

Frogs of the Genus

Hyla

in Venezuela



Hyla sibeszi
Photo: C. L. Barrio

César L. Barrio Amorós



Venezuela is home to an enormous diversity of amphibian species. Although not officially published, the most recent estimates are of more than 300 species, and this number could be increased to or surpass 500. Currently, Venezuela is considered the country with the sixth greatest number of amphibian species in the world, although these figures can change quickly, due primarily to descriptions of new species.

The two Venezuelan frog genera that stand out most for their extraordinary diversity are *Eleutherodactylus* and *Hyla*. *Eleutherodactylus*, of the tropical frog family Leptodactylidae, is represented by 37 known species in Venezuela. *Hyla*, of the tree frog family Hylidae, is represented by 38 known species in the country, and at

least three new species are soon to be described. Also, the presence in Venezuela of several other *Hyla* species that are known in neighboring Colombia, Brazil, and Guyana would not be surprising.

In this article we will focus on the diversity of the genus *Hyla*, which includes species of quite different sizes, colors, and habits. Some species scarcely measure 15 millimeters in length, while others exceed 120 millimeters. Their habitat ranges from cold elevations of more than 3,500 meters in the Andes, to the lowland tropics that seem more suited to species diversity. We adopt the following Venezuelan biogeographic regions (compare with BARRIO, 1996): the Andes Mountains, the Coastal Range, the Llanos savanna, the Amazon basin, the Guiana region, the Amacuro

delta, and the Lake Maracaibo basin. The Orinoco basin, between the Llanos to the north and the Guiana region to the south, is so diverse that it cannot be considered a biogeographic region. Although in many cases these divisions generally coincide with distribution ranges of amphibians in Venezuela, it has been determined that there are some differences that make it necessary to redefine the biogeography of Venezuelan amphibians in the near future. *Hyla* does not seem to adapt so exclusively to specific locations as do members of the genus *Eleutherodactylus*. Species of *Hyla*, most of which live in the lowlands, have a greater ability to occupy large extensions of territory as long as a minimum of required conditions exist.

The Andes and Coastal Range regions, and a subdivision of the Guiana region (which here could be called the "restricted" Guiana region), are the only regions that have endemic species of *Hyla* — these are mountainous regions, and therefore favor isolation of populations, and consequent speciation. On the other hand, the lowland regions, such as the Llanos savanna, Amazon and Orinoco basins, Amacuro Delta, and Lake Maracaibo basin, do not present effective biogeographic barriers to generally adaptable species. Thus, there are generalist species that inhabit both the Lake Maracaibo region and the Amazon plains region, for example. The best way to separate generalist species biogeographically is by grouping those that share similar habitats such as the savannas and forests of northern South America, and the tropical rainforests of the Amazon and Orinoco basins. The large distributions of some species extend through two of these large regions.

The Andes

The Andes of Venezuela constitute the northern extreme of the longest mountain range on Earth. Nowhere near the high elevations of mountains in the central and southern Andes — the highest of which is Argentina's Aconcagua, at over 7,000 meters — the highest peak in Venezuela, Pico Bolívar, has an elevation of a little over 5,000 meters. Several other mountains in the country surpass 4,000 meters, but this highest elevation zone, between 4,000 and 5,000 meters, is quite barren, especially of amphibians.

The páramo ecosystem from about 2,800 to 4,300 meters in elevation has a unique flora of small alpine shrubs and lichens. The climate is extreme, and temperatures frequently drop below 0°C (32°F) at night. In this zone there are very few amphibians, and among them only one *Hyla* species: *H. meridensis* (Rivero, 1961), which breeds in lakes and bromeliad funnels.

Farther down the slopes of the Andes, at elevations of 1,400–2,800 meters, is the cloud forest, one of the richest and least known ecosystems. This zone captures most of the moisture of rain and clouds, and includes the headwaters of most of the rivers that flow northward into Lake Maracaibo and eastward into the Orinoco



Hyla granosa. Photo: C. L. Barrio



Hyla punctata. Photo: C. L. Barrio



Hyla beritezi. Photo: C. L. Barrio



Hyla lanciformis. Photo: C. L. Barrio



Hyla boans. Photo: C. L. Barrio



Hyla lascinia. Photo: C. L. Barrio



Hyla luteocellata. Photo: C. L. Barrio



Hyla crepitans. Photo: C. L. Barrio

River. In the small mountain streams live many species of *Hyla*, the most common being *H. platidactyla* Boulenger, 1905, which, together with *H. jahni* Rivero, 1961, hides among the low shrubs to make its mating calls. The two species are similar, but differ in their calls, as well as in small morphological details. Another species, *H. lascinia* Rivero, 1969, is much rarer. It is found high in the trees or other more hidden places, and is a pretty green color with red eyes.

