller form with a less-distinct band on side of body, and dorsal spots not edged with white; anterior edge of tibia with heavy brown spots, lacking a white line; webbing on toes less than *lafrentzi*. 42 mm. Chihuahua, México; New Mexico and Arizona, U. S. A. .....*Hyla wrightorum* sp. nov., p. 436

Hyla eximia Baird

(Plate LXVI, figs. 1-10; Plate XLVII, figs. 3-5)

Hyla eximia Baird, Proc. Acad. Nat. Sci. Phila., 7, 1854, p. 61 (type description; type locality, City of Mexico, Distrito Federal, Mex. Major William Rich, collector); and Rept. U. S. Mex. Boundary Survey, 2, Reptiles, 1859, p. 29, pl. 38, figs. 8-10; Peters, Monatsb. Akad. Berlin, 1869, p. 880 (*part.*); Brocchi Bull. Soc. Philos., Paris, (7), I, p. 128 (*part.*); Boulenger, Cat. Batr. Sal. British Mus., Ed. II, 1882, p. 378, (*part.*); Günther, Biologia Centrali-Americana, Reptilia, Batrachia, June, 1901, pp. 261-262, (*part.*); Brocchi, Mission Scientifique au Mexique et dans l'Amérique Centrale, part 3, 2d sec. liv. 1, 1881, pp. 32-33, pl. 13, figs. 3, 4, 4a (*part.*); Cope, Bull. U. S. Nat. Mus., No. 32, p. 14 (*part.*); Nieden, Das Tierreich, Anura I, Berlin and Leipzig, 1923, p. 245 (*part.*); Kellogg, Bull. U. S. Nat. Mus., No. 160, 1932, pp. 153, 164-168 (*part.*).

Hyla gracilipes Cope, Proc. Acad. Nat. Sci. Phila., V. 17, Oct., 1865, p. 194 (type description; type locality, "Tableland northeast of the City of Mexico" [Mirador, Veracruz]); and Bull. U. S. Nat. Mus., No. 32, 1887, p. 14; Brocchi, Mission Scientifique au Mexique et dans l'Amérique Centrale, part 3, 2d sec. liv. 1, 1881, pp. 36-37; Boulenger, Cat. Batr. Sal. British Mus., Ed. II, 1882, p. 378; Günther, Biologia Centrali-Americana Reptilia and Batrachia, June, 1901, p. 262; Kellogg, Bull. U. S. Nat. Mus., No. 160, 1932, pp. 153-154 and 168-170 (*part.*).

The identity of *Hyla gracilipes* Cope has been something of a puzzle. Boulenger (1882 *loc. cit.*) recognizes the form as distinct and merely copies a part of Cope's description, while Günther (June, 1901, *loc. cit.*) places the species in the synonymy of *Hyla eximia*. He comments that the statement in the description, "eyes little prominent, one half tympanic disk," is probably a *lapsus calami*.

Brocchi (*loc. cit.*) recognizes the species apparently without having specimens, and wholly on the authority of Cope *et al.*

Kellogg (*loc. cit.*) revives the name and includes the four cotypes, and nine specimens from the state of Chihuahua. He places *Hyla lafrentzi* Mertens and Wolterstorff in the synonymy of the species.

An examination of the cotypes (USNM, Nos. 15318-15321, which, according to Cope, were from "Mexican tableland northeast of the City of Mexico," and according to the USNM Catalogue, "Mirador, state of Veracruz, 1863, Carlos Sartorius, collector") shows four small specimens, so faded that practically no trace of the original coloration can be discerned, and the markings are very dim. However, the general characters of skin, body and limbs are not effaced. When compared with *H. eximia* from the type locality region I find only differences so slight that I regard them as negligible. The great length of the foot mentioned is but a trifle longer in one specimen than the normal for *H. eximia*. In all, the tympanum is only

one half (or less) than the eye, instead of the opposite (an erroneous statement given in the type description).

Another significant fact is that all are small, measuring from 28 to 33 mm. That these are adult is evidenced by the fact that two have the ovaries filled with ripe eggs. I am placing *H. gracilipes* Cope as a synonym of *H. eximia* Baird.

While *H. eximia* shows numerous variations in its wide range, it appears that these are of lesser import than would warrant even subspecific designations, at least as regards the material available to me. Specimens from Puebla in the south, with the spotting greatly reduced, compared to the heavily lined and spotted ones from Nayarit and Durango, seem superficially to be rather different from each other, but there is no sharp limit to these forms and the transition seems gradual in various populations.

The most recent treatment of *H. eximia* is that of Kellogg (*loc. cit.*). He includes *Hyla euphorbiacea* Günther and *Hyla smithii* Boulenger in the synonymy. I am commenting on the former in this paper. I have recently [Trans. Kan. Acad. Sci., 39, 1936 (July 2, 1937), pp. 357-359, pl. 2, figs. 1-5] redescribed *H. smithii*. Beyond question it is distinct from *Hyla eximia* Baird. Specimens of these forms have been examined by Mr. H. W. Parker of the British Museum and drawings made of the types of *Hyla smithii* which show the characteristic differences between the forms. *H. smithii* is related to *Hyla underwoodi* and *Hylella picta*, showing the characteristic type of pigmentation, entire lack of green coloration, larger finger pads, greater amount of webbing on the toes and feebly developed vomerine teeth. *H. smithii* has a distribution coextensive with *H. eximia* in the western part of the range, but probably occupies more territory in Guerrero and perhaps less in the eastern part of the range of *H. eximia* in Puebla and Veracruz.

