



PARATELMATOBIOUS GAIGEAEE (COCHRAN, 1938) RE-DISCOVERED (AMPHIBIA, ANURA, LEPTODACTYLIDAE)¹

(With 11 figures)

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ABSTRACT: The genus *Paratelmatobius* currently comprises five species of small frogs endemic to the Atlantic Forest of Southeastern Brazil. *Paratelmatobius gaigeae* was known only by two syntypes collected in 1931. Recently, we re-discovered this species in Serra da Bocaina, near the type locality, in an altitude above 1000m. A re-description is presented. The re-discovery of *P. gaigeae* illustrates how deficiently sampled the amphibian fauna of Atlantic Forest is. The success in finding presumably missing or rare terrestrial frog species is due to the use of intensive sampling procedures such as pit-fall traps. A preliminary list of anurans collected at the same locality is provided.

Key words: Anura. Telmatobiinae. *Paratelmatobius gaigeae*. Atlantic forest. Taxonomy.

RESUMO: Redescoberta de *Paratelmatobius gaigeae* (Cochran, 1938) (Amphibia, Anura, Leptodactylidae).

O gênero *Paratelmatobius* atualmente é composto por cinco espécies de anuros de pequeno porte endêmicos da Floresta Atlântica do sudeste do Brasil. *Paratelmatobius gaigeae* era conhecido apenas dos dois síntipos coletados em 1931. Recentemente, esta espécie foi redescoberta na Serra da Bocaina, próximo à localidade-tipo, em altitude superior a 1000m. A redescoberta de *Paratelmatobius gaigeae* ilustra a deficiência de amostragem de anfíbios da Floresta Atlântica. O sucesso no encontro de espécies terrestres de anuros aparentemente desaparecidas ou raras é devido a utilização de armadilha de interceptação e queda como procedimento de amostragem. Uma lista preliminar dos anuros coletados na mesma localidade é fornecida.

Palavras-chave: Anura. Telmatobiinae. *Paratelmatobius gaigeae*. Floresta Atlântica. Taxonomia.

INTRODUCTION

The genus *Paratelmatobius* B.Lutz & Carvalho, 1958 currently comprises five species of small frogs endemic to the Atlantic Forest of Southeastern Brazil (see review in POMBAL & HADDAD, 1999). COCHRAN (1938) described the first species of the genus as *Leptodactylus gaigeae*, based on two specimens collected by Adolpho Lutz in 1931 in the locality known as Fazenda do Bonito, Serra da Bocaina, State of São Paulo. Both specimens are presently missing (POMBAL & HADDAD, 1999). A.Lutz (in B.LUTZ & CARVALHO, 1958) described *Paratelmatobius pictiventris* based on the same two specimens used by COCHRAN (1938, 1955) in her description of *L. gaigeae*. More recently, CARDOSO & HADDAD (1990) erroneously re-described *P. gaigeae* based on specimens of an undescribed species of *Paratelmatobius*. The former taxon was

subsequently described as *P. cardosoi* by POMBAL & HADDAD (1999). HEYER *et al.* (1990) also reported *P. gaigeae* in the wild, in the region of Boracéia. However, these specimens represented a distinct species described by GIARETTA & CASTANHO (1990) as *P. poecilogaster*. Despite various attempts made by several researchers in the last few years to collect new specimens of *P. gaigeae*, the species has remained known only from the two now lost type specimens.

Recently, we collected several specimens of *Paratelmatobius* near the type locality of *P. gaigeae* that exactly fit the description of this species. The re-discovery of the species, after 73 years since its discovery by Adolpho Lutz, illustrates our lack of knowledge regarding the actual conservation status of the Atlantic Rainforest anuran fauna, and reinforces the view that this important biome is still poorly sampled.

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MATERIAL AND METHODS

The 11 specimens of *P. gaigeae* were caught in pit-fall traps during a survey of the terrestrial vertebrate fauna of the Ecological Station of Bananal, São Paulo, in December 2003 and January 2004. The station is situated in a mountainous region of the Serra da Bocaina, in altitudes ranging from 1100 to 1900m, and belongs to the Municipality of Bananal in the State of São Paulo, near the border with the State of Rio de Janeiro.

