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Geographic Variation in  
Brazilian Species of *Hyla*

*by*

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# Geographic Variation in Brazilian Species of *Hyla*

BERTHA LUTZ\*

## ABSTRACT

Until now, practically all Brazilian species of *Hyla* have been described or discussed exclusively under the nominative form, without regard for geographical variation. The subspecies is almost unknown in the systematics of Brazilian frogs. This paper is concerned with local variation in two difficult groups, that of *Hyla catharinae* and of the species *Hyla polytaenia*. Variation becomes apparent on extension of the known distribution, going from altitudinal forms to subspecies in isolated or peripheral parts of the range.

Altitudinal variation was first pointed out by the author (1952) for *Hyla circumdata* Cope when specimens of this montane coastal species were collected above 1,800 meters on the Itatiaia Mountains. They were robust, and lacking the specific pattern of dark violet circles on a lighter blue-violet background on thigh parts which were concealed in repose. These colors were substituted by a uniform purplish-black, or slate colored surface. A new subspecies was not set up because some robust specimens from slightly lower elevations at Itatiaia, and elsewhere, showed vestiges of the circles.

## New Subspecies of *Hyla catharinae*

The typical form of *Hyla catharinae* was described by Boulenger (1888) from the state of Santa Catarina in southern Brazil. This species is individually variable, but the nominative form is recognizable in the mountains of that state and of Rio Grande do Sul. The subspecies described below come from more northern serras (mountains) belonging to the same coastal orographical system. The specimens conform to much more than 75 per cent of differentiation from other geographical races.

*Hyla catharinae bocainensis* n. subsp.—This form was first seen by A. Lutz in 1925 at his brother's Fazenda do Bonito in the Serra da Bocaina, at approximately 1,100 meters altitude. He selected the name long ago, but did not formally describe the form. All but two of the specimens obtained there agree with this form. One of these is aberrant, the other, a small specimen taken above timberline, agrees with the form I call *simplex*, which is dominant above timberline on the Itatiaia Range, across the Paraíba Valley.

*H. c. bocainensis* (Fig. 1) is best characterized by a light, scalloped and

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Fig. 1. *Hyla catharinae bocainensis* female;  
natural size, 44 mm.

festooned network surrounding and enclosing, or limiting, the dark dorsal spots and dorsolateral areas. The females are large and robust, 40 mm. or more from snout to vent.

Type and Type-Locality.—There are 11 specimens, including three large females in the A. Lutz collection and one at the Department of Zoology of the state of Sao Paulo. The following description is based on the latter (No. 56) as it is more recent and in perfect condition. It was collected at the Fazenda do Bonito by Mrs. Maria Aparecida Volcano of the DZSP, in January 1960. The female paratypes are numbers 2517, 2518, and 2535 in the A. Lutz collection at the Museu Nacional, Rio. Type-locality: Fazenda do Bonito, 22° 22' 30" S.; 44° 35' 30" W.

Size.—Type 44 mm. snout to vent length; other females from 41.5 to 46.5 mm. Build robust. Males much smaller, less robust, 33–36.5 mm. snout to vent length. Leg length average, the tibiotarsal articulation reaching between the eye and the nostril when the hind limb is adpressed, head is oval and as wide as long. Snout truncate between the nostrils, rounded in front, with moderately distinct canthus rostralis and concave loreal region flaring to the mouth. Eye large and very prominent, its horizontal diameter greater than the distance from its anterior corner to the nostril, equal to the distance to tip of the snout. Tympanum moderate, one-third the diameter of the eye. Interorbital space slightly wider than the upper eyelid; internarial space one-fourth less than the interorbital space. Tongue large, round, and

emarginate. Vomerine teeth in two small groups between the choanae, contiguous in the type. Disks short, wide, the largest slightly rounded in front, all constricted behind. A rudiment of web between the lateral fingers. Web on foot oblique and narrow between first and second toes, slightly wider between second and third, wide and quite symmetrical between third, fourth and fifth; inserted below the disk on the outer sides of second, third, and on fifth, wide to the second subarticular tubercle on the inner side of the third and on both sides of the fourth toe. A callous under the first finger and another, wider one under the third and fourth; an elongate inner and a minute outer metatarsal tubercle. Palmer and plantar tubercles as in typical *H. catharinae*. Skin slightly warty on the head, granular on the ventral aspect.

