

ANURANS FROM A DEGRADED AREA IN A SEASONALLY SEMI-DECIDUOUS FOREST IN SOUTHERN BRAZIL

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Abstract: We herein provide a species list of the anurans from Porto Rico municipality in a degraded area in northwestern Paraná state, Brazil. Sampled area is covered by forest and pasture fields which are under anthropogenic pressure. Eighteen species of anurans distributed in ten genera of five families were recorded between March 2010 and December 2011. This number corresponds to 12.6% of anurans registered in Paraná state and the cumulative species curve did not show a tendency to stabilization. Our study presents an important contribution to the knowledge of the anuran fauna in seasonally semi-deciduous forests under anthropogenic pressure.

Keywords: Amphibia, Anuran fauna, Paraná, Atlantic Rainforest, species list, environment impacts.

Resumen: Igor de Paiva Affonso, Priscilla Guedes Gambale, Fabrício Hiroiuki Oda and Rogério Pereira Bastos: "Anuros de una zona degradada en un bosque estacional semideciduo del sur de Brasil". Proporcionamos una lista de especies de anuros del municipio de Puerto Rico, en un área degradada al noroeste del estado de Paraná, Brasil. El área de muestreo está cubierta de bosque y pastos y está sometida a presión antropogénica. Entre marzo de 2010 y diciembre de 2011, fueron registrados 18 especies de anuros distribuidos en diez géneros y cinco familias. Este número corresponde al 12,6% de los anuros registrados para el estado de Paraná y la curva acumulativa de especies no mostró tendencia a la estabilización. Nuestro estudio presenta una importante contribución al conocimiento de la fauna de anuros en bosques estacionales semi- deciduos sometidos a presión antropogénica.

Palabras clave: Amphibia, Fauna de anuros, Paraná, Mata Atlántica, Lista de especies, impactos ambientales.

INTRODUCTION

Atlantic Forest ("Mata Atlántica") is one of the 34 global biodiversity hotspots for conservation priorities (Mittermeier *et al.* 2004). However, part of the complex of forests on the Atlantic Forest and one of the most threatened forest ecosystems of Brazil, the Seasonally Semi-deciduous Forest (SSF) was reduced to only 7% (48.077 km²) of its original cover of 727.000 km², which corresponds to approximately 49% of the original domain of the Atlantic Forest (Ribeiro *et al.* 2009). Moreover, the SSF has been historically neglected as an area for creation of conservation units, due to its low level of endemism when compared to the humid forests (Pennington *et al.* 2006). Only a small percentage (4.1%) of the total remaining forest has been set as reserves (Fonseca *et al.* 2004).

The majority of studies of the anuran fauna in SSF was developed in the state of São Paulo in transitional areas with "Cerrado" environments (e.g. Bernarde and Kokubum 1999; Vasconcelos and Rossa-Feres 2005; Santos *et al.* 2007, 2009;

Araujo *et al.* 2009; Sabbag and Zina 2011) and in areas with this type of vegetation only (Toledo *et al.* 2003, Zina *et al.* 2007, Brassaloti *et al.* 2010). Although 143 anuran species are registered in the Paraná state (Toledo and Batista 2012), there is a lack of biological information for the communities in most regions of the state, and inventory and ecology studies are concentrated in a few localities (Machado *et al.* 1999, Conte and Rossa-Feres 2006).

Species lists are important tools used by ecologists and conservationists to obtain information on the local, regional, and continental levels for use in studies of populations, community structure, estimation of species richness and biogeographic patterns (Droege *et al.* 1998). Due to lack of studies, inventories and biological studies are needed to fill gaps of information about anurans diversity in South region of Brazil. Thus, with the aim to contribute to the reduction of gaps in the knowledge of the anuran fauna in the northwestern Paraná state, we present in this study a list of species of anurans from municipality of Porto Rico.

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MATERIAL AND METHODS

Study area

The study was conducted at “Base Avançada de Pesquisas do Núcleo de Pesquisas em Limnologia, Ictiologia e Aqüicultura (BAP/Nupelia)”, municipality of Porto Rico (22°45'S, 53°15'W), northwestern Paraná state, southern Brazil. Samplings were made in a riparian forest fragment in which there is a stream (Caracu stream) (A1) and an adjacent pasture area where there are three artificial ponds (A2) (Figure 1).

The original vegetation in this area is dominated by Seasonally Semi-deciduous Forest (Veloso *et al.* 1991), which is represented by Submontane and Alluvial formations. Local climate is considered temperate with hot summer and without dry season, classified as Cfa in Köppen's system (Peel *et al.* 2007). The mean temperature in colder months is below 18 °C with rare frosts and above 22 °C during warmer months. Most of the rainfall occurs from October to March (wet season), and the least amount occurs from April to September (dry season), with a mean annual rainfall of 1.500 mm (IAPAR 1994).

