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Source: *Journal of Herpetology*, Vol. 11, No. 1 (Feb. 28, 1977), pp. 17-24

Published by: Society for the Study of Amphibians and Reptiles

Stable URL: <http://www.jstor.org/stable/1563286>

Accessed: 22/08/2008 07:48

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## The Herpetofauna of the Central Llanos of Venezuela: Noteworthy Records, a Tentative Checklist and Ecological Notes

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**ABSTRACT**—A tentative checklist of 16 amphibian and 42 reptilian species from the central Venezuelan Llanos is presented along with notes on the ecology of many of the species from this herpetologically poorly known area. Fifty state records from the states of Apure and Guarico are included.

\* \* \*

### INTRODUCTION

The herpetofauna of the Llanos of Venezuela is poorly known, largely as a result of the paucity of collecting in this area. The Llanos is a physiographically distinct region in Venezuela, consisting of savannas 40 to over 200m in altitude (Tamayo, 1961) and, generally, extending longitudinally from just west of the Amacuro Delta southwestward into Colombia through the state of Apure and, latitudinally, north of the Orinoco River drainage to the Venezuelan Andes and coastal mountain ranges. Adjacent parts of the state of Bolivar and the Territorio Federal Amazonas south of the Orinoco River are also part of the Llanos (Rivero, 1964). The entire area is characterized by a marked rainy season-dry season (6 months each), the average annual rainfall varying between 1.0 and 1.8 m; year-round average daily temperatures vary between 26 and 30 C (Ewel and Madriz, 1968). Although 80-95% of the savannas flood during the rainy season, only large lagoons, rivers and their interlocking tributaries (*Cãnos*), and man-made reservoirs retain any water during the dry season. Confronted with such extremes of aridity and moisture, most amphibian and reptile species of the surrounding areas are capable only of extending their range into the periphery of the Llanos; only few species are adapted to these conditions.

During an 11 month (October 1973-November 1974) study of the spectacled caiman, *Caiman crocodilus crocodilus*, in a centrally-located part of the Llanos (Fig. 1), we were able to collect representative samples of the local herpetofauna; many of these are state records and we present them here, combined with literature records, as a tentative checklist of the amphibians and reptiles of this unique and poorly known region.

### THE CENTRAL LLANOS AREA

We collected mainly in the southwestern portion of the state of Guarico and the northwestern portion of the state of Apure, between the cities of Calabozo and San Fernando de Apure. Other collecting sites and literature records led us to expand the area covered by this tentative checklist to central as well as southwestern Guarico, northern Apure, and the eastern most part of Barinas (Fig. 1). No collecting was performed in Barinas, and no literature records were available for the eastern portion of this state; nevertheless, we include it since it falls within the areas sampled. This "central Llanos" region is more or less equidistant from the northern and southern limits of the Llanos. In this area the rainy season usually extends from April to November.

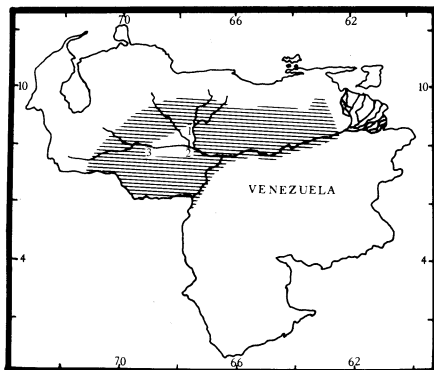


FIGURE 1. General outline of the Venezuelan Llanos. Our central Llanos area is delineated by Site 1 (Hato Masaguaral, 8.0 km N Corozo Pando), Site 2 (Hato La Guanota, 4-8 km W San Fernando de Apure), and Site 3 (Hato El Porvenir, 5-10 km SW Bruzual).

Our main collecting sites follow:

*Site 1.*—Hato Masaguaral, 75 m, is located 8 km N Corozo Pando, state of Guarico. Dominant plant species include the savanna palm, *Capernicia tectorum*, strangler figs, *Thetis* sp., and various trees and shrubs of the Leguminaceae. A variety of grasses and herbs constitute the non-woody vascular flora. This site is described in detail by Neville (1972). See Myers (1933) for a description of vegetation in this region some years ago.