Pattern.—The light mantle of the mantled phase of *H. c. catharinae* from Santa Catarina is replaced by a conspicuous light network with scalloped and festooned edges surrounding and invading the dark dorsal areas. The interocular spot retains its form best; it has a slight dent in front, between the eyes, and is prolonged backward, narrowing gradually to a blunt point which is bipartite in some specimens. The sacral spot is broken up into a number of fragments. In the type, the largest fragment is narrow, roughly chevron-shaped and very much prolonged in front; it is followed by two slightly eccentric ocelli and a quite irregular and eccentric part. The sacral spot also may be broken up into insular spots. In some of the other specimens only vestiges of the chevron remain. The network is prolonged onto the top of the head and nostrils as a light cap, and may contain one or two large dark spots. The sides of the head below the canthi are dark, with four or even five light oblique bars from below the eye to the edge of the upper jaw. Light areas on the limbs similar to the network, enclosing broad dark spots, which are sometimes spoolshaped. Ventral aspect similar to that of the typical form. Pattern on concealed parts of the limbs not marked nor visible ventrally. Edges of limbs dark.

*Hyla catharinae simplex* n. subsp. This is the form of *Hyla catharinae* from the Serra da Mantiqueira, which is parallel to and slightly inland from the Serra do Mar. This subspecies differs from the nominative form and other subspecies by the slightly smaller size, narrow, elongate build, simplified dorsal pattern, and the absence of vivid flash colors.

Type-Locality.—Brejo da Lapa, Alto Itatiaia, 2,200 meters above the sea (app. 22° 31' 15" S.; 44° 39' 00" W.). Male type MNR No. 4035 collected by B. Lutz, Nov. 1954; female allotype No. 4036 collected by A. L. Carvalho and H. Berla, Dec. 1962.

Size.—Variable, generally fairly small. Female 35–40 mm., male 25–28, rarely more. Build narrow, elongate. Morphological characters of the species: dorsal pattern very simple. A triangular interocular spot prolonged posteriorly, and a pair of rather straight longitudinal lateral stripes on the back. Sacral spot indistinct. Mid-dorsal region plain, lighter than the spots. Flash colors dull, grayish-violet. Ventral aspect stippled, darker than usual.

In some specimens the interocular spot is pointed posteriorly, in others blunt, sometimes bifid, in others assymetrical; lateral stripes sometimes slightly deflected inward. The mid-dorsal region may be slightly ornate.

At Brejo do Lapa a large population has been under observation for many years. They call, in the weak voice of the whole species, on the ground or on the herbs at the edge of an artificial pool in which they breed.

Specimens from lower elevations at the Itatiaia and from Cidade Azul, Campos do Jordao, also on the Mantiqueira Range, are paler and slightly more ornate. A number of juveniles of other more ornamented races are similar to *H. c. simplex*. This suggests that the *simplex* pattern may represent the specific pattern in its simplest form, devoid of glands and a sacral spot, whereas in the other races the pattern is modified and becomes more complex during growth.

*Hyla catharinae opalina* n. subsp.—This is a very handsome race of *H. catharinae* from the northern block of the Serra do Mar.

Type Specimens and Type-Locality.—Serra dos Orgaos at Teresopolis, state of Rio de Janeiro ( $22^{\circ} 26' 12''$  S.;  $42^{\circ} 52' 42''$  W.), 800–900 meters elevation. MNR numbers 4037 (female, March 1945) and 4038 (male, March 1948) from the collection of Bertha Lutz.

*Hyla catharinae opalina*.—This differs from the nominative form by having a more northern distribution, a generally very light and glandular dorsal aspect, and an opaline flash color on the flank and upper concealed aspects of the thigh.



Fig. 2. *Hyla catharinae opalina* female; natural size, 44 mm.