Specimens were killed by injection with nembutal solution, fixed in 15% formalin, and posteriorly stored in 75% ethanol. Tissue samples from six specimens were preserved in 96% ethanol prior to fixation. All tissue samples were incorporated to the Tissue Collection of the Museu de Zoologia da Universidade de São Paulo (MZUSP). Additional specimens of all five species of *Paratelmatobius* examined are listed in POMBAL & HADDAD (1999). Measurements are in millimeters and were taken with an ocular micrometer in a Zeiss stereomicroscope or with a caliper, and recorded to the nearest 0.1mm. Abbreviations used in the measurements follow DUELLMAN (2001).

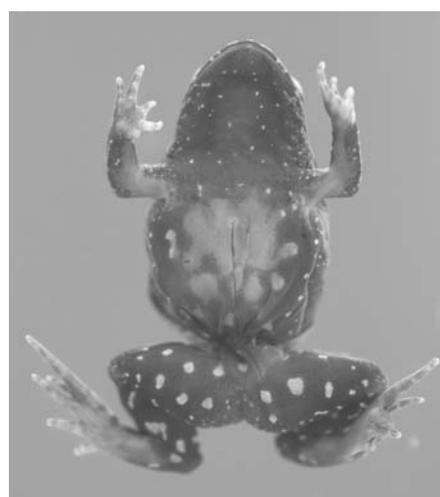
RE-DESCRIPTION OF *PARATELMATOBIUS GAIGEA* (COCHRAN, 1938) (Figs. 1-11)

Diagnosis – A small species of *Paratelmatobius* (SVL 14.0-19.9mm) characterized by the following

features: snout flat; tympanum indistinct; vocal slits absent in males; dorsolateral fold developed; absence of tubercle at base of mandible; fingers free, not fringed; large black spinous nuptial pad in males; first and second fingers of similar size; tip of third finger not pointed; foot fringed, not webbed; tips of the toes not dilated; in life, belly with large pinkish red blotches of irregular shape; border of belly with white dots on dark brown.

Comparison with other species – *Paratelmatobius gaigeae* differs from *P. cardosoi* and *P. mantiqueira* by its flat snout, indistinct tympanum, absence of vocal slits in males, and the first and second fingers of similar size (in *P. cardosoi* and *P. mantiqueira* the second finger is shorter than the first). *Paratelmatobius gaigeae* is distinguished from *P. lutzii* by the fringed toes in males (webbed in males of *P. lutzii*) and the first and second fingers with similar size (second finger longer than the first in *P. lutzii*). *Paratelmatobius gaigeae* differs from *P. poecilogaster* by its smaller size (SVL 19.8-30.3mm in *P. poecilogaster*; POMBAL & HADDAD, 1999); fingers and toes tip not rounded or expanded (fingers tip rounded and toes tip expanded in *P. poecilogaster*). Further, *P. gaigeae* is distinguished from others species of the genus *Paratelmatobius* by the pattern of its belly with large pinkish red blotches bordered by whitish dots on a dark brown background (see color figures in POMBAL & HADDAD, 1999).

Description – Body moderately robust to robust (Figs. 1-2); head flat, nearly as wide as long; snout nearly rounded in dorsal view, rounded to obtuse



Paratelmatobius gaigeae (MZUSP 132603): fig.1- dorsal view, fig.2- ventral view.

