

# The Frogs of the Federal District of Brazil

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## TOPOGRAPHY

(Plates 1-5)

The Federal District of Brazil is composed of the capital city, Rio de Janeiro, its scattered suburbs and a somewhat extensive rural area, comprising altogether 1.356 kms<sup>2</sup>. Politically, it corresponds to the city of Washington and the District of Columbia, in the U.S.A. It is entirely surrounded by the adjacent state of Rio de Janeiro, as Washington D.C. is surrounded by the states of Maryland and Virginia, and is situated 22° 54' 24" S. & 43° 10' 21" W. Gr. Much of it is lowland, but it is crossed by two chains of mountains, which are isolated parts of the maritime orographic system, separated from the inner and the higher parts of the Serra do Mar by wide expanses of plain. (See Map, Pl. 1 and Pls. 2-4.)

Besides very beautiful scenery, this sort of topography offers great ecological opportunity, as it provides many diverse habitats. The lowlands comprise beach, dunes, scrub, (Pl. 3) lagoons, plains and marsh. The mountains were originally covered by forest; much of it was destroyed through human agency, but some of it has been spared especially in the government-owned land. The forest (Pl. 4) is crossed by a multitude of small brooks.

Several of the lower hills reach a thousand feet and the two loftiest peaks, the Tijuca and the Pedra Branca, are slightly over three thousand feet high. Ancient heads of gneiss or granite rear their heights above the timber, or crop out as perpendicular ledges, over which, in certain places, water drips or pours almost constantly (Pl. 2, fig. 2). Cliffs and boulders rise sheer out of the ocean (Pl. 4, fig. 2) at the edges of drowned valleys (Sugar-Loaf), others mount guard over the sea as battlements (Gávea, Pl. 2, fig. 1; Pl. 4, fig. 3.) Between the mountains and the plain the land forms hills and slopes, partially covered by houses and gardens and cultivated stretches of land.

The city thrusts deep into the valleys and clings precariously to the flanks of the hills. It stretches onto ever increasing areas of lowland, especially towards the north, where the F.D. goes over into the lowlands of the state of Rio de Janeiro, which are called the Baixada Fluminense, and are somewhat similar to the San Joaquin Valley of California.

#### FROGS FOUND IN THE FEDERAL DISTRICT

Fifty two different frogs have been found until now within the boundaries of the Federal District. In the surrounding state of Rio de Janeiro, which is larger and where the mountains attain greater heights, there are more species.

My list (see p. 156-159) is not quite the same as that published by Myers in 1946. I have excluded some of the forms indicated by him because they do not occur in the F.D. This applies to the great horned toad, *Ceratophrys dorsata*, which could hardly have escaped notice until now if it were really present. *Lophiohyla piperata*, or rather *Amphodus luteolus* (Wied), since Miranda Ribeiro's form is the same as that of the Prince zu Wied, is a specialized frog from the coastal scrub of Espírito Santo and southern Bahia. The types of Miranda Ribeiro, which were labelled as having been found in the grounds of the National Museum, cannot have been collected there. *Hyla polytaenia* is a montane frog, which is very common in the southeastern coastal mountains, but I have never found it below 2.400 feet, an altitude at which there is no standing water available for breeding in the Federal District. *Hyla craspedospila* Lutz, the name of which was misspelt, through typographical error, into *crospedospila*, in the original description, also does not seem to occur in the F.D. but in the valley of the Parahyba river, in the states of Rio de Janeiro and of São Paulo. *Hyla elongata* (very near *H. nana*) is also not found in the F.D. Myers was evidently misled by Lutz' statement that he got them together with his *H. fuscomarginata* described from Rio, S. Paulo and Minas; this was however not in the F.D. but in Minas Gerais. *Hyla pallens* Lutz is excluded because its author later put it to the synonymy of *H. minuta*, together with *H. emrichi* and *H. suturata*. This also applies to Boulenger's *H. bivittata* and Cope's *H. velata* though they may be geographic varieties.

The inclusion of a few forms not found in Rio by a non-resident naturalist is not surprising since the capital city and the Federal District bear the same name as the adjacent state.

This circumstance led another author, R. Mertens, more recently (1950) into listing two other species also not found here, as pertaining to the anuran fauna of the vicinity of Rio. They are *Hyla giesleri* and (*Dendrophryniscus*) *moreirae*. The latter seems to be a relict; near the latitude of Rio de Janeiro it occurs on the Itatiaia, one of the highest mountains of Brazil (near 9.000 feet) on the borders of the states of Rio de Janeiro, S. Paulo and Minas Gerais. There it is common but it is also found on other high parts of the same range and on the peak of Marumbi, near Curitiba, the capital of Paraná, between 5.000



and 6,000 feet, on the Maritime Range. There are a few vicariants elsewhere.

A few forms formerly found in the F.D. may have died out. This seems to be the case of *Hyla corticalis* described by Burmeister (1856) from a garden in Laranjeiras, near the mountains. It is synonymous with *H. pardalis* Spix, fide A. Lutz; although it still is common in Petrópolis and other mountainous places in the state of Rio de Janeiro, it has never been found by us in the F.D., where we have been collecting for the last thirty years.