Morphological characters are those of the group. Build robust, size rather large: female (Fig. 2) 40–45 mm., male 23–34 mm. snout to vent. Dorsal parts very glandular, generally light in color, pattern indistinct. Interocular spot shallow, W-shaped; sacral spot absent; dorsolateral stripes marked only anteriorly. Flash color opaline, light greenish blue on bluish green. Bold black blotches at the flank and groin very conspicuous from beneath.

In some specimens the interocular spot is crescent-shaped, concave anteriorly but also shallow. Some specimens are more pigmented, and have a more pronounced dorsal pattern.

This subspecies is often seen in or at the entrance of the Organ Mountains National Park. It calls above the mountain streams and breeds in shallows. The voice is feeble, as in the whole group. The tadpole has a white spot between the nostrils.

Similar specimens have been collected at Nova Friburgo, and also in the northern block ( $22^{\circ} 16' 42''$  S.;  $42^{\circ} 21' 34''$  W., 900 meters elevation).

#### A New Subspecies of *Hyla perpusilla*

*H. perpusilla v-signata* n. subsp.—Some time after discovering *H. perpusilla* in the ground-dwelling bromeliads of the coastal plain, we began to find specimens in the bromeliads, both ground-growing and epiphytic, of the adjacent coastal sierras. These specimens, while conforming to the general coloring, morphology, voice, habitat and ecology of the nominative form, differ from it by attaining a slightly larger size and more intense pigmentation, especially on the gula. Nor is the proportion of the different patterns quite the same. This form is considered to be an altitudinal race which we call *Hyla perpusilla v-signata* (Fig. 3).

Diagnostic Characters.—An accumulation of pigment on the gula forms a thick, V-shaped figure, either fragmented into the two arms, or slightly out of shape, and sometimes broken up into dark flecks. Size slightly larger, flash color deeper and more abundant; montane distribution.

Types and Type-Locality.—More than 100 specimens were examined. The types were chosen from the Organ Mountains population, whose sample is more numerous than the others and also the most characteristic. Type: MNR 3607; four paratypes, MNR numbers 3608, 3609 from the Organ Mountains National Park at Teresopolis were collected by the author in November and December 1956.

Size.—Slightly larger than that of the nominative form; female 27 mm.; others 25, 26, and 24 mm., snout to vent. Build rather elongate and robust for the size. Hind limb variable, the tibiotarsal articulation reaching between eye and nostril in three, only to the front of the eye in others. Feet slightly more webbed than *H. p. perpusilla*, otherwise morphological characters in agreement with that subspecies. Dorsal aspect rather moss-like or lichenous. Pattern as in the *H. catharinae* group of species, more complete than usual in the nominative form. Interocular spot very shallow with light halo in front.

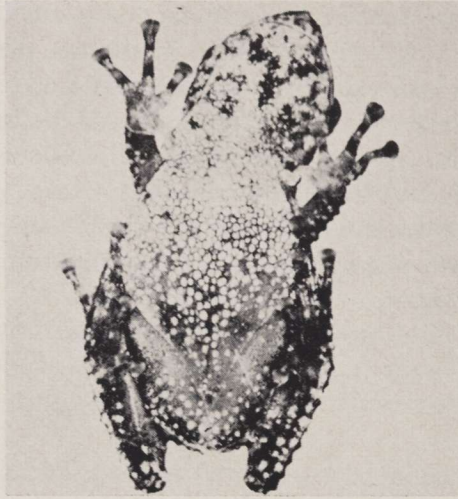


Fig. 3. *Hyla perpusilla v-signata*; natural size, 27 mm.

Sacral spot roughly crescent-shaped, somewhat longer and slightly eccentric in the largest syntype. Dorsolateral spots very distinct, like inverted (left to right), pointed parentheses, the apex turned upward onto the back. Bars on limbs distinct, with wide light intervals, and extensive flash color; light area on the flanks between the dorsolateral dark areas and the sacral spots; concealed pattern perceptible from beneath. Warts rather numerous, especially on the head and edges of the body.

Dorsal colors olive browns and grays. Flash color orange to cadmium orange. Pupil slightly tawny, iris as in nominative form. Underside: gula grayish, belly with whitish glandules, the viscera showing through dark blue. Ventral aspect of thighs paler, slightly violaceous.