*Site 2.*—Hato La Guanota, 68 m, is located 4-8 km W San Fernando de Apure along the Rio Apure Viejo in the state of Apure. The gallery forest has been extensively cleared, but still provides some habitat for local animals. The surrounding savanna contains few trees or shrubs and is dominated by the grass, *Paspalum fasciculatum*. Ramia (1959) discusses vegetation types in the regions of Apure in which Sites 2 and 3 are located.

*Site 3.*—Hato El Porvenir, is located 5-10 km SW Bruzual, Apure. It was visited briefly during the dry season, and only a small sample of the herpetofaunal diversity was obtained. The vegetation is predominantly

a grassland savanna, dominated by *Paspalum fasciculatum*, and some gallery forests occur along *caños*, small rivers and lagoons.

Localities mentioned in the literature within or near the central Llanos and referred to in Table 1 under their respective state for the purpose of indicating the fauna known previously include Arauca, Calabozo, "confluencia del Rio Apure con Rio Orinoco," Corozo Pando, El Sombrero, Espino, mouth of the Cinaruco River, Ortiz, Parmana, San Fernando de Apure, and Sosa.

*Faunal analysis.*—Table 1 summarized the literature records and state records reported herein and presents a tentative checklist to the herpetofauna of the central Llanos region. Range extensions are mentioned in the text. Comments on abundance are based on the following arbitrarily defined terms: (1) *rare*: less than 10 seen in 11 months of collecting; (2) *uncommon*: 10 to 25 seen; (3) *common*: 50 to 100 seen; (4) *ubiquitous*: over 100 seen. Frog and lizard species are discussed individually as most were common enough to gather some notes on their ecology.

## AMPHIBIANS

Caecilians are not known from the central Llanos, although aquatic species could presumably flourish in the area. Fossorial species, confronted with periodic inundation of most of the land, are less likely to be present.

The frog fauna consists of 16 species of five families, with the Leptodactylidae being the most predominant.

*Pseudis paradoxus.*—This ubiquitous frog is the only completely aquatic anuran of the central Llanos, having rarely been seen on land. This species called throughout the wet season and could be heard in artificially flooded fields even during the dry season. However, it is not known if they breed throughout the entire year. Tadpoles were found in both the early and late wet season. Amplexus was observed in early July 1974.

*Bufo marinus marinus.*—This ubiquitous toad thrived around human dwellings. Males with darkened thumbspines were found in the first half of the 1974 rainy season (May-July); they called from land within 1 m of water at this time.

*Bufo granulosis granulosis.*—Another ubiquitous anuran, *B. granulosis* calls throughout

the rainy season from shallow water or lumps of earth protruding from it. Pairs in amplexus were seen as early as 14 May 1974, after the first heavy rain of the year at Site 1.

*Elachistocleis ovalis*.—This frog was uncommon but consistently seen, even during the dry season. Calling began after the first rains and extended throughout the rainy season. They most commonly called from vegetation in shallow water near a shoreline.

*Hyla crepitans*.—This ubiquitous frog could be found year-round both in human dwellings and under natural conditions. It was commonly found on the ground near water in the dry season, even after most vegetation had died. Calling began approximately one month after the first rains. Call sites included trees, shrubs, herbs, and even the ground near a pond edge at times (See *Hyla rubra*).

*Hyla rubra*.—Another ubiquitous hylid, *H. rubra* occupied the same habitats as *H. crepitans*, but did not appear to be as resistant to the aridity of the dry season as was *H. crepitans*; in the dry season, it could be found only in dwellings, and it presumably aestivated during the dry season. Calling patterns with regard to sites and time were identical to *H. crepitans*, but when calling at the same pond, *H. rubra* invariably called from the ground, while *H. crepitans* called from vegetation. Amplexing *H. rubra* were observed in July 1974.

*Hyla underwoodi misera*.—This common frog was not seen during the dry season. It began calling about one month into the rainy season of 1973. Calling was always from vegetation at

TABLE 1. A tentative checklist to the herpetofauna of a central portion of the Venezuelan Llanos, including the following areas: central and southwestern Guarico, eastern Barinas, and northern Apure, based on our collections and literature records. Our localities: (1) Guarico, 8.0 km N Corozo Pando, and nearby; (2) Apure, 4-8 km W San Fernando de Apure; and (3) Apure, 5-10 km SW Bruzual and nearby. Literature citations refer to: (1) Rivero, 1961; (2) Fouquette, 1968; (3) Rivero, 1964a,b; (4) Kluge, 1969; (5) Roze, 1966; (6) Fiasson, 1945; (7) Mondolfi, 1955; and (8) Humboldt and de Bonpland, 1819. State records are indicated by an asterisk. X = Collected; O = Observed.