I have added the following species, omitted by Myers, which do occur: *Leptodactylus typhonius* or *sibilator*, *Eupemphix olfersioides*, *Thoropa petropolitana*, *Microhyla microps* (*sub-nigra* Miranda Ribeiro). Duméril and Bibron's description suits Miranda Ribeiro's form. The printed label and the Catalogue of Types in the Museum of Paris give Rio de Janeiro as type-locality for *Engystoma microps*.

*Hyla langsdorffi* is also present and *Hyla circumdata* even seems to be increasing of late.

Myers and I do not always use the same generic or specific name. Pending further study I retain *Elosia nasus*, *Trachycephalus*, *Centrotenella* and *Thoropa*. I have put *Hyla goeldii*, which carries its eggs on its back, supported by two low folds of dorso-lateral skin, to Miranda Ribeiro's name *Flectonotus* (1926). It is too specialized for *Hyla*. Miranda Ribeiro's name proposed for it, *Fritzia*, is preoccupied and so is his name *Coelonotus*, (both 1920-d), proposed for *C. fissilis* which is very near to *goeldii*. The difference in the support of the clutch between all these forms is not fundamental but rather one of degree and *Flectonotus* is the earliest valid substitute. I have also used *Sphoenohyla* n. nov. (Lutz & B. Lutz, 1939) for *Sphoenorhynchus* Tschudi since that name is preoccupied. The forms generally lumped together under *Hyla aurantiaca* Daudin, which includes a minute species from the F.D. called *S. planicola*, should be given sub-generic recognition (A. Lutz & B. Lutz 1938), since they have more aquatic habits than the average *Hyla* and reduced maxillary dentition, as well as a wedge-shaped snout. *Trachycephalus* is preserved as it corresponds to a phragmotic Hylid, whose completely ossified skull has adaptive value. *Thoropa* is often called *Eupsophus* but differs from that genus by having visible tympana and being adapted to a saxicolous mode of life. *Paludicola bressloui* seems to be a *Physalaemus*. *Eupemphix olfersioides* certainly does not belong to that genus, even if *Eupemphix* should be generically different from *Pleurodema*. *E. olfersioides* is very minute and seems nearest to *Sminthillus limbatus*, of Cuba. Both are very like *Phyllobates*, but *olfersioides*, at any rate, does not seem to transport its tadpoles on its back. The generic status of *Sminthillus brasiliensis* Parker is equally doubtful. It also occurs in the F.D., though rare. The hand is superficially similar to that of an *Atelopus*, but bears minute, excentrically acuminate disks and the whole palm is padded with tubercles.

Three undescribed forms are added. Two of them belong to the Kreis of *Hyla catharinae*. The morphological characters are quite similar but they differ from the typical form described from that state, the type of which I examined in London, by size, colour, details of pattern and build and from each other by the same characters, by the flash colour of the areas concealed in repose and also as to ecology and altitude. The other seems to be a southern sub-species of *H. misera* Werner (*H. goughi* Boulenger, in part) fide A. Lutz. *Hyla goughi* Boulenger may be the same species, but unfortunately the original description seems to have included characters belonging to *Hyla minuta* Peters. The plate accompanying it presents some of the latter, though the type is not *H. minuta* and is very near to our new form.

#### DIFFERENTIAL DIAGNOSES OF THE NEW FORMS.

*Hyla trapicheiroi* n. sp. Lutz & B. Lutz

(Pl. 16, figs. 2 and 5)

Morphological characters of the Kreis of *Hyla catharinae*; i. e.:

Vomerine teeth in two short, rounded, almost contiguous groups between the choanae; tongue rounded, slightly emarginate; disks very wide and short; eyes prominent, nostrils raised, snout projecting, a slight constriction at the base of the head. Dark interocular, sacral and dorsolateral spots.

Differs from the nominal form by the somewhat smaller size and the deeper colour of the concealed surfaces.

♂ 26 mms. ♀ up to 40 mms. Dorsal surface brown. Interocular spot large, quadrangular, prolonged well onto the back, sometimes fenestrated, fragmented or posteriorly bilobed. Sacral spot broad, roughly crescent- or, occasionally, pyramid-shaped. Surfaces concealed in repose deep blue, surrounded by black meshes on the thighs and interspersed with black spots on the flanks. Underside flecked with brown, especially in the larger, female, specimens. Voice weak; call: "tché tché tché".

Montane, sylvan. Hides in bromeliads, crevices and large rolled-up young leaves. Occasionally swarms at the nuptial period. Spawns in slack reaches of streams and brooks and in pools, even quite small or artificial ones. First collected near the dam and pool built in the Trapicheiro stream, at Tijuca F.D.

*Hyla humilis* n. sp. Lutz & B. Lutz

(Pl. 16 figs. 9 and 10, Pl. 17 fig. 9)

Morphological characters of the Kreis of *Hyla catharinae*.

Characterized by the much smaller size, ♂ 23 mms. 25 mms., ♀ 31-32 mms., very slender build, long legs and squarely truncate snout.



Dorsal aspect generally gray, sometimes brown, with a few large warts disseminated over it. Interocular spot W-shaped, generally very narrow, with very short arms; sacral spot indistinct; lateral pattern composed of double, elongate, finger-shaped marks, deflected downwards onto the sides; often additional ornamentation on the back. Concealed surfaces coerulescent, (topaz-blue to Nile green, Ridgway). Underside flecked with brown especially on the gula; often stripes and spots on the ventral surface of the hindlimbs.

Marshy lowlands of the Federal District and Baixada Fluminense.