Diagnostic V.—The montane subspecies was first separated from the lowland form because of the pigmented gula. At its best, the V of color on the throat is wide, complete, composed of two thick, not very oblique branches covering the upper part of the throat. In some specimens the branches are thicker at the top, in others they are almost horizontal; they may also be broken into separate branches. Occasionally the V-shaped part is prolonged downward by a double or single streak of pigment approximating a Y. In others the V is substituted by a single squarish blotch. Occasionally there is another pair of blotches below the first pair, or again the pigment is dissolved into a number of flecks and dots. Whereas the V is very striking in living specimens it is, unfortunately, liable to fade after death. By varying the incidence of light it can, however, frequently be sufficiently illuminated to stand out.

Voice, ecology, and breeding site is the same as in *H. p. perpusilla*.

Bromeliads constitute a habitat with an independent microclimate that emancipates their inhabitants from the general environment. The cooler climate of the serras seems to favor growth and intense flash colors.



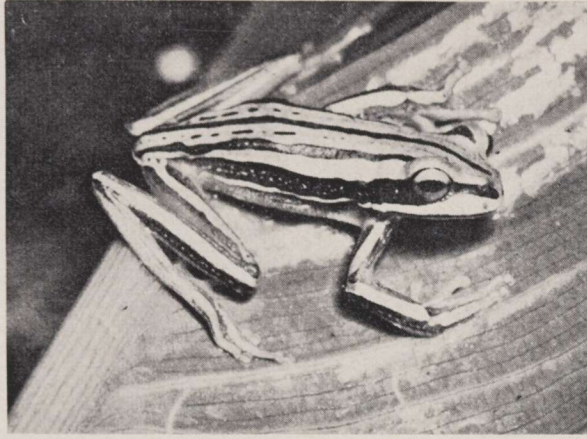


Fig. 4. *Hyla polytaenia* from Upper Itatiaia.

#### Variation in *Hyla polytaenia* Cope

*Hyla polytaenia* (Fig. 4) is a montane coastal Brazilian species of moderate size originally described from the southeastern mountains. Its typical pattern consists of a series of longitudinal stripes down the back. Cochran (1955) points out that in large specimens (over 40 mm. long) this pattern is reduced to three stripes, one central and two lateral. She calls this the adult patterns and considers simplification as a function of size and perhaps of sex, since all the large specimens are females. This is true to a certain extent for the southern part of the Serra do Mar which is the *terra typica* of the nominative form. There is, however, a geographical factor involved. On the parallel, slightly inland, at Serra da Mantiqueira (Campos do Jordão and especially Upper Itatiaia) this trend becomes evident in males also. The Upper Itatiaia populations living on the Plateau above 2,000 meters, where there are a few pools derived from mountain brooks, are unusually large. Males attain the length of the females from elsewhere and females may reach 50 mm. from snout to vent instead of the usual 39–40 (or quite exceptional 43 mm.). Simplification of pattern is not uniform. Some specimens have only the three main stripes but many show two longitudinal series of dots on the hind part of the back.

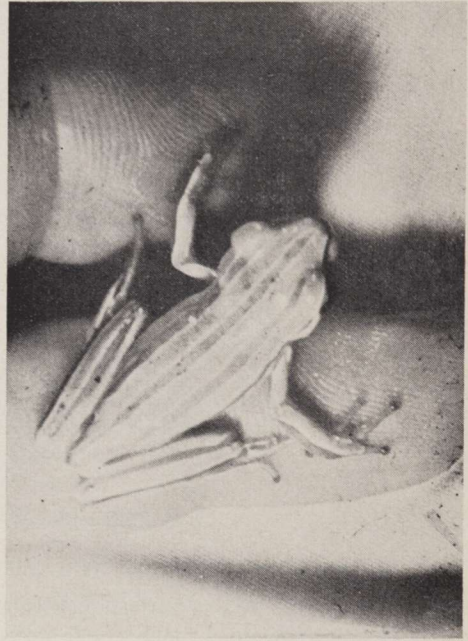
*Hyla polytaenia* goes into Minas Gerais. The samples from Juiz de Fora and from outside Belo Horizonte are small to average; the secondary stripes are present but generally fragmented. At Peços de Caldas the margin of the three main stripes is brilliant. Two populations, *H. p. cipoensis*, distant and peripheral from Goiás, and *H. p. goiana*, from the Serra do Cipó in Minas Gerais diverge even further.