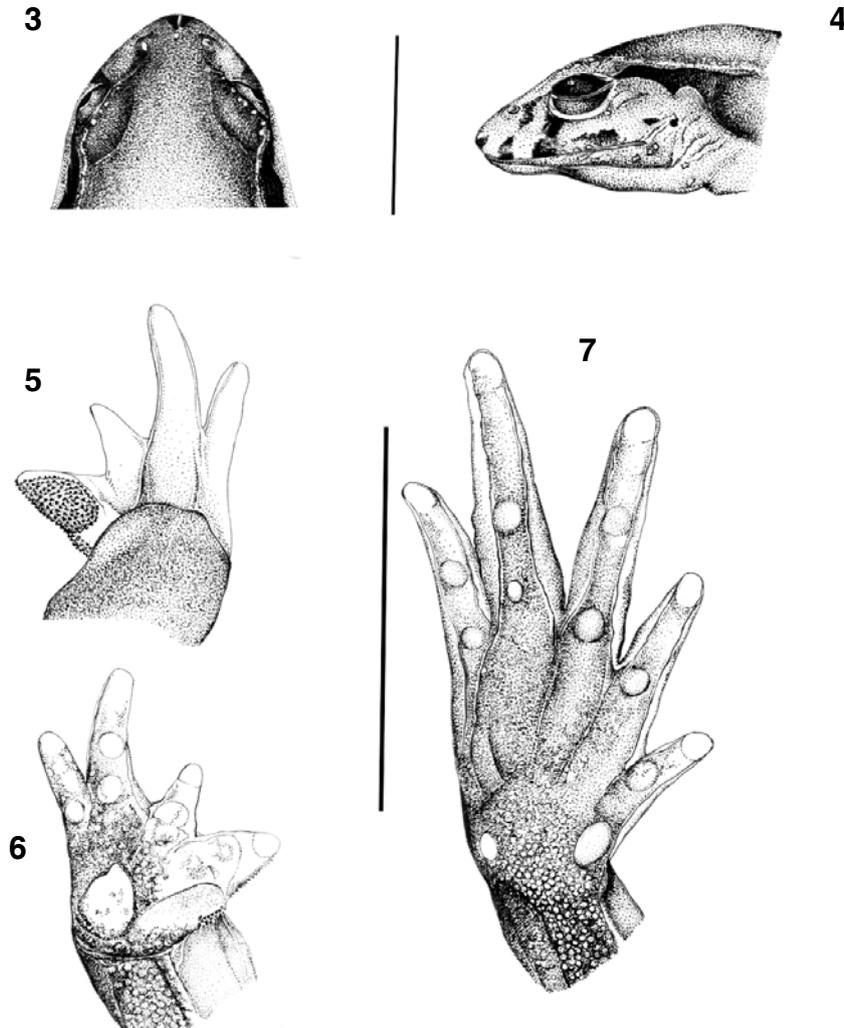
in lateral view (Figs.3-4); nostril slightly protuberant dorsolaterally; canthus rostralis not defined or weakly distinct; loreal region concave; eye medium sized, protuberant; tympanum not visible externally, supratympanic fold weakly developed; dorsolateral fold weakly developed to developed from behind eye to inguinal region; tubercle on the base of the mandible absent; a single small tooth-like process at the level of lower jaw symphysis received by a socket in between premaxillae; maxillae and premaxillae bear numerous teeth; vomerine teeth in two small transverse series lying posteromedially to choanae; choanae small, oval; tongue medium-sized; vocal slits absent; a weak or absent pectoral fold. Forelimbs moderately robust to robust; fingers slender to moderately robust; prepollex absent (not visible externally); finger lengths $I \approx II < IV < III$; finger tips rounded; fingers not fringed or slightly fringed; inner side of first finger not fringed; first finger robust in females,

very robust in males; in males, upper and inner side of the first finger covered with a large black spiny pad (Fig.5), divided in two parts, the part on the base of finger much smaller; subarticular tubercles weakly developed to moderately developed, nearly triangular to rounded on the first finger (Fig.6); nearly rounded basal tubercle on second, third, and fourth fingers; inner metacarpal tubercle elliptical, outer metacarpal tubercle with varied shape. Legs moderately slender; toes moderately slender and long; toe tips nearly rounded, without discs; toe lengths $I < II < V < III < IV$; toes not webbed (Fig.7); toes fringed, developed in males; the fringe of toe I joined to the inner metatarsal tubercle; subarticular tubercles single, rounded to ovoid, weakly developed; foot with an elliptical inner metatarsal tubercle and a small protruding outer metatarsal tubercle. Skin texture smooth. Variation in measurements of specimens examined is presented in table 1.

Table 1. Measurements of specimens of *Paratelmatobius gaigae* from Ecological Station of Bananal, Serra da Bocaina, Municipality of Bananal, State of São Paulo.