*Hyla misera meridiana* n. subsp.

(Pl. 17, fig. 1)

Very similar to the type specimen of *Hyla goughi* Boulenger from Trinidad B. W. I. (which includes specimens of *H. minuta* Peters) and to the Venezuelan specimens and pictures referred to *Hyla misera* Werner by Lutz (1927). Differs from both as to the length of the hindlimb, the vomerine teeth, details of pattern and southern distribution.

Size small, ♂ 17-19, max. 20 mm., ♀ 20-23, max. 24 mm. Body elongate, snout angular, tibiotarsal articulation reaching only to the eye. Vomerine teeth mostly quite indistinct, when visible disposed in oblique series, converging posteriorly. Dorsal background in attenuated tones of orange; a dark stripe over the canthus rostralis disappearing on the sides of the body; a pair of similar dark lines down the back, beginning on the interocular region, sometimes another pair over the sacrum, or dark dots and fragments; occasionally dorsal pattern absent; oblique dark stripes on the visible surfaces of the hindlimbs. Beneath immaculate. Webs on feet about 4/5.

#### BIOLOGICAL AND ECOLOGICAL NOTES<sup>1</sup>

The frogs from the Federal District can be roughly divided into montane forms and forms pertaining to the lowlands. Those from the mountains live mostly in the forest and those from the lowlands in open country. A number of unspecialized forms wander onto the slopes, presumably from the valleys, and occupy cultivated land, including market-gardens with open reservoirs and large beds of water-cress. The fauna of the montane forest and that peculiar to the coastal scrub are more specialized than the frogs from the open country. One genus, *Thoropa*, lives entirely on the ledges of rock over which water drips or pours constantly (Pl. 2, fig. 2). A number of forms are strict bromeliad-dwellers. Bromeliads (Pl. 5) ought, however, to be regarded as a separate unit in neotropical ecology (B. Lutz 1948).

<sup>1</sup> For habitats see plates 2-5.

For species 6-19.

The montane forest is very moist and rather near to saturation point. It offers many different niches to frogs (Pl. 4). All of them are in use and there is a general trend among their frog inhabitants to spawn and develop in the adult biotope, as shown by the examples mentioned below. The principal ecological niches available are the forest-floor, covered by mulch, dead leaves and low vegetation; the beds of brooks; plants overhanging them; occasional slack pools; grottoes; crevices, epiphytic ferns and bromeliads.

*Stombus boiei*, *Cyclorhamphus eleutherodactylus*, *Oocormus microps*, the three species of *Eleutherodactylus*, *Microhyla* or *Engystoma microps* and *Leptodactylus nanus* live on the forest-floor, though the latter also occupies slopes on the edges of the woods. *Brachycephalus ephippium* walks around sedately in very wet spots or on rainy days. *Microhyla* or *Engystoma microps* and *Oocormus microps* burrow; the latter and *L. nanus* have terrestrial larvae (Lutz 1931, B. Lutz 1944 a and 1948). *Eleutherodactylus* has no larval stage at all (B. Lutz 1941, Lynn and B. Lutz, 1944).

The mountain brooks are inhabited by *Elosia nasus*, *Crossodactylus gaudichaudii* and *Cyclorhamphus fuliginosus*. *Crossodactylus gaudichaudii* occasionally follows rills outside the forest. *Elosia* remains in the woods and as Guenther aptly says "*Elosia* sits in the brooks and sings like a bird" (Lutz, 1930). If disturbed, it leaps into the stream, but generally returns later to the same stone or spot, thus showing an incipient notion of territory, or rather of what the German authors call: "Ortstreue". These two genera are diurnal, a mode of life probably associated with their unusually good means of defense.

*Cyclorhamphus fuliginosus* is flat and ovoid and has fully webbed feet. It also remains in the brooks, lurking under stones or in crevices, from which it barks loudly, even in day-time, in short double staccato notes. Its tadpoles are semi-aquatic and either crawl around on wet ledges or swim with the anterior part of the body raised (Lutz 1929). *Cyclorhamphus eleutherodactylus*, which has no webs on the toes, is also troglodytic but terrestrial. I have never heard it calling in Rio, but in the higher mountains of the state of Rio de Janeiro it often croaks buried in the earth.

Above the brooks live *Phyllomedusa guttata* and *Centrolenella eurygnatha*, both of which spawn on leaves and have the embryonic period lengthened to a fortnight, after which the larvae hatch and fall into the water, with their full complement of larval organs. *Phyllomedusa guttata* follows the generic habit of glueing the leaves together, whereas *Centrolenella* leaves them open and uses the underside on which it also rests. It likes swift water or small water-falls; perhaps the spray is useful in preserving the clutch moist (A. Lutz & B. Lutz 1939 and B. Lutz 1948). Adult *Phyllomedusa guttata* also hide in crevices and grottoes, as does *Hyla trapicheiroi*. *H. circumdata* may sit on shrubs but is more often found on stones at the edges of brooks. It has a loud voice, which Prof. Gualter Lutz compares to stertorous breathing an J. Venâncio to uncouth guffaws.



Still or sluggish waters for spawning are hard to come by in the steep mountain woods (Pl. 1, fig. 1, Pl. 4). Those available at its edges, or quiet reaches in brooks are sought by *H. trapicheiroi*, *Stombus boiei*, *Physalaemus bressloui* and *E. olfersioides*. The last two are very small and satisfied with little puddles. *P. bressloui* is also found in the lowlands and *olfersioides* on slopes.