Species	Our Localities			Literature Localities	
	Guarico (1)	Apure (2)	(3)	Guarico	Apure
<i>Bufo granulosus granulosus</i>	X	X*	X	1	
<i>Bufo marinus marinus</i>	X	X	0	1	
<i>Elachistocleis ovalis</i>	X	X*	X	1	
<i>Hyla crepitans</i>	X	X*		1	
<i>Hyla rubra</i>	X	X*	0	2	
<i>Hyla underwoodi misera</i>	X	X*		2	
<i>Leptodactylus bolivianus</i>	X	X		2	3
<i>Leptodactylus fuscus</i>	X	X		1	1
<i>Leptodactylus labialis</i>	X*	X*			
<i>Leptodactylus macrosternum</i>	X	X		1	1
<i>Leptodactylus wagneri</i>	X*	X*	X		
<i>Phrynohyas venulosa venulosa</i>	X*	X*			
<i>Physalaemus cf. enesefae</i>	X*				
<i>Physalaemus pustulosus ruthveni</i>	X*	X*			
<i>Pleurodema brachyops</i>	X*	X	X		1
<i>Pseudis paradoxus</i>	X*	X*			
<i>Ameiva ameiva vogli</i>	X*	X*			
<i>Anolis cf. auratus</i>	X*	X*			
<i>Cnemidophorus lemniscatus ssp.?</i>	X*	X*	X		
<i>Gymnophthalmus speciosus speciosus</i>	O*	X*			
<i>Hemidactylus palaichthus</i>	X*	X	X		4
<i>Iguana iguana iguana</i>	O*	X*	O		
<i>Kentropyx striatus</i>		X*			
<i>Phyllodactylus ventralis</i>	X*				
<i>Tropidurus torquatus hispidus</i>	X*	X*			
<i>Tupinambis tequixín</i>	X*	X*			
<i>Boa constrictor constrictor</i>	X	X*		5	
<i>Chironius carinatus</i>	O	X*		5	
<i>Corallus hortulinus cookii</i>				5	
<i>Crotalus durissus terrificus</i>	X	X*		5	
<i>Drymarchon corais corais</i>		X*		5	
<i>Epicrates cenchria maurus</i>	X			5	
<i>Euneptes murinus gigas</i>		X		5	5
<i>Helicops angulatus</i>		X*			
<i>Hydrops triangularis venezuelensis</i>					5
<i>Leimadophis melanotus</i>		X*		5	
<i>Leimadophis reginae reginae</i>				5	
<i>Leptodeira annulata aschmeadii</i>	X	X		5	5
<i>Leptophis ahaetulla coeruleodorsus</i>		X*		5	
<i>Lygophis lineatus lineatus</i>	X		X	5	5
<i>Masticophis mentovarius suborbitalis</i>				5	
<i>Mastigodryas bifossatus striatus</i>		X*		5	
<i>Micrurus isoazonus</i>				5	5
<i>Oxybelis aeneus aeneus</i>				5	
<i>Oxyrhophus petola petola</i>				5	
<i>Phimophis guianensis</i>	X*				
<i>Pseudoboa newwiedii newwiedii</i>	X			5	5

TABLE 1 (Continued)

Species	Our Localities			Literature Localities	
	Guarico (1)	Apure (2)	(3)	Guarico	Apure
<i>Spilotes pullatus pullatus</i>	O	X*		5	
<i>Thamnodynastes strigilis</i>	X	X*	X	5	
<i>Chelus fimbriata</i>					6,7
<i>Geochelone carbonaria</i>	O*				6
<i>Kinosternon scorpioides scorpioides</i>	X*				6
<i>Podocnemis cayennensis</i>					6,7
<i>Podocnemis expansa</i>					6,7
<i>Podocnemis unifilis</i>					6,7
<i>Podocnemis vogli</i>	O*	X*	O*		
<i>Caiman crocodilus crocodilus</i>	X		X	8	8
<i>Crocodylus intermedius</i>				8	8

the shoreline or that within the water. Amplexing pairs were found on the 17th and 22nd of October.