MZUSP	SVL	HL	HW	ED	IOD	END	IND	THL	TBL	FL
138448	15.9	5.8	5.8	1.4	2.7	1.1	1.4	7.3	6.9	10.3
138783	16.9	5.4	5.4	1.7	2.0	1.1	1.4	6.6	7.0	11.0
138380	16.0	5.2	5.1	1.4	2.5	1.1	1.4	6.9	6.6	11.5
138454	14.3	5.6	5.2	1.8	2.1	0.9	1.4	6.7	6.8	10.6
138453	16.6	5.5	5.8	1.8	2.0	1.4	1.5	7.3	7.4	11.1
138365	17.0	5.4	5.6	2.0	2.2	1.4	1.4	7.0	6.8	10.6
138432	19.6	6.2	6.0	2.1	2.4	1.4	1.5	7.9	7.6	11.8
138424	19.9	6.0	6.4	2.2	2.1	1.2	1.6	7.9	8.0	12.2
138378	14.0	5.4	5.4	1.7	2.2	1.3	1.4	7.2	6.9	10.8
138358	16.9	5.1	5.2	1.7	2.2	1.2	1.4	7.5	7.0	10.4
138477	16.6	5.2	5.2	1.8	2.1	1.2	1.4	7.1	6.9	10.6
\bar{x}	16.7	5.5	5.5	1.78	2.22	1.20	1.43	7.21	7.08	10.99
SD	1.8	0.34	0.40	0.25	0.22	0.15	0.06	0.42	0.41	0.60

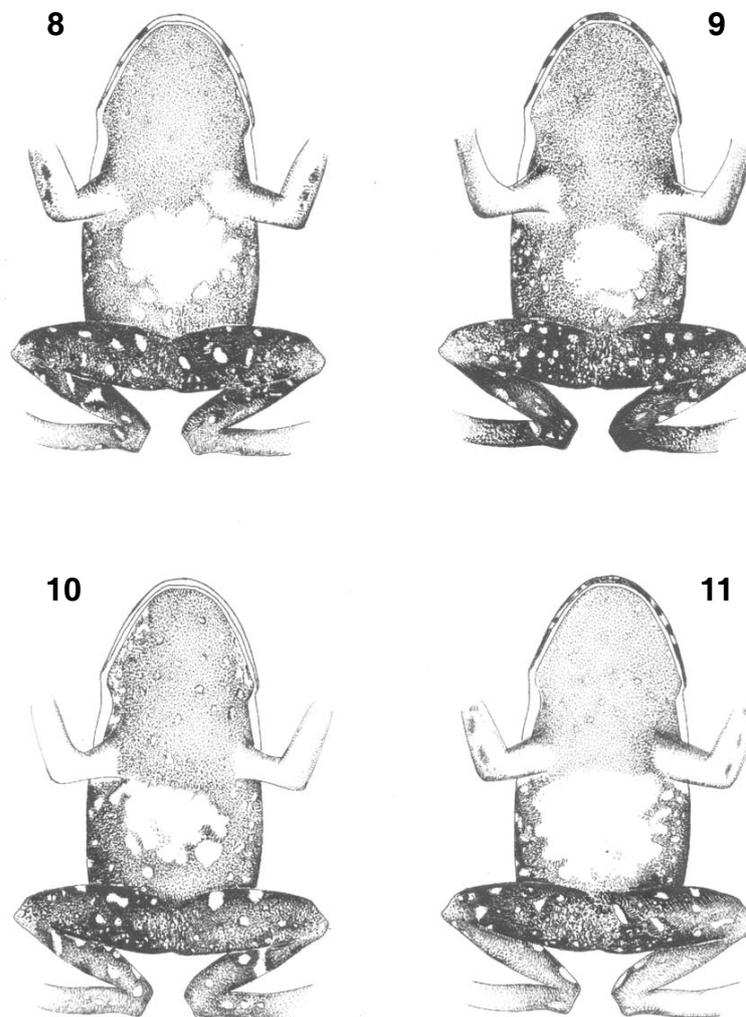
(SVL) snout-vent length; (HL) head length; (HW) head width; (ED) eye diameter; (IOD) inter-orbital distance; (END) eye-nostril distance; (IND) internasal distance; (THL) thigh length; (TBL) tibia length; (FL) foot length; (\bar{x}) mean; (SD) standard deviation.



Paratelmatobius gaigeae (MZUSP 132601): fig.3- dorsal view of head; fig.4- lateral view of head; fig.5- dorsal view of hand; fig.6- ventral view of hand; fig.7- ventral view of foot. Scale bar = 5mm.