A few years ago some lowland species were introduced into an artificial pond, at edge of the Tijuca montane forest, by a misguided dollar-a-year administrator, who filled the pond with lowland water-plants. The species found there now include *H. minuta*, *Hyla cuspidata*, *Hyla albomarginata*, *Hyla faber* and *Phyllomedusa burmeisteri*, though the last three may have arrived there before. They all seem able to maintain themselves but are not invading the forest.

There are different degrees of adaptation to life in bromeliads. *Brachycephalus* and other frogs merely take refuge in them. *Hyla albofrenata* calls almost the whole year round from those epiphytic on trees, in the montane forest, but leaves them for the brooks at spawning time. *Hyla perpusilla* is exceptional, as it is found in the maritime scrub formation, on huge coastal rocks covered with bromeliads and in the montane woods, where it is larger and generally has a V-shaped mark of dark pigment on the gula. It lives entirely in bromeliads, spawning and spending the whole of the tadpole stage in the water of the leaf-cups. *Dendrophryniscus brevipollicatus*, which is sylvan and montane, also breeds in the bromeliads (Lutz, 1931). The coelonotus form *Flectonotus goeldii* is a strict bromeliad dweller. The females carry the eggs on their backs until submetamorphosis and then release them into the leaf-cup for a short period.

Of the Microhylidae only a few specimens are known and there is very little information as to their habits. *Microhyla microps* is a forest form.

*Thoropa* is not strictly a forest dweller, but spends its whole life (eggs, larvae and adults), on ledges of rock over which water flows or drips constantly.

With only two exceptions, there seems to be far less specialization among the frogs from the generally open plains and deforested slopes. Many of them belong to the large unspecialized genera of the dominant families such as *Hyla*, *Bufo* and *Leptodactylus*, though there are a few species of other fairly large genera. Life-histories also mostly conform to the usual pattern of aquatic larvae and terrestrial adults.

Some of our lowland species of *Hyla* have never been collected above the plains. This applies to *Hyla langsdorffi*, *Hyla anceps*, *Hyla misera meridiana*, *Hyla bipunctata* and *Hyla humilis*. Others work up towards the hills in the Federal District, or elsewhere, but are always collected in the open, in the vicinity of standing water. Some of them, such as *Hyla minuta*, or *Hyla senicula*, seem very tolerant, others apparently have a few modest requirements. Some forms of *Phyllomedusa*, *Hyla anceps* and *Hyla leucophyllata* like deeper water, as pointed out by J. Venâncio. These forms have the tail ending in

a flail and keep it vibrating constantly. *Hyla faber* seems to prefer ponds at a certain altitude, especially those with a clayey bottom and shallow margins, where it can build the round, walled, private pools, within the vicinal one, in which it spawns, *Hyla decipiens* hangs its clutch from the vegetation, so that it can dangle above the water and release the embryos into it. Two of the three species of *Phyllomedusa* found in the Federal District live in the lowlands and on open slopes. The large one, *P. burmeisteri*, prefers deep pools overhung by trees or relatively high vegetation, such as lattices with vines. The smaller one, *P. rohdei*, is less arboreal. The larvae of these species of *Phyllomedusa* also have the tail ending in flail, which they vibrate constantly, as they swim up and down, using the rudimentary lungs as hydrostatic organs. Only one small lowland species of *H.* (*Sphoerohyla*), named *planicola* by Lutz and B. Lutz, occurs in the Federal District.

The two species of *Bufo* are wide-spread and tolerant. *B. crucifer* is found in almost every large garden. *B. marinus ictericus* is rare in Rio, though very common in open and higher places, in the state of Rio de Janeiro, including small towns and villages, where it for-gathers under the street-lamps to catch nocturnal insects.

The different species of *Leptodactylus* form a cline from aquatic larvae to terrestrial ones (*L. nanus*), passing over pans dug out at the margin of semi-permanent waters (*L. mystaceus*), or large holes scooped out of the ground into which water can seep (*L. pentadactylus labyrinthicus* a *L. p. flavopictus* which do not occur in Rio). (Lutz, A. 1926 & 1930).

The two specialized lowland forms found in the Federal District are both large, casque-headed Hylids, with complete skull-caps formed by the dermatocranium. In *Trachycephalus* the cap is rounded, con-crescent with the skin and raised only on the bilobed occipital border, which in large adults is produced into a pair of lateral prongs. The head of *Corythomantis* is a superficially smooth helmet, pointed and slightly spinescent in front and provided with strong ridges. Both of them, especially the latter, hold the head obliquely to the body and use it as a plug to fill the central lumen. This phragmotic habit seems to serve as a protection against the bites of certain mosquitoes, special-ized for sucking poikilothermous vertebrates and also against snakes, which hunt for tree-frogs in bromeliads. *Trachycephalus* goes further inland and sometimes hides in holes in trees. *Corythomantis*, is a strict bromeliad-dweller and found exclusively in the coastal scrub between the dunes and lagoons (Lutz A. & Lutz B., 1939).