In the mountains of the Cordillera de Mérida, Venezuelan continuation of the Colombian Cordillera Oriental, there is another species of *Hyla* found in streams and lakes: *H. pelidna* Duellman, 1989 (which is similar to *H. meridensis*).

The lower piedmont areas of the Andes share species with the Amazon and Orinoco basins and the Coastal Range. Noteworthy are *Hyla lanciformis* (Cope, 1870), *H. minuta* Peters, 1872, and *H. luteocellata* Roux, 1927. Taking an orientative figure of 38 species of *Hyla* in Venezuela, it can be said that 13 percent of these species are found in the Andes.

Coastal Range

Sometimes considered the final reaches of the Andes, extending as far as Trinidad, the Coastal Range runs parallel to the Caribbean coast, with elevations of up to 2,700 meters. In this region, cloud forest extends from 600 to 2,200 meters, thus enveloping most of these mountains. The area is surprisingly rich in species of *Hyla* and other amphibians. And because of the variety of different mountains that make up this bioregion, many species are endemic here and restricted to very small ranges. For example, the recently described *H. amicorum* Mijares-Urrútia, 1998, and *H. yaracuyana* Mijares-Urrútia and Rivero, 2000, inhabit small enclaves of cloud forest in danger of being logged. Other species such as *H. alemani* Rivero, 1964, and *H. battersbyi* Rivero, 1961, have apparently declined such that they have not been seen in a long time. The reported presence in Venezuela of *H. albomarginata* Spix, 1924, a species of eastern Brazil, is certainly an error, but the true identity of the species thus diagnosed remains to be demonstrated. The most widely distributed species in the Coastal Range is *H. luteocellata*, a member of the *parviceps* group. This beautiful species is extremely common, and often shares habitat with two other widely distributed species: *H. minuta* and *H. microcephala* Cope, 1886. *Hyla lanciformis* occupies low piedmont areas. Like the Andes, the Coastal Range region also contains 13 percent of the total of Venezuelan species of *Hyla*.

Amazon and Orinoco basins

The following group of species are those that inhabit the lowland rainforests east of the Andes, in the drainage basins of the Amazon and Orinoco rivers. They tend to be species that are commonly found in Bolivia, Ecuador, Peru, Brazil, Colombia, and Guyana

as well as in Venezuela. One of the most representative species is *H. boans* (Linnaeus, 1758). This is the largest frog of the group, reaching 120 millimeters. It differs from the others in that it begins breeding during the dry season. Males sing from the trees along rivers and streams that are reduced in flow. Sometimes the noise produced by this species is so overwhelming that nothing else can be heard in the forest. The males then form nests in the sand at the water's edge. They continue singing to attract females, who will lay eggs in the crater-like nests. Males of this species (sometimes called gladiator frogs) often engage in combat over females or nest sites (KLUGE, 1979). A very similar species, *H. wavrini* Parker, 1936, inhabits the upper Orinoco (HOOGMOED, 1990).

Another species, *H. geographica* Spix, 1824, is a little smaller but still reaches the considerable size of up to 90 millimeters, and has beautiful coloration including a blue ocular ring. Another large *Hyla* species is *H. raniceps* (Cope, 1862), although its presence in Venezuela is doubtful. *H. granosa* Boulenger, 1882, has a lime green color with yellow flecks. Some specimens have gray eyes. Others, more those of the Orinoco than those of the Amazon, have red eyes, which could be taxonomically significant. They also have semitransparent venters, similar to the glass frogs of the family Centrolenidae. Another species of the *granosa* group is *H. hobbsi* Cochran and Goin, 1970, which is known in Venezuela only in the extreme south. *H. parviceps* Boulenger, 1882, is a small, very arboreal species with interesting reproductive behavior that is being studied.

Within the *leucophyllata* group, which are perhaps the most beautiful neotropical members of the genus, *H. sarayacuensis* Shreve, 1935, has been found in southern Venezuela. Another widely distributed species is *H. calcarata* Troschel, 1848. On the other hand, *H. marmorata* (Laurenti, 1768) is rare or difficult to find, and little is known about it, although its appearance is extremely unusual and attractive. The small *H. minuta*, is perhaps one of the most widespread frog species in South America. It is found not

only in the Orinoco and Amazon basins, but also in parts of the Andes and Coastal Range regions. It is generally yellow at night, but it can change to an ivory or gray to dark gray color during the day, always retaining its characteristic wavy pattern. About 29 percent of the Venezuelan *Hyla* species are found in the Amazon and Orinoco region.