The collection made by Dr. H. M. Smith and myself in Mexico totals some 245 specimens. The following localities are represented: Nos. 1840-1877, 3 km. northeast, Cholula, Puebla, July 11, 1932 (Taylor-Smith); 1881-1915A, 6 km. east, Amazoc, Puebla, July 20, 1932 (Taylor-Smith); 1916, La Colorada, Zacatecas (Smith and Dunkle), July 10, 1934; 1917-2009, 13 to 15 km. east Aguascalientes, Aguas. July 23, 1934 (Smith-Dunkle); 2010-2014, Rancho Guadelupe, 42 km. west of Toluca, México, August 4, 1932; 2015-2023, Tepic, Nayarit (Taylor); 2024-2033, near Zapotiltic, Jalisco, June 24, 1935 (Smith); 2034-2058, near Chapala, Jalisco, July 2, 1935 (Smith); 2059-2066, near Uruapan, Michoacán, July 1, 1935 (Smith); 1878, near Tierra Colorada, Veracruz, July 16, 1932

(Taylor-Smith); 1879-1880, 3 km. S. Hda. San Martín, near Zitácuaro, México, August 4, 1932 (Taylor-Smith); 5600-5603, Tepeaca, Puebla, August 12, 1936 (Taylor); 5604-5605, Hda. El Sabino, south of Uruapan, Michoacán, August 5, 1936 (Smith); 5606-5617, Uruapan, Michoacán, August 6, 1936 (Smith).

I have been able to examine a large part of the material of this group present in the United States National Museum.

Diagnosis. The smallest Mexican representative of the *eximia* group; usually some shade of green above and yellow below; dark reticulation, enclosing cream spots on posterior and anterior sides of thigh lacking; head proportionally small; a brown line from snout passes through nostril to eyes, then continues diagonally low on the side to groin, bordered above by a silver white line; lip bordered by a dark line; area between the two dark lines on the side of head, whitish, forming a stripe of irregular width to arm; front side of tibia with some dim spotting, not or rarely bordered by a whitish line on its dorsolateral surface. Trace of a web between fingers; toes about one third to two-fifths webbed; the finger pads small but distinct, one half to four fifths of the diameter of tympanum; a tarsal fold; vomerine teeth between small choanae; eyelid narrower than interorbital space; tibiotarsal articulation brought forward, reaches to some point on eye. The horny nuptual pad present on first finger a very light brown, but never a deep brown color.

Description of the species. The species is somewhat variable as regards coloration and the character of the preserving fluid tends to change somewhat the general appearance. Specimens preserved in alcohol are usually some shade of gray or ultramarine; in formalin they are often grayish-brown. Throughout its range the species tends to break up into races, some of which will doubtless be named eventually, when their ranges can be better determined. Four rather distinct varieties are discernible. These vary somewhat in size; in the size of the digital pads; the extent of the webbing on the toes; the shape of the head, and in dorsal coloration. I can discern the following varieties:

A. The typical form occurring in Puebla, Central Western Veracruz, Distrito Federal, México, and possibly also the borders of adjoining states. These are characterized by the strongly defined lateral lines; usually a pair of elongate spots in the sacral region, which may be extended forward or broken into a second pair of spots, which are white-bordered, especially on the medial edges.

B. A western striped form, best differentiated in Nayarit. In this the head is usually less pointed and the dorsal stripes are wider, often reaching forward to the eyelids; there is frequently a medial row of irregular dark

dots, and some small spots lateral to the dorsal stripes; often there is little or no green coloring anywhere on body; usually the thigh and tibia have no, or only sparse, spotting above; the range of this type includes Jalisco, Nayarit, Michoacán, and Morelos. In the latter region (Michoacán and Morelos) many of the specimens are greenish and have the area between the dorsal stripe and the lateral stripe, very light (yellowish or cream) and the medial and outer lateral rows of small spots are wanting. (See plate XLVI, figs. 1, 2, 4, 5, 9, 10.)

C. Specimens from Zacatecas and Aguascalientes have the hind limb very heavily barred with brown dorsally. They are somewhat smaller, but have much of the general appearance of the typical specimens. Sometimes, however, the stripes reach the eyelids and certain ones show spots lateral to the dorsal stripes. (See plate XLVI, figs. 3, 6, 7, 8.)

D. The most striking variant is represented by two specimens from Durango (USNM, No. 14083). These have a brownish ground color; one has large, irregular, deep-brown spots covering the dorsal surface of the body and limbs; the other a pair of curving shoulder spots with other scattered spots and fine scattered flecks over the dorsal surfaces of the body. These specimens are badly shrivelled; however, the pads on fingers are distinctly larger than those on specimens from Nayarit.

These variants appear different to the eye. However, with the study of the material available to me I am unable to make a satisfactory separation of these variant forms into groups that warrant subspecific designation.

All seem to agree on having small choanae; relatively large groups of vomerine teeth, and the same essential color pattern on sides of head and body.

The figures given by Baird, United States and Mexican Boundary Survey (plate 38, figs. 8-10) are poor for detail, especially as regards the markings on the side of the head, the general characters of the roof of the mouth and the characters of the pads; and the general habitus of the body (in fig. 8).

I am at a loss to account for the apparent absence of *H. eximia* from Guerrero. Kellogg (*loc. cit.*) lists specimens collected by Hans Gadow from Tacubaya, Guerrero. Since the postal directories of 1892 fail to list such a locality for Guerrero, I suspect that the state is incorrect. This name occurs in Distrito Federal, where Gadow collected, as well as in certain other states which I believe he did not visit. (Tamaulipas, Campeche, Yucatán, Tabasco).

Hyla euphorbiacea Günther

Hyla euphorbiacea Günther, Cat. Batr. Sal. British Mus., Feb. 12, 1859, p. 109, pl. X, fig. C (type description; type locality, Córdova [Veracruz]; Cordilleras [of México?] and México, four specimens and a skeleton).

Hyla eximia ? Peters, Monatsb. Akad. Wiss. Berlin, 1869, p. 880 (*part.*). (It is possible that all the specimens mentioned are true *H. eximia*. However, *H. euphorbiacea* is placed in

synonymy.) Boulenger, Cat. Batr. Sal. S. Ecuad. British Mus., 2d Ed. 1882 (*part.*, specimens, types of *H. euphorbiacea*); Günther, Biologia Centrali-Americana. Rept. Batr; June, 1901, p. 261-262 (*part.*) Brocchi, Mission Scientifique au Mexique et dans l'Amérique Centrale, pt. 3, 2d section, livr. 1, 1881, pp. 32-33 (*part.*); Kellogg, Bull. U. S. Nat. Mus., No. 160, 1932, pp. 164-167 (*part.*) (all or part of the Oaxaca specimens—certainly USNM, No. 47908).