The morphological adaptation of these frogs should probably be regarded as a response to an environment which, though provided with standing water for larvae, is devoid of appropriate shelter for adults. The scrub is extremely xerophytic and thorny (Pl. III) so that the bromeliads growing on the ground really afford the only moist and



tubular dwellings suitable for adult tree-frogs, used to sheltering on the vegetation of their habitat, and of resting with the body upright. The small *Hylas* found near the sea-shore also shelter in the bromeliads but they use the narrow spaces between the outer leaves.

Conversely, the trend towards spawning and development in the adult biotope, which occurs among the montane forest-dwellers and saxicolous frogs, might be regarded as an adaptation to an environment which, though otherwise near optimum, is deficient in standing water for average tadpoles.

Perhaps both instances may serve as examples of ecological stimulus provoking organic response. The former suggests the usefulness of complete ossification of the skull in the absence of outside protection; the latter may resemble an early attempt at an entirely terrestrial life made possible by environments in which humidity tends towards saturation point.

The habitat selection of these frogs may thus be of some slight interest from the point of view of evolution.

#### SHORT NOTES ON EACH FROG FOUND IN THE FEDERAL DISTRICT OF BRAZIL

##### *BUFONIDAE*

1. *Bufo marinus ictericus* Spix, 1824. 160 mm. (Pl. 6 figs. 1 and 2). Paratoids huge. ♀ marbled in brown and white; ♂ olive. Voice a melodious tremolo, hence the name *cúrúru*. Rare in the F.D.
2. *Bufo crucifer* Wied, 1821, 80 mm., exceptionally up to 130 mm. (Pl. 7 figs. 3-4). *Head angular. Paratoids narrow.* Common even in gardens in Rio. Voice similar to that of *B. ictericus*.

##### CERATOPHRYDAE:

3. *Stombus boiei* (Wied), 1825. 60 mm. (Pl. 7 figs. 1 and 2). Brown. *A horn on the upper eyelid but none on the tip of the snout,* Sylvan, breeds in standing water. Voice: "ccrraau" ccrraau, inflected in semi-tones, heard when rain threatens.
4. *Oocormus microps* (Blgr), 1905. 25-30 mm. (Pl. 12, fig. 7). *A meniscus on the edge of the iris. No dermal appendage on the lid.* Several colour phases: rose to terracotta; brown, or green to green olive. Burrows, spawns on banks, has terrestrial larvae. Call: "ccrr ccrr". Sylvan, montane.

## LEPTODACTYLIDAE

## LEPTODACTYLINAE:

5. *Leptodactylus ocellatus* (L.), 1758. Maximum: 140 mm. (Pl. 8)  
Dorsal ocelli and longitudinal glandular folds. Huge arms and horny finger-tips in the male. The female guards her progeny. Aquatic, crepuscular. Barks.
6. *L. typhonius* (Daud), 1803. = *L. sibilator*. Max. 40 mm. (Pl. 9 fig. 1) Smaller. Pattern similar. Head very angular. Sides of gula (♂) black. Legs sturdy, arms short. Terrestrial. Whistles: "huit, huit".
7. *L. mystaceus* (Spix), 1824. Max. 40 mm. (Pl. 9 fig. 3)  
No ocelli, only dorso-lateral stripes. A stripe on the sides of the head, a light streak on the thighs. Gregarious, forms villages. The tadpoles await flooding of the earthen nests, open below. Whistles in chorus.
8. *L. caliginosus* (Girard), 1853. Maximum 40 mm. (Pl. 9 figs. 5 and 6). Type locality Rio. Dark vermiculation on the underside. Lives at, or, in waters seeping out of the ground. Voice: *fi fi* or *wick wick*".
9. *L. nanus* L. Mueller, 1922 (*L. trivittatus* Lutz). 20-25 mm. (Pl. 9 fig. 4, Pl. 12 fig. 1, 2, 3). Two phases (see figs.) Montane, terrestrial; non-aquatic larvae in earthen pan, excavated distant from water. Voice isolated calls: *ti, ti*, very insistent.
10. *Physalaemus bresslaui* (L. Mueller), 1924. 26-27 mm. (Pl. 12 figs. 6 and 8). Sagittiform pattern on the back; ventral surface often suffused with red. Voice nasal, inflected in semi-tones, like an infant wailing, sings in chorus.
11. ? *Eupemphix olfersioides* (Lutz), 1926. 18-20 mm. (Pl. 12 fig. 5). Generic status uncertain, probably nearest to *Sminthillus limbatus*. Resembles *Physalaemus olfersi*, but is much smaller and has a light ventral surface. Very dark lateral stripe. Montane or on slopes.

## CYCLORHAMPHINAE:

12. *Cyclorhamphus fuliginosus* Tschudi, 1838. 50-55 mm. (Pl. 9 fig. 9, Pl. 10 fig. 1). Feet webbed. Body oval, flat. Aquatic. Montane, sylvan. Endemic to Rio mountains with allopatric substitutes. Voice: Short double barks.
13. *C. eleutherodactylus* Mir. Rib., 1920. 50-55 mm. (Pl. 10 figs. 2 and 3). In Rio small, not very common, Violaceous black. Fingers free. Troglodytic, terrestrial. Montane, sylvan. Never heard in F.D.; croaks buried elsewhere.