Guiana region

This group covers the endemic species of the Guiana region of Venezuela. Although this region includes part of the Orinoco basin, whose lowland forests also share species with the Amazon region, the Guiana region is distinguished by features such as the *tepuis* — those magical mist-shrouded tablemountain formations, with surrounding high cliffs and the tallest waterfalls in the world. Each of these *tepuis* is a biological island topped with endemic life forms that have evolved in isolation. These include *H. aromatica* Ayarzagüena and Señaris, 1993, of Huachamakari; *H. inparquesi* Ayarzagüena and Señaris, 1993, of Marahuaka; and the very recently described *H. rythmicus* of Jaua (SEÑARIS and AYARZAGÜENA, 2002). Around the high slopes (but not on the mesa tops), species are found in common among several or all of the *tepuis*. These include several medium-sized *Hyla* of green or brown coloration, and generally quite beautiful. They are *H. benitezi* Rivero, 1961; *H. lemai* Rivero, 1971; *H. loveridgei* Rivero, 1961; and *H. sibleszi* Rivero, 1971. Endemic species of the lower areas of the Guiana region include *H. multifasciata* Gunther, 1858; and *H. ornatissima* Noble, 1923. The *Hyla* species of the Venezuelan Guiana region make up 21 percent of the total number of *Hyla* species in this country.

Other species

Another category of species are those that are found throughout a very large area of northern South America — across Colombia, Venezuela, Guyana, northern Brazil, and in some cases further south. These species are usually inhabitants of the savanna, except *H. lanciformis*, which inhabits rainforests from



Hyla microcephala. Photo: C. L. Barrio



Hyla meridensis. Photo: C. L. Barrio



Hyla platydactyla. Photo: C. L. Barrio



Hyla minuta. Photo: C. L. Barrio

Bolivia to the Venezuelan Coastal Range. The most representative species in this group is without a doubt *H. crepitans* Wied-Neuwied, 1824, which can be found in both savanna and rainforest, as well as in civilization-altered habitat. Sometimes called the banana frog because it is often seen in the leaves of banana trees, it is also found around human habitation, in cisterns and other water deposits, especially during dry months. During the day, it sleeps crouched on a leaf or tree trunk, and has a pale, white color; at night, when it is active, it is brown with striped flanks. What is known as *Hyla crepitans* is actually a species complex, which must be better studied by analysis of vocalization, DNA, and behavior. A very similar species is *H. pugnax* Schmidt, 1857, known in the Lake Maracaibo basin, and recently discovered in the Andes piedmont (CHACÓN, pers. comm.). The two species have been confused under the name *Hyla crepitans* (KLUGE, 1979). Other typical species of *Hyla* in the savannas of northern South America are the ubiquitous *H. microcephala*, *H. minuscula* Rivero, 1971, and *H. punctata* (Schneider, 1799). The first two are sometimes confused because of their small size and similar yellow color. However, *H. microcephala* is a little larger (reaching 20 millimeters, whereas *H. minuscula* reaches 15 millimeters) and sings like a cricket. Another difference is that *H. minuscula* colonizes rainforests, whereas *H. microcephala*, at least in Venezuela, stays strictly in

the savanna. *H. punctata* is one of the most gorgeous species of the genus in the neotropical region. It is difficult to observe however, even though its odd song, somewhat like the hammering of a woodpecker, reverberates through the savanna. Until very recently it was known only in eastern Venezuela in a few localities; BARRIO et al. (2000) have now reported it on the opposite side of the country, in the west, and it is being found in more and more places. ■

Bibliography

- BARRIO, C. L., 1996. Anfibios de Venezuela, visión aproximativa. *Reptilia* (E) 6: 24–32.
- BARRIO-AMORÓS, C. L., 1998. Sistemática y Biogeografía de los anfibios (Amphibia) de Venezuela. *Acta Biologica Venezuelica* 18(2): 1–93.
- BARRIO, C. L., R. RIVERO, and R. MANRIQUE, 2000. Geographic distribution. *Hyla punctata*. *Herpetological Review* 31(1): 50.
- HOOGMOED, M. S., 1990. Resurrection of *Hyla wavrini* Parker (Amphibia: Anura: Hylidae), a gladiator frog from northern South America. *Zool. Med. Leiden* 64(6): 71–93.
- KAISER, H., BARRIO-AMORÓS, C. L., TRUJILLO, J. and LYNCH, J. D., 2002. Expansion of *Eleutherodactylus johnstonei* in Northern South America: Rapid Progress Through Human Interactions. *Herpetological Review* 33(4): 290–294.
- KLUGE, A. 1979. The Gladiator frogs of Middle America and Colombia—a reevaluation of their systematics (Anura: Hylidae). *Occasional Papers Museum Zoology, University of Michigan* 688: 1–24.
- SEÑARIS, J. and AYARZAGÜENA, J. 2002. A new species of *Hyla* (Anura: Hylidae) from the highlands of Venezuelan Guayana. *J. Herp.* 36(4): 634–640.