*Phrynohyas venulosa venulosa*.—This uncommonly seen species called during the first half of the wet season, having begun about one month after the first rains. It called mainly on the night of a heavy rain or the following night. Although it calls occasionally from the shoreline, the usual call site was a tree or shrub, up to a height of 4 m.

*Pleurodema brachyops*.—This ubiquitous frog was invariably seen on sandy soil and apparently stayed beneath the soil throughout the day. This species was observed emerging from sandy substrates between 2300-2330 hrs on several nights. Their emergence from a sandy substrate with sparse vegetation between the above hours reminds one of "popping popcorn". Almost simultaneously, several will emerge by a sudden eruption of sand, head & eyes appear first, followed almost immediately by a short jump which clears them from their daytime retreat. They appear as lumps of damp sand with only the eyes visible, but shortly the condensation on surrounding grass leaves washes away the sand particles leaving the frog almost the same color as the sand. The only visible color to the eye is the bright orange "flash marks" of the groin as they jump from place to place. Calling and breeding began immediately after the first heavy rain of the wet season and extended throughout the rainy season. It called from shallow water.

*Physalaemus pustulosus ruthveni*.—Calling *P. pustulosus* were heard throughout the wet season. Amplexing pairs of this common species were observed on 4 and 22 October 1973, and foam nests were observed the following mornings. One female was observed swimming to a calling male near the edge of a pond, and upon contact, the male immediately clasped the female; the pair swam to the shore and hopped to a rest position beneath a small shrub. No further activity was observed for 10 min.

*Physalaemus cf. enesefae*.—Only two specimens closely resembling *P. enesefae* (Heatwole, Solano and Heatwole, 1965) were collected during July 1974. Calling began in July and extended into August, but individuals became highly wary of disturbances in the shallow water from which they called.

*Leptodactylus fuscus*.—Formerly *L. sibilatrix* (Heyer, 1969a: pers. comm.) this species is common in the central Llanos. Populations of this species at all three collecting sites were polymorphic, with some members possessing orange or yellow dorsomedial stripes from the tip of the snout to the vent. With the first indications of rain, this species began calling from fields and dried-up ponds. As the rains progressed and the earth softened, *L. fuscus* built small underground chambers which eventually served as incubating chambers for the eggs (Heyer, 1969b); after the chambers are built, the frogs called from above ground at the mouth of or nearby the tunnel leading to the chamber. Metamorphosed young were first found in early July, 1974, less than two months after the first hard rains and about two and a half months after the species began to call (See *L. labialis*).

*Leptodactylus macrosternum*.—Rivero (1961, 1964b) has referred to this species as *L. ocellatus*, but Gallardo (1964) has referred Venezuelan and other populations of *L. ocellatus* to *L. macrosternum*. The male of this ubiquitous species developed thumbspines in April, but was never heard to call, probably as a result of its weak call (Heyer, pers. comm.). Metamorphosed young were first found in late July of 1974, just over two months after the first rains. Thumbspines were not present during the latter half of the rainy season (See *L. bolivianus*).

*Leptodactylus bolivianus*.—Males of this ubiquitous frog species developed thumbspines during the latter half of the rainy season, and gravid females were present throughout October. As ponds begin to dry up at the end of the wet season, this species and *L. macrosternum* frequent the same water sites. *L. bolivianus* is apparently more tolerant of dry conditions because it is usually farther from water than *L. macrosternum*, and as drying continues, *L. bolivianus* maintains its abundance while *L. macrosternum* goes into hiding to avoid desiccation.

*Leptodactylus labialis*.—Another ubiquitous frog. *L. labialis* called throughout the rainy season and under conditions identical to those described for *L. fuscus*. However, *L. labialis* called only after the soil had been softened by early rains, and *L. labialis* called from within its burrow as opposed to *L. fuscus*, which called from the surface above its more complicated burrow (See *L. wagneri*).

*Leptodactylus wagneri*.—This frog was rare, but of 7 specimens collected, at least one was from each of the three main collecting sites. During the latter half of the 1973 rainy season, it called in association with *L. labialis*, but from the edge beneath clumps of grass; none called from burrows. The voice of *L. labialis* was loud and clear while that of *L. wagneri* was muted and throaty.