*H. p. cipoensis* n. subsp.—This is a series of fairly small tree frogs (Fig. 5), collected in the Serra do Cipó, Minas Gerais. While similar to *H. p. polytaenia*, they are sufficiently different to warrant considering them as sub-specifically distinct.

Differential diagnosis.—Morphologically like *H. p. polytaenia* but differing



A



B

Fig. 5. (a) *Hyla polytaenia cipoensis*, dark phase. Female allotype, natural size 37 mm. (b) *H. p. cipoensis*, light phase, male, natural size 26 mm.

greatly in color, dorsal pattern and pattern on the gula. Lateral pattern more similar, size and build moderate. Hind limb variable but rather short. Head mostly as long as wide. Tympanum small. Group of vomerine teeth round and short.

Types and Type-Locality.—Three males, type and paratypes, were collected in December 1947 by the author, one female allotype and seven other paratypes in the same year by Prof. Amilcar Vianna Martins. All were taken near Alto do Palacio, in the Serra do Cipó, municipality of Jaboticatubas, between Lagoa Santa and Ferros, Minas Gerais, at approximately 1,300 meters elevation. Types in the Museu Nacional, paratypes in the Adolpho Lutz Collection, also at the Museu: Nos. 4039, male type; 4040, female allotype; 4041, 4042, 4043–49, male paratypes.

Description. Size small. Males 29 (type), 27, and 26 mm. from snout to vent. Hind limb 48, 47, 46 mm., the adpressed tibiotarsal articulation reaching in front of the eye. Head as long as wide, except for the largest one, in which it is barely wider. Snout short, loreal region concave, high; canthus rostralis distinct; interorbital region wider than the upper eyelid. Eye longer than the distance from its anterior corner to the nostril. Tympanum less than half the diameter of the eye. Tongue variable, unnotched, slightly emarginate in the third, very slightly free. Vomerine teeth in small, rounded, separate groups between the choanae. A short web on the lateral fingers. Toes about half webbed; palms and soles full of tubercles; pollex rudiment present,

knob-like; an oval, inner metatarsal tubercle. Skin of abdomen and mid-ventral part of the thigh very granular.

Female (allotype) much larger than male, 37 mm., the hind limb (64 and 63 mm.) relatively shorter, the tibiotarsal articulation reaching only to the eye. Build more robust. Pollex rudiment not noticeable.

Paratypes 36 mm. (female); 33 and 28 mm. (males); 23 and 22 mm. juveniles, from snout to vent.

Pattern.—Dorsal pattern reduced to the three main dark stripes, one vertebral, two lateral, the first ending on the head before the tip of the snout, the others on the inner posterior edge of the upper eyelid. No vestige of the other stripes from which the name of *H. p. polytaenia* is derived. Permanently visible dorsal stripe of the limbs similar in color to the dorsal surface, light edged. Main lateral stripe passing under the canthus rostralis and ending before the tip of the snout (as in *H. p. polytaenia*), enclosing the eye and the tympanum, and ending before the groin. Upper light stripe no more than the dorsolateral light edge; lower light area wide, about as long as the dark stripe, brilliant white on the sides and on the maxilla, except in front, where it takes the color of the dorsal background. A brilliant white curved stripe on each side of the gula.

Color.—In life completely different from the browns and buffs of *H. p. polytaenia*. Two phases, dark more common; background dull green, lighter on the limbs and the outer digits visible in repose. Stripes purplish-brown. Light phase: background a clear luminous yellow, stripes grayish lavender.

Well preserved specimens show vestiges of pigment, especially the green one which acquires a bluish tint.