14. *Thoropa miliaris* (Spix), 1824, 75 mm. (Pl. 10 fig. 4). *Colour of wet stone, protective*. Vulgar name: goat frog, because of the voice. All stages live on wet ledges, including the eggs and the larvae.
15. *Thoropa petropolitana* (Wandolleck), 1907. 26 mm. (Pl. 9 fig. 8 and 10). *Colouring even more protective, moss-green in two tones, warty*. Entirely saxicolous on the same ledges as 14. In Rio miaows, at dusk. In Petrópolis clucks in day-time. *tchk tchk*.

## ELOSIINAE:

16. *Elosia nasus* (Lichtenstein), 1823. 42 mm. (Pl. 9 fig. 2). *Colour of wet stones with spots on the back and dark vermiculation on the belly. Finger-tips dilated, with two dorsal scutes*. Voice like a song bird. Diurnal, running-water, montane. Has allopatric substitutes.
17. *Crossodactylus gaudichaudii* Dum. et Bibr., 1841. 30 mm. (Pl. 9 fig. 7). Dorso-lateral glandular outline. *Fingers fringed; nuptial spines on 1 finger*. Substitutes at higher altitudes. Voice and habits similar to those of *Elosia*, less specialized.

## ELEUTHERODACTYLYNAE:

18. *Eleutherodactylus binotatus* (Spix), 1824. Large 60 mm. (Pl. 10 fig. 5). *1 finger longer than 2. Longitudinal glandular folds on the back, both diagnostic*.
19. *E. guentheri* (Stdnr.), 1864. Medium-sized 45 mm. (Pl. 11 fig. 1-4). Very polymorphic. *1 finger shorter than 2*.
20. *E. parvus* (Girard), 1853. 25 mm. (Pl. 12 fig. 4). *Peri-anal region black. Dorso-lateral glandular lines, white line on the thigh*.  
All three species montane, sylvan, ground-dwellers, with direct development. Voice: "táca táca táca táca". like castanets.

## HYLIDAE

## HYLA: Unspecialized Type-Genus:

## A. EXTREMELY LARGE, THE COLOUR OF MOSS AND BARK:

21. *Hyla langsdorffi* Dum. & Bibr., 1841. 98 mm. (Pl. 13 figs. 1 and 3). Dorsum *greenish-gray and brown* in different tones: *lower surface of thighs and belly dark yellow*. A scalloped, light, glandular border outlining the limbs and anal region. Bones, tongue and inside of mouth light green. Lowland species.

## B. BROWN, VARYING IN TONE ACCORDING TO LIGHT AND SUBSTRATUM:

22. *Hyla faber* Wied, 1821. 100 mm. (Pl. 14 fig. 3, 4, 5). Webs and concealed areas chrome yellow. Hilly, open places; builds private pools in ponds with clay-soil. Vulg. *Blacksmith, from the voice*.
23. *H. circumdata* Cope, 1867. 60-70 mm. (Pl. 13 fig. 2 and 4). Brown also. Concealed aspects of *thigh blue-violet with narrow darker circles*. Pollex rudiment used as a spur. Montane, sylvan, edges of brooks. Voice coarse.
24. *H. geographica* Spix, 1824 (*appendiculata* Boulenger, 1856). 40-50 mm. (Pl. 14 figs. 1 and 2). Brown. In Rio relatively small, lowland form, with immaculate belly. *Golden arabesques on nictitating membrane*, diagnostic. Whimpers like a small puppy. Tadpoles black, gregarious.

## C. MEDIUM-SIZED, LIGHT GREEN:

25. *H. albomarginata* Spix, 1824. ♂ 45 ♀ 50-60 mm. (Pl. 15 figs. 7 and 10). *Glandular light line from eye-lid to elbow. Webs and concealed areas of the limbs vivid orange; iris silver. Lowland form, or from open hillsides. Gregarious, quacks in chorus on rainy and warm nights.*
26. *H. albofrenata* Lutz, 1924. ♂ 40 ♀ 50 mm. (Pl. 15 fig. 6). *Montane, sylvan, bromeliad-dweller. No flash colours. Glandular light line on the canthus only. Iris vinaceous purple, belly lemon yellow, gula and joints blue-green. Voice: isolated pizzicato notes: ting ting; ti/ ti/ ting. Calls almost the whole year round, aloft.*

## D. HYLAE RUBRA &amp; X-SIGNATA KREIS:

27. *Hyla fuscovaria* Lutz, 1925. 30-40 mm. in Rio (Pl. 16 fig. 11) *Pattern obscured by a dark net-work and white dots. Voice a loud croak. Familiar, enters houses; comes out of faucets and lives under well-watered vases at the Instituto Oswaldo Cruz, where it hunts for insects on the windows and in the stable.*
28. *Hyla fuscomarginata* Lutz, 1925. 25-27 mm. (Pl. 17 fig. 3). *Very similar to the genuine H. rubra from Surinam, but no light areas on hind-limbs; skin rough; head short, triangular. Lowland form. Voice: rã rã rã, loud.*



## E. HYLAE CATHARINAE KREIS:

29. *Hyla trapicheiroi* n.sp. ♂ 26-30 ♀ 35-40 mm. (Pl. 16 figs. 2 and 5). *Concealed light areas blue*. Interocular spot W-shaped, large, quadrangular. Edges of montane forest; gregarious. Voice a weak: "tché tché". Breeds in still water.
30. *Hyla humilis* n. sp. Lutz & B. Lutz. ♂ 23-26, ♀ 31-32 mm. (Pl. 16 figs. 9 and 10, Pl. 17, fig. 9). Small, slender, *concealed surfaces light, blue-green*. Lowlands. *Snout truncate, legs long*.
31. *H. perpusilla* Lutz & B. Lutz, 1939. 20-25 mm. (Pl. 17 figs. 3, 4 and 5) *Concealed light areas yellow*. Back lichenous; two phases (see figs.). *Bromeliad-dweller, breeds in leaf-cups. Sea-scrub, rocks; voice weak: te te té*. In *montane woods* a dark V on the gula.