? *Hyliola bocourti* Mocquard, Nouv. Arch. Mus., (4) T. 1, 1899, pp. 341-342 (type description; type locality, "Haute Vera Paz," Guatemala; maximum length, 40 mm.; the posterior face of the thigh is brown with yellowish white spots).

A series of nine small hylid frogs collected by Dr. Hobart M. Smith near the city of Oaxaca make evident the necessity of reviving the name *Hyla euphorbiacea* Günther. These specimens agree with Günther's brief description and figure. While obviously of the *eximia* group, and related to *Hyla eximia*, they differ from this species in the pigmentation and coloration of the posterior femoral regions, and somewhat greater webbing of the toe, and in having a broader head. *Hyla regilla* listed by Brocchi (*loc. cit.*), plate XIII, figs. 2, 2a, cannot be *H. bocourti* (*euphorbiaecea*), since the dorsal coloration and the posterior thigh coloration shown is different from that given in Mocquard's description of *Hyliola bocourti.* Figure 3 of this same plate is labeled *Hyla eximia* var. *euphorbiacea.* This is a specimen lacking black lines on the back and may or may not be *Hyla euphorbiacea*, since certain *eximia* lack evidence of these spots or lines, and they are frequently present in *euphorbiacea.*

Hyla bocourti Mocquard, Bull. Soc. Philom., Paris, (9) T. 1, 15, is very probably a true *Hyla eximia* of the Tepic form shown in this paper (plate XLVI, figs. 1, 2, 4, 5).

Diagnosis. A member of the *eximia* group, related to *Hyla eximia* Baird, but somewhat larger with a broader head and the posterior part of the femur strongly marked with blackish pigment enclosing round or irregular cream markings. Upper labial edge dark gray, bordered by a cream line; greenish, or grayish-green above with elongate spots which may be absent or obscured; vestige of web between the fingers, with traces of dermal fringes on fingers; toes with webs extending about a third of their length, with strong dermal fringes; a well-defined tarsal fold; a large inner and smaller outer metatarsal tubercle; largest disks on fingers about two thirds to three fourths the area of the tympanum; a fold on breast. Male with vocal sac; tibiotarsal articulation reaches to about middle of eye; length of eye slightly longer than its distance from the nostril, one fourth shorter than length of snout; interorbital width about one third greater than width of upper eyelid; vomerine teeth in two slightly diagonal series between the choanae.

Description of the species. (From EHT-HMS, No. 3134, near

Oaxaca, Oaxaca, México, August 4, 1935. Hobart Smith, collector; one of a series of 9 specimens.) Top of head nearly flat; the depth at tympanum, 4.5 mm., at nostril, 3.2; eyes moderate, projecting somewhat, their length a little greater than distance to nostril, but much shorter than snout; tympanum rather distinct, its diameter a little greater than half the length of eye opening; upper eyelid about two thirds as wide as interorbital distance; snout projecting moderately beyond mouth. Canthus rostralis more or less distinct, rounded or slightly angulate, the loreal region strongly oblique, not or slightly concave; vomerine teeth in two groups more or less closely approximated, lying between the large choanae, separated from them by a distance slightly less than length of a single group; tongue nearly circular, slightly notched behind, free for a little more than one fourth its length; a large median vocal sac; skin above and on sides smooth; abdomen and most of ventral surface of the femur with large granules; chin with very minute granules; breast nearly smooth, the granulation can scarcely be discerned; a part of the posterior part of femoral region granulate; arm with a few granules or tubercles on the ventral surface; fingers with well-developed disks, that on first finger small, scarcely wider than digit; that on third finger more than two thirds size of tympanum; first finger reaching a little beyond the subarticular tubercle of the second; latter reaches the disk of fourth; the fourth reaches the disk of third; a vestigial web between the fingers and a trace of a dermal fringe on sides of digits; inner palmar tubercle large, prominent, rounded anteriorly; median and outer partly confluent, forming a large tripartite pad; subarticular tubercles, large, rounded, save the proximal tubercles on two outer fingers, which are scarcely larger than supernumerary tubercles on palm; hand, to tarso-metatarsal joint, shorter than the tibia; when limbs are folded at right angles to body axis the heels overlap about one millimeter. Inner metatarsal tubercle large, salient, its length in its distance from tip of first finger about 2.5 times; toes about one-third webbed, the webbing extending to or a little beyond the second subarticular tubercle on the three outer toes, to the single subarticular tubercle on the first and second; well-defined dermal fringes on toes extending to the disks.

Color. Above green (silvery gray in alcohol) with two elongate, irregular dark blotches beginning about middle of body and extending to groin; a dark narrow black bar extends from snout through nostril to eye, silver-edged above; a broad, dark-blackish stripe, silver-edged above, begins behind eye, including most of the tympa-

num, then passes above arm; it then turns down, passing along the sides of body, rising again posteriorly; the lower part of the stripe is grayish posteriorly on its lower side and fades to a lighter shade toward the ventral surface; a few small, indefinite, lighter spots on sides; two or three larger yellowish spots in groin; upper lip bordered with a narrow gray line continuous in front and bordered above with a narrow cream or silvery line which is scarcely distinguishable from the lighter area in the loreal region, which continues back a little distance behind the angle of the jaws; outer edge of arm with a light-edged, broad, dark stripe; an irregular darker blotch on hand; palm lacking pigment; a dim darker bar crosses femur distally; one or two similar bars on tibia; anterior surface of femur with a dim dark stripe, light-edged above; a large blotch on foot near heel; underside of foot and heel with some dark pigment; chin and other ventral surfaces creamy white (vocal sac more or less darkened in males); the posterior and anterior surface of femur blackish or brownish with well-defined yellow-cream spots, round or irregular in shape; the front side of the arm with none, or only very dim, markings.