Length of hind limb variable (as in other forms and in most Brazilian hylas), but on the whole short. Head wider than long in one paratype. Shape of the tongue also variable. Additional short, light and dark lateral areas in the large female paratype.

Sexual dimorphism not marked in our series. Vocal sac of male not large; claw-shaped point of the pollex rudiment not palpable; only the medium syntype has thickened forearms.

The short stay of only two days and nights in the type-locality, mostly under torrential rain, did not yield much information on points such as behavior and voice.

Ecology. The Serra do Cipó constitutes a most interesting environment. The vegetation belongs to the type called "Cerrado" in Brazil, i.e., open scrub with tortuous bushes and many open spaces. A brook runs between banks below Alto do Palacio, where the water table overflows much of the higher ground. Low herbaceous vegetation grows in marshy places which are spongy underfoot. Rocks are plentiful and are used for erecting stone walls.

Distribution not known. The typical form, *H. p. polytaenia*, occurs 134 kilometers from the Serra do Cipó, and some 500 meters lower.

*Hyla polytaenia goiana* n. subsp. (Fig. 6).—This is the outmost population

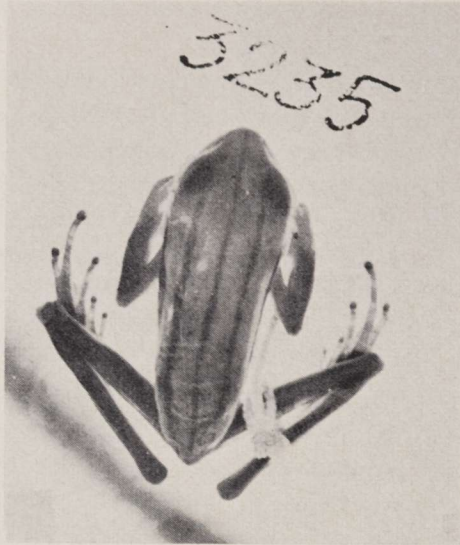


Fig. 6. *Hyla polytaenia goiana*, male paratype; natural size 30 mm.

of *H. polytaenia* known. While immediately reminiscent of the species, it diverges not only by the distance of its locality from the remainder of the known range, but also in color by having dull, powdery spots and pigments in contrast to the usually brilliant colors of *H. polytaenia*, and by having longer legs.

Unlike most forms described by the writer, I had not seen the specimens from the Highlands of Goiás alive. They were given subspecific rank because of the characters mentioned above, albeit with some doubts about the validity of this race.

Type-Locality.—Jatobasinho, São João da Aliança, highland of Goiás, collected by A. L. Carvalho, May 1956. Type, MNR No. 3235; male paratypes, numbers 3233, 3234, 3236, and 3237.

A series of nine males in the Museu Nacional was collected by Mr. Antenor Leitão de Carvalho in the county of São João da Aliança, above 1,000 meters of altitude; these specimens diverge from the typical form of *H. polytaenia*. Four, obtained in a camp called Jatobá, are very dark, whereas the other five, from another camp, Jatobasinho, are pale.

Size and Appearance.—Similar to those of the typical form—30 to 31 mm. from snout to vent—one 29, another 33, both from Jatobá Camp. Build similar to nominative form; head apparently narrower, length and width subequal. Hind limb relatively long, the adpressed tibiotarsal articulation reaching almost to the nostril, or even beyond the snout in all but one shorter-legged specimen. Vomerine teeth forming a straight row; vocal sac puckered in the middle, in some specimens, with two lateral oblique folds. Forearm thick in the nuptial condition; rudiment of pollex present in all, but no sharp point perceptible. Dorsal pattern simplified; one entirely devoid of pattern, the

others with the three main stripes only; uniform in width, not fragmented or forming drops, the two lateral near the central stripe. Vestiges of secondary stripes fragmented into drops present only in the largest specimen. Dark borders of limbs noticeable on forearm and tarsus as in the nominative form; a light, upper border over the anal and the tarsal folds. Vestiges of rounded spots made up of minute dots, occupying the permanently visible dorsal strip of the femur and corresponding area of the tibia, in large specimens only. In all nine specimens spots and pigment have a powdery aspect.

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