## F. CUSPIDATE SNOUT:

32. *Hyla cuspidata* Lutz, 1925. 22 mm. (Pl. 16 fig. 7) *Snout very cuspidate, skin smooth, olive, iris copper, bones green*. Close to the small coelonotus Hylids in habit. Lives in bromeliads on rocks by the sea-shore, elsewhere in un-specialized habitat. Voice like the winding of a watch.

## G. FORMS WITH FULLY WEBBED FEET AND A PATAGIUM:

33. *Hyla anceps* Lutz, 1929. ♂ 35 ♀ 42 mm. (Pl. 16 figs. 1 and 4) *Back brown, belly orange-red with gray-brown network, lower aspect of limbs scarlet, with large black spots and bars*. Lowlands, in the coastal marsh. Voice: "hii/cã/cã", like an anguished intake of breath, followed by loud quacks.
34. *Hyla leucophyllata* Beireis, 1783. 33 mm. (Pl. 16 fig. 8). *Dorsal surface white, enclosing a quadrangular dark spot. Belly lemon, limbs orange red*. Trills like a bird. In Rio lowland form; occurring elsewhere also at higher elevations.
35. *Hyla senicula* Cope, 1856. 30-35 mm. (Pl. 16 fig. 3). *Snout short, rounded, limbs with glandular scalloped borders. The colour of bark, with grayish and silvery tones above, purplish beneath. Croaks on the ground. Distribution wide. In the F.D., a lowland species*.

## H. VERY SMALL FORMS:

36. *Hyla decipiens* Lutz, 1925. 18-22 mm. (Pl. 17 fig. 2). *Pattern similar to H. leucophyllata, sometimes absent. Vomerine teeth present, or totally or partially absent. Nuptial spines on the 1 finger of the male. Spawns on foliage above water.* Lowlands and hills. Voice like a small rasp.
37. *Hyla misera meridiana* n. subsp. ♂ 17-19 ♀ 20-23 mm. (Pl. 17 fig. 1). Light brown to tan with a pair of *broken or wavy lines* down the back and oblique bars on the legs. Voice: a trill. Lowlands.
38. *Hyla bipunctata* Spix, 1824. 25 mm. (Pl. 17 fig. 7 and 10). *A diagnostic checkered pattern of light spaces enclosed in a maroon-red network on the sides of the head. An hour-glass pattern on back. Belly lemon yellow, limbs red.* Voice musical, sings in chorus, heard far away.
39. *Hyla minuta* Peters, 1872. 25 mm. (Pl. 17 fig. 8). Similar to *bipunctata*, *paler*. No pattern on the sides of the head. *A supra-anal glandular light line.* Spots sometimes enclosed by a light outline. Call *tí/tí/tí*, loud and insistent. Wide-spread, tolerant.

## FLECTONOTUS (dorso-lateral folds protecting the eggs)

40. *Flectonotus goeldii* (Boulenger), 1894. ♂ 30, ♀ 40 mm. (Pl. 15 fig. 8 and 9 Pl. 16, fig. 6). *Dorso-lateral folds only at the edges of the clutch.* Skin rough, with or without median dark ocelli, or other pattern, attenuated posteriorly, *Bromeliad dweller, releasing the tadpoles, at sub-metamorphosis, into the leaf-cup.* Montane, sylvan. Voice "tectectectec" . . . loud.

## SPHOENOHYLA (nom. nov. for SPHOENORHYNCHUS Tschudi)

Spawns on leaves).

*Snout wedge-shaped*, maxillary teeth reduced; last phalanx blunt. Aquatic.

41. *Sphoehyla planicola* Lutz & B. Lutz, 1939. 24 mm. (Pl. 15 fig. 5). *Snout pointed.* Colour light green, translucent. *Iris green with rosy inner rim.* Lowlands, aquatic, calls afloat on lesser arms of lagoons. Voice *crack crack*.

## CENTROLENELLA: last phalanx-T-shaped. Eyes directed forwards. Spawns on leaves).

42. *Centrolenella eurygnatha* Lutz, 1925, 23 mm. (Pl. 15 fig. 4) Light green, translucent, *head rounded, mouth wide.* Montane, sylvan. Trills like a bird.



## PHYLLOMEDUSA: (PUPIL VERTICAL, INNER TOES OPPOSABLE)

43. *P. burmeisteri* Boulenger, 1882. Large 70-80 mm. (Pl. 16 fig. 2, Pl. 18, fig. 1). *Paratoid glands and vomerine teeth present*. Lowlands and open hills, above water reservoirs, pools etc. Arboreal. Voice a deep base: *quô, quô*.
44. *P. rohdei* Mertens, 1926. Small  $\delta$  35,  $\text{♀}$  42 mm. (Pl. 16 fig. 3) *1 toe longer than 2. No paratoids or vomerine teeth. Concealed surfaces reddish-orange*. Habitat similar to those of the former, but less arboreal. Voice: a double cluck.
45. *P. guttata* Lutz, 1924.  $\delta$  36,  $\text{♀}$  46 mm. (Pl. 16 fig. 1) *1 toe not longer than 2. Vomerine teeth absent*. Skin lighter, slightly rougher. Violet drops on concealed surfaces, montane, sylvan; rheophilous tadpoles with a perioral float.