## REPTILES

*Anolis cf. auratus*.—This rare lizard is a grass form, having only been seen on clumps of grass or short herbs.

*Tropidurus torquatus hispidus*.—The ecology of this ubiquitous species in the region of Belem, Para has been described by Rand and Rand (1966), and their results adequately described the ecology of this species in the central Llanos. When pursued, individuals sometimes ascended 10-15 m into tall trees. Reproduction is being reported on separately. Few individuals were seen during the dry season.

*Iguana iguana iguana*.—This ubiquitous species occupied its typical riparian habitat and could be seen 8-10 m up in trees basking. At least some females contained eggs in November; young appeared at the end of the rainy season and during the dry season.

*Phyllodactylus ventralis*.—Found only at Site 1, this uncommon species frequented fence posts and trees. Only one was seen on human buildings. This species was, nevertheless, common in the foothills bordering the Llanos near Camatagua, Aragua, where it frequented rotten trees, rocks, and dwellings.

*Hemidactylus palaichthus*.—This common species was seen most regularly on dwellings and other buildings, but was also found on trees and on the ground. Only one was seen at Site 1, where it was rare. At Site 2, hatchlings were observed from early December through March. Also taken at Site 3, these constitute northwestern range extensions of 210 km and 240 km respectively from the previously known westernmost point, "near mouth of Cinaruco River" (Kluge, 1969).

*Cnemidophorus lemniscatus ssp.*—A ubiquitous species at Site 2, this lizard was rare at Site 1. Morphological and color differences in populations at Site 2 and other Venezuelan localities present an interesting systematic problem, and we are currently analyzing the taxonomic status of the San Fernando de Apure population. Behavioral and reproductive aspects of the ecology of this species are being reported on separately.

*Kentropyx striatus*.—Only two specimens of this rare lizard were collected, both at Site 2 in the late wet season of 1973 and both pregnant females with clutch sizes of 7 and 10 eggs.

*Gymnophthalmus speciosus speciosus*.—This uncommon microteiid was most frequently seen in the leaf litter of gallery forests, but was also found in grassy fields and near human dwellings.

*Ameiva ameiva vogli*.—Adults of this ubiquitous lizard aestivated during the dry season and emerged after the first rains; some young of the year remained active during the dry season. *A. ameiva* frequented transition areas between gallery forest and savanna, but it was also seen in open grasslands. Young of the year appeared in mid-November 1973. Individuals appear

in early morning one to one-and-a-half hours after sunrise and bask for periods up to 30 min before beginning to forage. About mid-morning, at least some individuals begin to travel in loose packs. Although it is not known whether they form such packs for foraging, it was noted that when foraging in the same area, adults will attack and drive away subadults and juveniles from potential food items. Subadults of the same size also fought over food.

*Tupinambis tequixín*.—This large teiid was ubiquitous at Site 1 but uncommon at Site 2. Two adult females examined in the late wet season contained enlarged ovarian follicles. Paradoxically, no juveniles were collected during the eleven month field period. One *Bufo granulosis* was found in the stomach of a female.

Because many snakes were collected only once or a few times, a discussion by species is inappropriate. Ecological remarks on the more common species follow. Range extensions mentioned below refer to the previously known ranges as given by Roze (1966).

Aspects of the ecology of the ubiquitous *Leptodeira annulata aschmeadii* are being reported on separately. *Epicrates cenchria maurus* was taken commonly on the road at night during the early rainy season; apparently, as the savannas begin to flood, this species moves to dry ground and their density undoubtedly increases. They were rarely taken in the dry season. Hatchling *E. cenchria maurus* appeared in late July and early August, 1974. On 21 August 1974, a gravid *Pseudoboa newwiedii newwiedii* measuring 76.0 cm snout-vent length 94.5 cm total length and containing 10 calcified eggs was collected. *Phymophis guianensis* and the fore-mentioned species are nocturnal. *Thamnodynastes strigilis* is active at night and after rains during the day. *Boa constrictor constrictor* is active during the day and night. Other snakes are predominantly diurnal.