Measurements of *Hyla euphorbiacea* Günther

Number	3126	USNM 47908	3133	3134
Sex	♂	♂	♂	♀
Snout to vent	35	37	32.2	33
Head length to angle of jaw	10	11.5	10	10
Head width, greatest	12.2	12.9	10.7	10.5
Diameter of eye	2.5	4	3.5	3.6
Diameter of tympanum	2.1	2.2	2.1	1.8
Length of snout	4.9	5	4.4	4.4
Interorbital distance	3.65	3.8	3	2.9
Upper eyelid	2.8	2.4	2.5	2.4
Arm	20.2	21.5	19.8	20
Hand and longest finger	9.9	11	8.6	9.1
Leg	55	60	51.5	50
Tibia	16.6	19	15.2	14.2
Foot and tarsus	25	27	23.2	22.3
Largest finger pad	1.9	2	1.5	1.3

Variation. The series of ten specimens vary in the presence of visible dark spots on the sacral region. In some they are totally obscured, in others they may be more distinct and there may be one or more small spots farther anteriorly; the loreal region below the

black bar, and the region under eye and in front of tympanum may be lighter or darker, but posteriorly the light color is prominent and strongly delimited by darker color. The groups of vomerine teeth vary in their proximity, sometimes being closely approximated, in others rather widely separated; usually they reach both anterior and posterior level of choanae.

Remarks. This lot of specimens was collected by Hobart M. Smith, very near the city of Oaxaca, Oaxaca. In his diary he states: "This hyla has a different call from *H. eximia.* The green color on the back is about the shade of that in the leaves of a water lily. The dark stripe on the side is brownish. The groin and concealed surfaces of the femur and tibia are, in the lighter areas, yellowish with a fine brownish reticulation. The vocal sac of the male is light yellow with fine brown stippling. One copulating pair was taken. They were extremely wary and were captured with difficulty. All were captured in a rain pool in a cornfield."

This species differs from the typical *H. eximia* in having a somewhat larger size, and broader head; slightly more elongate fingers, with the vestigial web more pronounced and with somewhat larger disks; the webbing extends a slightly greater distance on the toes, and the posterior coloration of the thigh is wholly different.

Günther states: "M. Sallé generally found it resting on the large euphorbiaceous plants."

Hyla cárdenasi sp. nov.

(Plate XLVII; fig. 2)

Holotype. USNM, No. 84403, Puebla, Puebla, México, September, 1919. H. Ruano, collector. (Field No. 3, Comision Geografica Exploradora de México.)

Paratype. EHT-HMS, No. 3963, near Rio Frio, México, July 31, 1932, E. H. Taylor, collector.

Diagnosis. A member of the *eximia* group. Eyelid wider than the interorbital distance; eye longer than snout in adult; tympanum more than half diameter of eye; head wider than long; diameter of largest finger pads slightly greater than half the diameter of the tympanum; pads subtruncate; web rudiment between first three fingers, none between outer fingers; a thick, well-defined tibiotarsal fold; when limbs are folded, heels touch; tibiotarsal articulation reaches slightly in front of eye; tongue with fine raised papillae; vomerine teeth in two small groups close together, lying directly between choanae, but separated from them by a distance greater than a single group.

Description of type. Head very short, the snout as deep as its length or approximately so, extending somewhat beyond mouth; length of the snout distinctly shorter than length of eye; eyelids distinctly wider than interorbital distance; diameter of tympanum more than half the length of the eye; distance between nostrils equals distance from eye to nostril; tympanum separated from eye by a distance equal to three fourths its diameter; tongue subcircular, very slightly emarginate behind, covered with numerous salient papillae; choanae moderately large, separated by a distance greater than that between nostrils, but not greater than distance between outer edges of nostrils; groups of vomerine teeth rather narrowly separated, about size of choanae, not reaching anterior level of choanae, but extending half their length behind hinder level; skin of dorsal surface quite smooth, on sides growing somewhat pustulate or granulate toward ventral surface; chin and throat with small indistinct granules; remainder of the ventral surface of the body strongly granulate, the granules unequal in size; most of proximal half of ventral surface of femur strongly granulate; distal half smooth; a few enlarged granules below anus, the median ones bordering a distinct groove; some indistinct granules on the ventral surface of arm; a thick fold behind eye covering upper edge of the tympanum and extending back toward arm insertion, not folding down behind tympanum; an area of thickened skin somewhat back of the angle of the jaw.

Tips of fingers strongly dilated, the tips more or less truncate, the essential portion of the pad (anterior to groove) practically twice as wide as deep, the free edge of skin above the tip scarcely evident; a mere vestige of a web between first three fingers; scarcely or not indicated between the two outer fingers; the diameter of the largest pad on fingers as great as that of tympanum, but area is smaller than area of tympanum; distal subarticular tubercles large, rounded, not divided; numerous supernumerary tubercles on palmar surface. A large flat tubercle on ventral surface of the base of the first finger, and a large flattened palmar tubercle, partially divided anteriorly, on posterior part of palm; narrow more or less continuous skin folds on outer edges of fingers, not or scarcely indicated on inner edges; no fold on ventral surface of forearm; tibiotarsal articulation reaching to about anterior edge of eye; a well-defined tarsal fold becoming thickened posteriorly. Toes about one-third webbed, the web continued on sides of toes as a narrow fringe, save there is none on outer edge of outer toe; terminal disks smaller than on fingers, the essential pad nearly twice as wide as long, the tips

rather truncate; all subarticular tubercles well developed, the distal ones not noticeably larger than the proximal ones; supernumerary tubercles on fingers low, rather indistinct; a strong oval, inner metatarsal tubercle; a small indistinct outer tubercle anterior to level of the anterior edge of inner.

Color in alcohol. Above a uniform purplish or lavender-gray (probably a shade of green in life) with no evidence of darker markings; no trace of a light line from eye along side; upper lip scarcely lighter than remainder of side of head and no light mark continued to arm from eye; lighter about insertion of arm; no light mark above anus; posterior surface of femur heavily stippled or powdered with brown; chin of female heavily pigmented; ventral surfaces of hands lacking pigment; feet with some pigment; ventral surface of body dirty-white, lacking pigment.

Measurements in mm. of the type and paratype of Hyla cárdenasi. USNM, No. 84403, and EHT-HMS, No. 3963, respectively: Snout to vent, 39, 22; head length to jaw angle, 12, 8.2; head, greatest width, 14, 8.2; diameter of eye, 5, 3; length of snout, medial, 4, 3.4; depth of snout in front of eye, 4.1, 3.2; diameter of tympanum, 2.6, 1.6; interorbital width, 3.4, 2; upper eyelid, 3.4, 2; arm, 23.7, 12.2; width largest finger pad, 2.5, 0.9; length of leg, 67, 35; tibia, 21, 11; foot and toes, 30, 15.2; largest toe pad, 1.5, 0.9.