## TRACHYCEPHALUS: (A COMPLETE OSSEOUS SKULL CAP CONCRESCENT WITH THE SKIN:)

46. *T. nigromaculatus* Tschudi, 1838. 100 mm. (Pl. 18 fig. 2. Pl. 19. figs. 4, 5, 6). *Skull cap rounded, bilobed posteriorly, with a pair of lateral prongs in very large specimens. Skin slimy, the colour of granite with a few blood-red spots above*. Coastal plains, *phragmotic*. Two vocal sacs, voice rough.

## CORYTHOMANTIS: (HELMET-SHAPED SKULL CAP PRODUCED INTO A POINT:)

47. *Corythomantis (Aparasphenodon) brunoi* (Mir. Rib.) 1920. 76 mm. (Pl. 18 fig. 3-5. Pl. 19, fig. 1). *Casque-headed, strict bromeliad-dweller, using the head as a plug. Maritime scrub formation, between the dunes and lagoons. Skin smooth, dry, bronze coloured, with dark drops (C. adspersa Lutz)*. Voice: barks or isolated quacks.

## BRACHYCEPHALIDAE:

48. ? *Sminthillus brasiliensis* Parker, 1926. Very minute, 19 mm. (Pl. 12 fig. 10 and 13). *Most digits very small, looking like those of Atelopus, but small excentrically pointed disks present; palms entirely padded with tubercles*. Dark, above and beneath, with indistinct dorsal pattern. Rare, found twice in the Tijuca mountains.
49. *Dendrophryniscus brevipollicatus* Espada, 1870. 25 mm. (Pl. 12 fig. 9) *Build narrow, elongate. Only 1 finger reduced*. Olive browns and grays above, a sulfurous suffusion beneath. Sylvan, montane, breeds in bromeliads.

50. *Brachycephalus ephippium* (Spix), 1824. 22 mm. (Pl. 12 fig. 11 and Pl. 19 fig. 7). Build short, broad. All the fingers rudimentary. Pumpkin-coloured all over, with round black eyes. Aposematic, very sedate, walking around slowly on wet spots or on rainy days.

#### MICROHYLIDAE:

51. *Microhyla* = *Engystoma microps* Dum. & Bib. 1841, 29-30 mm. (Pl. 12 fig. 12) Type-locality Rio, fide label of the types (*E. sub-nigra* Mir. Rib. 1920). (Pl. 12 fig. 12) Montane, burrower, blackish, with very small eyes.
52. *Sterocyclops incrassatus* Cope 1869, (*Hypopachus parkeri* Wettstein, 1934, fide A. Carvalho (1948)). Size 33-? 50 mm. (Pl. 12 fig. 14). Build heavy, head short. Brick-coloured above with double rhomboid central figure; beneath dark, cryptic. A light median upper segment in the iris. Rare in the F.D.

#### SUMMARY AND CONCLUSIONS

The frogs of the Federal District of Brazil are listed and discussed as to habit, biology and ecology.

The F.D. is situated 22° 54' 24" S. & 43° 10' 21" W Gr. and comprises 1.356 km<sup>2</sup>. Its topography includes sea-shore, maritime scrub, lagoons, plains and marsh, open slopes, forested mountains and great heads of rock. Three thousand feet of altitude are attained at two points.

Fifty two different frogs occur in the F.D.

Three fifths of them live in open country. Two fifths of these have never been found above the plains; the others range higher but mostly in open country. Their environment offers conditions suitable for average tadpoles and adults. These frogs are more or less unspecialized. There are six genera and thirty species. Two thirds of the latter belong to the type genera of the large neotropical families Bufonidae, Leptodactylidae and Hylidae.

Only in the maritime scrub formation are conditions somewhat different. Water for average tadpoles is provided by the lagoons. The xerophytism of the vegetation is, however, so marked that bromeliads growing on the ground provide almost the only appropriate shelter for adult tree-frogs used to sleeping upright on the vegetation. One large Hylid genus lives entirely in them. It is casque-headed and phragmotic, shutting the lumen of the leaf-cup with the head used as a plug. Another large Hylid genus shows a lesser degree of the same specialization. (Lutz A & Lutz B, 1939 II).

One genus with two species is entirely saxicolous; it lives on wet ledges of rock at all phases of its life history. (B. Lutz 1948).



The other two fifths of the frogs from the F. D. are montane forest forms. Their environment offers numerous and varied biotopes and is near optimum for adults. There is, however, hardly any standing water available for larvae. These frogs are ecologically diversified. They also show a general trend towards spawning in the adult biotope, which leads to delayed hatching, semi-aquatic and terrestrial larvae and direct development. (B Lutz, 1948).

The author interprets the morphological specialization of the casque-headed Hylids and the biological specialization of the montane forest forms as adaptive. Casque-headedness and phragmosis increase protection against blood-suckers and predators. The humidity of the rain forest permits eggs, embryos and larvae to develop, unharmed, outside their usual, aquatic, environment.

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