Color – Dorsum of head, body, and legs light brown to grey; dorsal surface of body with small, sparse whitish dots present in some specimens and a thin whitish vertebral line often broken into several small lines, more conspicuous at the level of the scapula; the thin scapular line often runs across and divides a blunt vertebral dark brown blotch; a large dark brown stripe running from the posterior border of the eye to the inguinal region, bordered dorsolaterally by a narrow cream line mottled with whitish glandular dots that runs from the upper eyelid to the inguinal region; in some specimens the whitish dots extend anteriorly to the eye along the canthus rostralis, bordering a narrow dark brown stripe; the upper lip is marked

with three to five dark brown blotches of different size, the one bordering the anteroventral edge of the eye being larger and somewhat triangular in shape. Dorsal surfaces of forelimbs uniform grey; posterior surfaces of arms with one or two dark brown blotches; elbows often with a dark brown blotch, except in some specimens where it is uniform grey; anterior surfaces of forearms with one or two dark brown blotches; ventral surfaces of forelimbs mostly pinkish red, except for the palms of the hands that are light grey. Dorsolateral surface of the inguinal region with two dark brown spots. Two dark brown stripes running obliquely from the lateral edge of the cloacal opening toward the posteroventral surface of the thigh; dorsal and



Figs.8-11- Color pattern of venter in four specimens of *Paratelmatobius gaigae* (MZUSP 132603, 132599, 132598, and 132602, respectively).

posterior surfaces of thigh with poorly defined brownish transverse stripes, absent in some specimens that show an uniformly greyish pattern; anterior surface of thigh uniform dark brown. Dorsal surface of tibia with two transverse dark stripes enclosing a lighter brown stripe that together form a well defined band, except in three specimens where the tibia is uniformly grey; in some specimens there is a dark brown blotch on the inner surface of the metatarsus that align with the tibial band; inner and outer sides of the tibia with three to four transverse dark brown stripes that reach the ventral surface of the tibia; heel uniformly dark brown; dorsal surface of feet bicolored (pinkish red and dark brown), except in

one specimen where the feet are uniform dark grey; the bicolored pattern is highly variable with one (I), two (I and II), three (I to III), or four (I to IV) toes pinkish red dorsally; ventral surface of feet dark brown; throat mostly dark grey with whitish dots. Venter showing a highly variable pattern of blotches and dots, generally dark brown with large and irregular pinkish red blotches that tend to merge, resulting in an almost uniform pinkish red venter surrounded by several irregularly disposed whitish dots (Figs.8-11); ventral surfaces of thighs and tibia with whitish spots and larger whitish dots on a dark brown background, except in three specimens where the thighs show a large irregular pinkish red blotch; soles of feet light grey.

Natural History – There is to date virtually no information available regarding *P. gaigeae*. All 11 specimens documented in the present study were found in pit-fall traps, suggesting that the species is active either on or in leaf litter.

The vegetation of the station is characteristic of the Tropical Atlantic Domain (AB'SÁBER, 1977), being predominantly of high altitude rainforest, characterized by a thick layer of litter, abundant palms, ferns, epiphytes, and ground bromeliads, with some sparse patches of large pine trees (*Araucaria angustifolia*). The rainforest in most of the surrounding region near the station was devastated to produce charcoal and pasture at lower altitudes. All specimens were caught in three of the four lines of pit-fall traps disposed in the ecological station, in altitudes ranging between 1160m and 1230m (1164, 1220, 1227m, respectively). GPS positions of each line of pit fall traps are as follows: 22°47'53"S 44°21'35"W; 22°47'42"S 44°21'36"W; 22°48'05"S 44°22'12"W. All three sampled areas show typical rainforest vegetation in advanced process of regeneration since the area was subject to selective logging of larger trees during the first half of the XX century.

DISCUSSION

Based on the present re-description, we are able to corroborate the allocation of *Paratelmatobius gaigeae* to the *P. lutzii* group, as suggested by POMBAL & HADDAD (1999), since it shares the following features: absence of vocal slit, a flat head, absence of tympanum, a developed dorsolateral fold, first finger not longer than second, inner side of the first toe fringed or webbed (POMBAL & HADDAD, 1999). *Paratelmatobius gaigeae* seems to be more closely related to *P. poecilogaster* with which it shares a

similar color pattern of the dorsum and upper lips. *Paratelmatobius gaigeae* has not been re-collected at the type locality, despite several field trips made by several researchers (A.J.Cardoso, A.A.Giaretta, C.F.B.Haddad, M.Martins, and J.P.Pombal Jr.) to the region. At present, the species seems to be restricted to the fragment of high altitudinal rainforests (above 1000m) preserved in the Ecological Station of Bananal. The failure to find new specimens of *P. gaigeae* during the last 73 years in the Bocaina mountainous region may be mainly due to the secretive habits of this small litter frog, as well as to a highly restricted distributional range. However, its presumed absence in the type-locality is more probably due to local extinction triggered by accelerated degradation of its natural habitat. At the present, the species seems to be restricted to the persisting fragments of high altitudinal (above 1000m) rainforests of the Municipality of Bananal, in the Serra da Bocaina, State of São Paulo.