Variations. The paratype is a young specimen. It will be noted from the dimensions presented that the proportions vary between young and old, the head being proportionally narrower and the limbs proportionally different from those of the adult. The skin is thickened, minutely corrugated. In life the color was a deep bluish-green; in preservative it is ultramarine.

Remarks. The paratype was collected in the pine forest near Rio Frio, México, at an elevation of about 3,000 meters. It was hopping about on the forest floor. The type is an adult female, the ovaries filled with large eggs.

The relationship of the species appears to be closest to *Hyla lafrentzi,* from which it differs in the details of markings; in lacking the pronounced dark and white lines on the side of the head and body; in the somewhat wider and more truncate pads on the fingers; in having a shorter, thicker snout, and in the heavy pigmentation of the throat of the female. Other differences are evident on a comparison of the descriptions and figures.

In size the species is intermediate between *eximia* and *lafrentzi.*

The species is named for General Lazaro Cárdenas, president of the Republic of Mexico.

Hyla lafrentzi Mertens and Wolterstorff.

(Plate XLVIII; figs. 1, 2)

Hyla lafrentzi Mertens and Wolterstorff, Zoöl. Anz., B. 84, No. 9/10, August 25, 1929, pp. 235-241 (type description; type locality, Desierto de los Leones, in mountain forest, 3,000 meters elevation, near Mexico City, Distrito Federal. Type in Magdeburg Mus. No. 49/27; K. Lafrentz, collector, December 18, 1927); Lafrentz, Blatt. Aquar-Terrar. Kunde, 38, 1927, p. 322.

Hyla gracilipes Kellogg, Bull. U. S. Nat. Mus., No. 160, 1932, pp. 153-154, 168-170 (*part.*).

This species is represented in the collection by EHT-HMS, Nos. 3958A, 3959-3962, near Vigas, Veracruz, México, July 13, 1932, Taylor and Smith, collectors; and Nos. 5978-5991, Lake Zempoala, near Tres Marias (Tres Cumbres), Morelos, 3,300 meters elevation. (Lake Zempoala is about thirty kilometers from the type locality.) I have examined two Michigan Museum specimens, Nos. 5304 and 48065, Guerrero, Hidalgo.

Diagnosis. The largest species of the *H. eximia* group, attaining a known maximum size of 50 mm. head-body length; a vestigial web between fingers; toes between one half and two thirds webbed; fingers and toes with rather small terminal disks, those of fingers the larger; those of outer fingers about half the area of the tympanum; large nuptual callosity at base of first finger, covered with a deep brown horny excrescence in males; tympanum one half to two thirds the length of the eye; eye somewhat shorter than the snout, the interorbital space somewhat wider than upper eyelid; tibiotarsal articulation reaches tip of snout or somewhat beyond; a distinct tarsal fold. Greenish above, the ventral surfaces yellowish, save the chin may be dark in males; paired black spots edged with white on sacral region and a dark blackish streak through eye to side, edged above with white.

Description of species (from EHT-HMS, No. 1814, collected near Vigas, Veracruz, July 13, 1932). Head rather thickened with a depth at jaw angle of 6.5 mm., sloping forward to nostril, where the depth is 3.8 mm., then sloping abruptly down to the mouth; the snout very slightly rounded, in lateral profile, and projecting slightly beyond mouth; canthus rostralis distinct to nostril, slightly rounded rather than angulate; eye moderately prominent; the interorbital width slightly less than width of an upper eyelid; length of eye less than the length of snout; nostril nearer the eye than to the median anterior edge of mouth; tympanum rather large, its diameter a little more than half the length of the eye; pupil of eye horizontal; loreal region sloping obliquely to mouth, slightly concave, the lines of the canthus nearly straight, when extended intersecting at tip of snout or slightly beyond.

Vomerine teeth in two rather small, somewhat conical groups, lying wholly between the choanae, separated by a narrow distance, and separated from the choanae by a distance slightly less than width of a single group; choanae smaller than a single tooth group; tongue subcircular, large, emarginate posteriorly, free for a little less than one third its length; vocal sac medial, single, evident on chin by ample folding of the skin, its elongate openings lying lateral to the posterior part of tongue.

A well-defined supratympanic fold, overhanging the tympanum somewhat, runs back and down to a point somewhat back of the insertion of the forearm; a glandular area behind the angle of the jaws which is rounded on the posterior border; an indefinite glandular area on anterior proximal portion of upper arm. The skin above is practically smooth (minutely corrugate); sides indistinctly granular or areolate, becoming more distinctly granular low on sides; entire abdomen and underside of thigh (largely) with large distinct granules, while those on breast and distended membranes of the throat, smaller, with still smaller intercalated granules; a heavy skin fold across the pectoral region, in which the granules are less distinct; anal region granular; underside of arm granulate, but remainder quite smooth; skin glandular in the supranal region.

A distinct vestige of a web is present between the fingers, and evidence of a thickened dermal fringe on edges of digits extending to the disks. Disks distinct, rounded, that on the third finger largest, about one half the area of the tympanum, that on first finger distinct, but scarcely wider than digit; a large nuptual callosity on inner side of first finger extending to the disk, covered with a dark horny excrescence (perhaps present only during breeding season). A very large palmar tubercle present on base of first finger, its inner outline obscured by the nuptual callosity; medial and outer palmar tubercles confluent posteriorly, separated by a groove anteriorly; subarticular tubercles large; surface of palm with large, irregular granules or tubercles; foot moderately elongate, the part from the tarso-metatarsal articulation to tip of longest toe a little shorter than tibia; a large inner metatarsal tubercle, its length contained in its distance to tip of first toe one and two thirds times; outer metatarsal tubercle small, rather indistinct. Toes somewhat more than half webbed, the webs continued to the terminal disks as narrow, thickened dermal fringes; the proximal subarticular tubercles on the two outer toes small, others large; foot with numerous indistinct subarticular tubercles; a clearly-defined tarsal fold; the

dermal fringe on the fourth toe continued a little behind proximal subarticular tubercle.