Roze's Venezuelan distribution of *Thamnodynastes strigilis* is that of two disjunct populations in the states of Zulia and in the Territorio Federal Amazonas, and our records could represent a link between these two populations. Our *Spilotes pullatus pullatus* record (Site 2) represents an approximately 130 km southward range extension from a locality (apparently near Palenque, Guarico) not specified by Roze. *Phymophis guianensis* was previously thought to avoid the Llanos; our southernmost locality for this species, 11.2 km S Corozo Pando, constitutes a 260 km southward range extension from the Maracay area. The sole *Mastigodryas bifossatus striatus* collected at Site 2 extends the known range of this species 120 km from Calabozo. *Leptophis ahaetulla coeruleodorsus* specimens from the Site 2 and nearby represent an extension of the known range of that species by approximately 180 km SW of the nearest known locality, Espino, Guarico. The known range of *Leimadophis melanotus* is extended southward 150 km by virtue of our Site 2 specimens; the nearest previous locality is Sosa, Guarico. A *Lygophis lineatus lineatus* taken at Site 3 extends the known range of this species 165 km and 300 km WSW of the nearest known localities, "costa del rio Apure" and Acarigua, Portuguesa respectively. A *Drymarchon corais corais* collected 10.2 km E Mantecal (under Site 3 in Table 1), is a 340 km westward range extension from Ortiz, Guarico. A *Crotalus durissus terrificus* taken about 30 km S Bruzual (under Site 3 in Table 1) is about 240 km ESE of the nearest known locality (Calabozo) and represents a 100 km southward range extension from a line drawn between Calabozo and Ejido, Valle del Chama, Merida, the other previous southernmost localities for the species.

*Podocnemis vogli*, a gregarious, ubiquitous turtle, was the only species regularly seen. This species frequented the lagoons, *caños*, and ponds, and during the dry season, dug itself into soft mud in grassy areas to aestivate. Eggs are incubated in underground chambers throughout the dry season, and young appear during the early rainy season. Other turtle species are rare. Although we saw no *P. cayenensis*, *P. expansa*, *P. unifilis*, or *Chelus fimbriatus*, these species are believed to occur in the central Llanos (Fiasson, 1945; Mondolfi, 1955); no specific locality records are known.

*Caiman crocodilus crocodilus* is a ubiquitous species throughout the area, but locals claim that its populations have decreased drastically due to hide hunting. Our major objective in Venezuela was the study of the life history and ecology of this species in the Llanos, and reports are in preparation. *Crocodylus intermedius* has succumbed to the hide-hunting factor;

no individuals were seen in the wild, although the species is known to have occurred in the San Fernando de Apure area in the last century (Humboldt and de Bonpland, 1819). Isolated individuals, mostly juveniles, are said to still inhabit the Rio Apure in the central Llanos.

#### DISCUSSION

The herpetofauna of the central Llanos is particularly impoverished for a tropical region. For example, we record only 22 species of snakes from the area. In contrast, the tropical rainforest of the Territorio Federal Amazonas contains over 40 known species of snakes, and the coastal montane forests near Caracas contain over 45 snake species. Over 65 lizard species occur on the Venezuelan mainland (Donoso-Barros, 1968), but only 10 of these have extended their range into the central Llanos. Of the approximately 100 frog species in Venezuela (Rivero, 1961), we found only 16 in the central Llanos.

The area has no endemic species of reptile or amphibian, with the possible exception of the San Fernando de Apure *Cnemidophorus* population currently under study. Furthermore, of 42 species of reptiles present, only 6 (including the four *Podocnemis*) were congeners. Amongst anurans, only the Leptodactylidae, well known for its adaptations to arid conditions, was represented by a diversity of forms. It is evident that the Llanos has been an area of little or no herpetofaunal radiation and of invasion by species capable of surviving the extreme environment.

#### ACKNOWLEDGMENTS

We are grateful to Sr. Tomás Blohm and the National Science Foundation for funding. We thank Srs. Blohm, Leon Moser-Guerra, and F. DeVries for permission to study the herpetofauna of their ranches. We are especially grateful to Sr. and Sra. Blohm for their kind hospitality during our Venezuelan visits. Due thanks are given to the kids of La Guanota whose slingshots and stone-throwing ability have added substantially to the knowledge of the herpetofauna of the central Llanos. W. R. Heyer kindly identified the *Leptodactylus* species involved, and W. E. Duellman identified the species of *Hyla*.

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