As mentioned previously, the re-discovery of *P. gaigeae* after such a long interval of time also illustrates how deficiently sampled the southeastern Atlantic Rainforest amphibian fauna is, not to mention the northeastern part of the biome which represents by far its more devastated portion (DEAN, 1997). Another terrestrial species of leptodactylid, *Holoaden luederwaldti* Miranda-Ribeiro, 1920, may represent a similar case of a long-time vanished species not recorded since the 60's, for which one specimen was caught in the pit-fall traps disposed in the Ecological Station of Bananal. Such sudden success in finding presumably missing or rare species of frogs is certainly due to the use of pit-fall traps as a routine procedure of intensive sampling (VERDADE & RODRIGUES, 2003; pers.obs.).

Table 2. Number of species of anurans surveyed in five localities within the Atlantic Rainforest of the State of São Paulo.

LOCALITY	NUMBER OF SPECIES	REFERENCE
E.E. Juréia	26	POMBAL & GORDO (2004)
P.E. Intervales	48	BERTOLUCI (2001)
Serra do Japi	24	HADDAD & SAZIMA (1992)
E.B. Boracéia	65	HEYER <i>et al.</i> (1990)
E.E. Bananal	30	Present study

(E.E.) Ecological Station; (P.E.) State Park; (E.B.) Biological Station.

Our survey of the herpetofauna of the Ecological Station of Bananal rendered a list of 30 species of amphibians (see Appendix 1). This list is still preliminary since there are several species expected to occur in the region that were not sampled during the survey. For example, taxa belonging to the Phyllomedusinae and Centrolenidae are likely to be present in the area. However, our results are already significant and supersede in number of species some of the other localities of Atlantic rainforest sampled previously (*e.g.*, Serra do Japi and Ecological Station of Juréia) (see table 2).

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APPENDIX 1

Species of amphibians registered for the Ecological Station of Bananal, State of São Paulo.

Bufonidae

Bufo ictericus Spix, 1824

Brachycephalidae

Brachycephalus ephippium (Spix, 1824)

Leptodactylidae

Cycloramphus cf. *eleutherodactylus* (Miranda-Ribeiro, 1920)

Cycloramphus sp.

Eleutherodactylus binotatus (Spix, 1824)

Eleutherodactylus guentheri (Steindachner, 1864)

Eleutherodactylus parvus (Girard, 1853)

Eleutherodactylus sp.

Holoaden luederwaldti Miranda-Ribeiro, 1920

Hylodes gr. *lateristrigatus*

Leptodactylus fumarius Sazima & Bokermann, 1978

Leptodactylus mystacinus (Burmeister, 1861)

Paratelmatobius gaigeae (Cochran, 1938)

Physalaemus olfersii (Lichtenstein & Martens, 1856)

Physalaemus maculiventris (A. Lutz, 1925)

Proceratophrys boiei (Wied-Neuwied, 1825)

Proceratophrys melanopogon (Miranda-Ribeiro, 1926)

Hylidae

Hyla arildae Cruz & Peixoto, 1987 "1985"

Hyla circumdata (Cope, 1867)

Hyla elegans Wied-Neuwied, 1824

Hyla faber Wied-Neuwied, 1821

Hyla minuta Peters, 1872

Hyla leucopygia Cruz & Peixoto, 1985 "1984"

Hyla microps Peters, 1872

Hyla pardalis Spix, 1824

Hyla aff. *polytaenia* Cope, 1824

Scinax hayii (Barbour, 1909)

Scinax gr. *perpusillus*

Microhylidae

Myersiella microps (Duméril & Bibron, 1841)

Chiasmocleis aff. *leucosticta* (Boulenger, 1888)