Color in life. Upper parts dark green to olive-green, somewhat lighter on the sides (bluish in alcohol). A dark bar from nostril to eye and a dark grayish line bordering the lip, darkest on its upper edge, and bordered above by a cream line, which terminates below angle of jaw; a more or less dense black stripe, edged above with cream, runs from eye along the supratympanic fold, and is continued on the side of the body as a very narrow, scarcely discernible, dark line to groin, delimiting the greenish color of back and sides.

A pair of dark, light-edged spots on the posterior third of the body, with two or three spots on back between femora; a single indistinct dark spot on distal surface of femur; a narrow, light-edged, dark line on outer (anterior) face of tibia, and a similar line on outer (posterior) edge of the tarsus, continued along outer toe; the dark line merges into the coloration below it; glands above anus, cream; posterior surface of femur and concealed part of tibia with a sparse, uniform peppering of black; a few indistinct darker flecks on toes; ventral coloration cream to flesh, the vocal sac grayish-purple with the granules cream; ventral surface of foot sparsely pigmented; a dark line with a light border above on outer side of arm and hand.

Measurements (in mm.) of *Hyla lafrentzi* Mertens and Wolterstorff

Number	5980	5984	5986	5978	5991	3960
Sex	♀	♀	♂	♂	♂	♂
Snout to vent	50	44	41.2	43.2	40	39
Snout to eye	5.5	5.2	5.9	5.8	5.6	5.5
Head length to angle of jaw	15	14.6	13.2	13	12	12.3
Head width, greatest	15.9	15.2	15	14.6	13	14.1
Diameter of eye	5	4.7	4	4.3	4.1	4
Diameter of tympanum	3	3	2.6	2.85	2.35	2.3
Eye to nostril	3.5	3.7	3.35	3.6	3.1	3.3
Depth of head in front of eye	4.7	4.5	4.5	4.5	4.5	4.4
Heels overlap	3.7	3	3.5	2.7	2.5	3
Arm	29.2	28	23	23.6	24.6	24.5
Hand	15	12.1	12.1	12.1	12.3	11.6
Leg	85	75.5	68	68.3	67.5	64
Tibia	27.2	23	22	21.5	21	20.2
Foot and tarsus	37.1	33.5	32	31	29	28.9

Variation. Specimens from Lake Zempoala, Morelos, from a higher elevation show a slight difference in the depth of the head, and the tip of the snout is slightly more elongated.

Remarks. The specimens collected near Vigas, Veracruz, were found about a small rain pool beside the highway during the morning. The males were calling. Those taken at Zempoala were calling most of the day. A single pair was found clasping. A few immature tadpoles, presumably of this species, were found in small pools in the bog near the lake edge.

While this species resembles certain specimens of *Hyla eximia* in general characteristics, its much greater length and bulk, the longer legs, proportionally wider head, and the fact that the range of *H. lafrentzi* is within that of *H. eximia*, should preclude the possibility of their being regarded as the same species.

Hyla wrightorum sp. nov.

(Plate XLVII, fig. 1.)

Hyla eximia Yarrow, Bull. U. S. Nat. Mus., No. 24, 1882 (*part.*) (specimens from New Mexico); King, Copeia, 1932, No. 2, p. 99 (Mormon Lake, Arizona); Wright and Wright, Handbook of Frogs and Toads, Ithaca, N. Y., 1933, pp. 118-119, plate XLIII (an excellent series of photographs of live specimens with a description, and notes on voice, breeding, and habits (Texas, New Mexico, Arizona); Stejneger and Barbour, Check List North Amer. Amph. Rept., 3d Ed., 1933, pp. 34, 35 (*part.*).

Hyla gracilipes Kellogg, Bull. U. S. Nat. Mus., No. 160, pp. 154, 168-170 (*part.*) (specimens listed from Chihuahua); Stejneger and Barbour, Check List North Amer. Amph. Rept., 3d Ed., 1933, p. 35 (*part.*).

Holotype. No. 79141, Museum of Zoölogy, University of Michigan. Eleven miles south of Springerville, Apache county, Arizona, U. S. A.

Paratypes. USNM, Nos. 26605-26609, Meadow Valley, Chihuahua, Mexico; USNM, No. 9338 (2 specimens), Santa Fe, New Mexico, U. S. A.; MUMZ, Nos. 79141, 3 specimens; 11 miles south of Springerville, Apache county, Arizona, August 13, 1935; 79143, 4 specimens; David Lee Lake, southwest of Luna, Catron county, New Mexico, August 6, 1935, 8,000 feet; 79142, 3 specimens; 26 miles north of Luna, Catron county, New Mexico, 8,100 feet, July 31, 1935; 75734, 1½ miles northwest of Miller's peak, Huachuca mountains, Arizona, August 16, 1933.

Diagnosis. A member of the *Hyla eximia* group, but differs from typical *H. eximia* in a larger size, longer legs, the heels overlapping one or two millimeters when limbs are folded at right angles to the body; the tibiotarsal articulation reaches the tip of snout or slightly beyond; the head is less pointed, and proportionally wider; the first finger is proportionally longer. The posterior half (or more) of the edge of the lower jaw is darkly pigmented; the posterior side of femur lightly and evenly pigmented.

Description of the type. A medium-sized member of the *Hyla eximia* group. The snout is rather truncate or bluntly conical, with the canthi more or less distinct but rounded; the line between eye and nostril somewhat concave, sloping obliquely from canthus to edge of lip; diameter of eye somewhat greater than distance of eye to nostril, and equal to distance of nostril to middle of upper labial border; nostrils below edge of canthus, the distance between them about equal to their distance from eye; the area about nostril slightly elevated, and a slight, shallow groove present between nostrils; diameter of the tympanum is contained in the diameter of the eye slightly more than 1.5 times; the distance between the tympanum and eye about .65 of diameter of tympanum.

Tongue broadly cordiform or subcircular with a very slight median emargination posteriorly; free posteriorly for two fifths of its length. In males the openings of the single vocal sac are lateral to the tongue and much elongate; tongue papillae not prominent; the raised prominences bearing the vomerine teeth are large, placed slightly diagonally and closer to each other than to choanae; they arise near anterior level of the choanae, but do not reach their posterior level. The openings of the mucous glands form a continuous groove anterior to choanae; latter proportionally large.

A vestige of a web between first three fingers, but practically obsolete between outer fingers; disks on the fingers moderate, only a little wider than the toes, the widest one on outer fingers equal in width to a little more than half the diameter of tympanum; first finger reaching to a point halfway between the distal subarticular tubercle and the terminal disk of the second; the distal subarticular tubercles large, that on outer finger very slightly bifid on right side (probably abnormally); a slight dermal fringe on the lateral edges of fingers; fourth finger longer than second.

Legs elongate, the limb laid forward, the tibiotarsal articulation reaches to the tip of the snout or beyond slightly; when limbs are folded at right angles to body the heels overlap about two millimeters; terminal disks on toes not wider than digits, distinctly smaller than finger disks; a well-defined tarsal fold; a prominent, salient, inner metatarsal tubercle, its length in the first finger length about two and one-half times; outer metatarsal tubercle distinct, flattened, lying behind the anterior level of the inner tubercle; inner toes webbed at base, the depth of web from one fourth to one third the length of the outer toes; the web between the three outer toes incised to a point one third the distance between the two

proximal subarticular tubercles of the fourth toe; supernumerary tubercles on palm and foot more or less distinct. (In males the large tubercle at the inner part of the base of first finger is covered with a corneous callosity, usually very light brown in color.) Anal flap rather wide, not especially modified; no axillary web; skin on body relatively smooth, under magnification one observes minute corrugations, more evident above eyes; a strong skin-fold across the breast; ventral surface granulate, the granules on the anterior part of abdomen largest, less distinct on throat and chin; granulations prominent on median ventral, and to some extent, posterior part of thighs; a rather thick but relatively indistinct fold above tympanum.

Color in alcohol. Above, on limbs and body, grayish-lavender (probably some shade of green in life); two rather large and several smaller spots in sacral region; a narrow brownish line begins near tip of snout, passes back through the nostril to eye; beginning behind eye it involves tympanum and runs back low on the sides, breaking up into irregular spots as it rises diagonally on the posterior part of the side; limbs barred with brownish, two bars each on thigh and tibia, several on foot; the tibial spots are continued onto front face of tibia; upper lip, and to a lesser extent lower lip, bordered with a narrow band of brown, narrowly edged with cream or white; ventral surface dirty-white, immaculate; a well-defined

Measurements (in mm.) of *Hyla wrightorum* sp. nov.

Number	USNM 9338*a*	MZUM † 19141 Type	USNM 9338*b*	USNM 26607	USNM 26605
Sex	♀	♀	♀	♀	♂
Snout to vent	42	42	40	37	34.2
Head length to jaw angle	12.4	13	12*	13.2	12.2
Head width, greatest	13.1	13.2	12	12	11
Diameter of eye	4.5	4.35	4.3	4	3.5
Diameter of tympanum	2.6	2.85	2.3	2.5	2.1
Length of snout	5.2	5.2	5	5.4	5
Interorbital width	4	4	3.6	4	3.85
Eyelid	3.5	3.8	3.2	3.5	2.9
Foreleg	21.2	23.2	22.6	21	18
Hind leg	68	70.5	62	60	55
Tibia	22	23	20	20	18
Foot and tarsus	30	31.5	27.5	26.2	23

* Head somewhat dried and distorted.

† Museum of Zoölogy, University of Michigan

spot on anterior side of upper arm, and none or only a vague scattering of pigment on the chin and throat; underside of feet and hands with some pigment and lighter flecks; posterior and anterior part of femur and groin region with an equal distribution of fine, brown pigment.

Remarks. Specimens of this species have been present in the United States National Museum since 1874. Yarrow (North American Reptilia and Batrachia, Bull. U. S. Nat. Mus. No. 24, 1882, p. 172) lists No. 8508, 2 spec. Nutrias, New Mexico, and No. 9338, 2 spec. Santa Fe, New Mexico, June, 1874, H. W. Henshaw, collector, under the designation *Hyla eximia* Baird. In Cope's Batrachia of North America, Bull. U. S. Nat. Mus., No. 34, these specimens are not listed under *Hyla eximia*, nor, so far as I can discover, is there reference made to them.

In the Stejneger and Barbour, Check List of North American Amphibia and Reptiles, 3d Ed., 1933, pp. 34-35, *Hyla eximia* is listed from Mexico, Texas, New Mexico and Arizona. *Hyla gracilipes* is likewise listed, p. 35. I have seen no specimens of the *eximia* group from Texas, but if a form of the group occurs there, it may belong to this species (*wrightorum*). I have examined a series of specimens of this species in the collection at Cornell University, due to the kindness of Dr. A. H. Wright. These specimens were collected near McNary, in Arizona, by W. C. Chapel, Jr. Mr. F. Willis King (*loc. cit.*) has published a short note on the species based on specimens collected by him at Mormon Lake, Arizona.

This species is related more closely to *H. regilla* and *H. lafrentzi* than to the typical *H. eximia*. From the former it differs in having a smooth rather than pustular skin, and in having a longer leg, the tibiotarsal joint reaching the tip of the snout or beyond, instead of to the region of the eye. The webbing of the toes is somewhat less and the diameter of the tympanum is greater than half the diameter of the eye; the toes and fingers are wider with somewhat wider pads.

From *H. lafrentzi* it differs in having the webbing between the toes somewhat less with narrower fingers and toes, larger choanae, a shorter, blunter snout, somewhat deeper in front of nostrils. The front edge of the tibia is heavily spotted with brown, instead of having it blackish with a cream-white or silver line which is continued to foot.

It is a species apparently adapted to semidesert conditions.

The species is dedicated to Anna Allen Wright and Albert Hazen Wright in recognition of their work in American herpetology.

PLATE XLVI

Hyla eximia Baird

FIG. 1. *Hyla eximia* Baird. EHT-HMS, No. 2021, ♀ ; Tepic. Nayarit, Mexico. × 1.

FIG. 2. Same. EHT-HMS, No. 2023, ♀ ; Tepic, Nayarit, Mexico. × 1.

FIG. 3. Same. EHT-HMS, No. 1931, ♂ ; Aguascalientes, Aguascalientes, Mexico. × 1.

FIG. 4. Same. EHT-HMS, No. 2018, ♂ ; Tepic, Nayarit, Mexico. × 1.

Fig. 5. Same. EHT-HMS, No. 2015, ♂ ; Tepic, Nayarit, Mexico. × 1.

FIG. 6. Same. EHT-HMS, No. 1925, ♂ ; Aguascalientes, Aguascalientes, Mexico. × 1.

FIG. 7. Same. EHT-HMS, No. 1924, ♂ ; Aguascalientes, Aguascalientes, Mexico. × 1.

FIG. 8. Same. EHT-HMS, No. 1947, ♂ ; Aguascalientes, Aguascalientes, Mexico. × 1.

FIG. 9. Same. EHT-HMS, No. 2061, ♂ ; near Uruapan, Michoacán. × 1.

FIG. 10. Same. EHT-HMS, No. 2064, ♂ ; near Uruapan, Michoacán. × 1.

PLATE XLVI

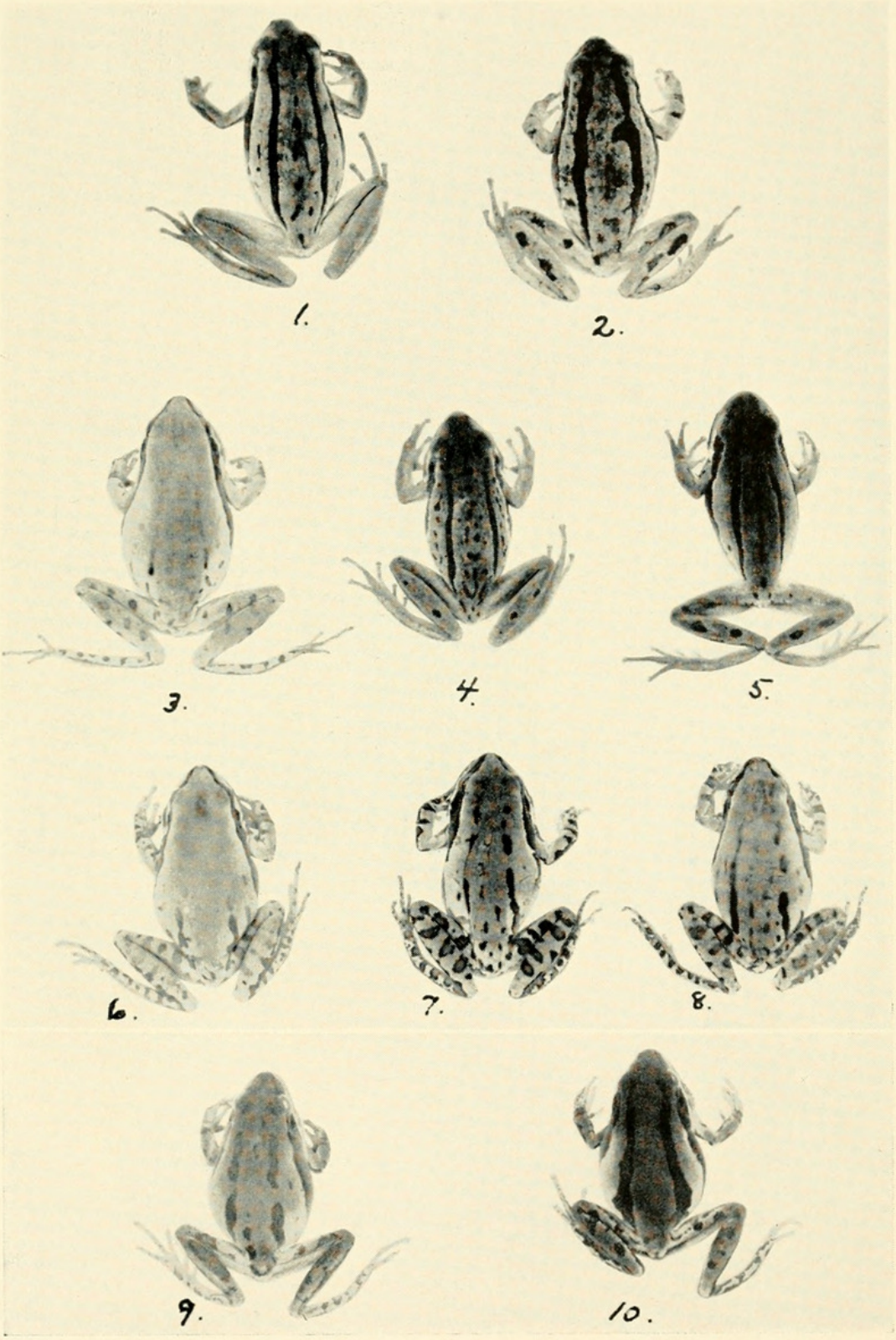

PLATE XLVII

MEXICAN HYLIDAE

FIG. 1. *Hyla wrightorum* sp. nov. Holotype, MZUM, No. 79141, 11 miles south, Springerville, Apache county, Arizona, U. S. A.; actual length, 42 mm.

FIG. 2. *Hyla cárdenasi* sp. nov. Holotype, USNM, No. 84403, Puebla, Puebla, Mexico; actual length, 39 mm. (Spotting on back and limbs due to injuries.)

FIG. 3. *Hyla gracilipes*, Cope. Cotype, USNM, No. 15318 ♀ ; actual length, 22 mm.

FIG. 4. Same. Cotype, USNM, No. 15319 ♀ ; actual length, 23 mm.

FIG. 5. Same. Cotype, USNM, No. 15320 ♀ ; actual length, 21.8 mm.

PLATE XLVII

PLATE XLVIII

Hyla lafrentzi Mertens and Wolterstorff

FIG. 1. EHT-HMS, No. 5978, ♂ ; Lake Zempoala, Morelos, Mexico; actual length, 43.2 mm.

FIG. 2. EHT-HMS, No. 5980, ♀ ; Lake Zempoala, Morelos, Mexico; actual length, 50 mm.

PLATE XLVIII