Methods

Fieldwork was conducted in March, June, September and December of 2010 and 2011, resulting in a total of eight campaigns. All specimens were registered by direct visual search (Crump and Scott Junior 1994) and acoustic identification (Zimmerman 1994) covering the entire perimeter of bodies of waters. Caught animals were identified, measured, photographed, and released at the site of capture when no further information was required. For further identification some specimens were preserved in 10% formalin and later transferred to 70% ethanol. They were deposited in the Coleção Zoológica of Universidade Federal de Goiás (ZUFG), in Goiânia, state of Goiás, Brazil (collecting permit SISBIO/ICMBIO 30965-1).

To estimate local richness based on data of presence and absence of species for both sampling environments and on the number of sampling days, acumulative species curve was generated by using first-order Jackknife estimator, with 1000 randomizations. This analysis was conducted using the software EstimateS® 7.5.2 (Smith and Van Belle 1984, Colwell 2005).

RESULTS

Eighteen species of anurans in ten genera were recorded at Porto Rico municipality, representing five families: Bufonidae (5.5% of the total number of species, 1 spp.), Hylidae (44.4%, 8 spp.), Leiuperidae (11.1%, 2 spp.), Leptodactylidae (33.3%, 6 spp.) and Microhylidae (5.5%, 1 spp.) (Table 1, Figure 2).

The cumulative species curve did not reach its asymptote, as evidence that the total sampling is not enough to represent the real richness in the area. The first-order Jackknife estimator calculated 22.69 ± 2.26 species for the area and its curve did not show a tendency to stabilization (Figure 3). Richness was different among the environments sampled, with 16 species registered in temporary ponds amidst pasture area and only eight species in stream amidst forest area, both environments close to human settlements (Table 1).

Species accounts

FAMILY BUFONIDAE

Rhinella schneideri (Werner, 1894) (Figure 2A)

This species belongs to the *Rhinella marina* group and is distributed from the Atlantic coast of Brazil inland through Paraguay to central Bolivia, Argentina and Uruguay (Frost 2013). All individuals observed presented (following Brandão *et al.* 2007) diagnostic characters for this species, such as: large size, presence of large or small tubercles on the dorsal skin, distinct tympanum and a large, elongate and ovoid paratoid gland behind of tympanum; in life they present coloration ranging from pale brown to dark brown. These toads adapt well to anthropogenic environments and can be found around human constructions searching for food (Eterovick and Sazima 2004). In this study, the habitat recorded for this toad is open areas in stream and temporary ponds, associated with degraded environments. We occasionally registered *R. schneideri* in bodies of water even in the driest periods. Males vocalized during the wettest months sampled, floating on margins of ponds or on the floor where water level was low.

FAMILY HYLIDAE

Dendropsophus minutus (Peters, 1872)

Dendropsophus minutus belongs to the *Dendropsophus minutus* group, that occurs in many countries of South America and presents a wide distribution (Amphibiaweb 2013). Specimens are of small size, arboreal and exhibit hourglass-shaped dark marks on dorsum, the most remarkable trait that differentiate them from others similar species (Bastos *et al.* 2003). They inhabit tropical moist forests, forest edge, and marshes, and are also common around roadside ditches and puddles and can be found in places with anthropogenic disturbances (Silvano *et al.* 2010). In Porto Rico, the habitat recorded for *D. minutus* was temporary ponds in open areas, where they are abundant along the edge of sampled ponds. Males were registered by vocalizations on marginal herbaceous vegetation at 15 to 30 cm above the ground or in grasses on the ground at the edge of bodies of water.

Dendropsophus nanus (Boulenger, 1889) (Figure 2B)

This species belongs to the *Dendropsophus microcephalus* group and occurs in Brazil, Surinam, and French Guiana southward through central Paraguay, Argentina and eastern Bolivia to Uruguay (Frost 2013). Individuals exhibit small size and males reach a maximum size of 23 mm; in life they are brown with vocal sac yellow, almost all of them have dark spots on their backs that differ from those on *D. minutus*. This species inhabits tropical rainforest and open areas, and is abundant in disturbed areas associated with human impacts (Reichle *et al.* 2004). In Porto Rico, the habitat recorded for *D. nanus* was temporary ponds and stream in open areas, where they used as microhabitat herbaceous vegetation at 20 to 30 cm above the ground at the edge of bodies of water. *D.*

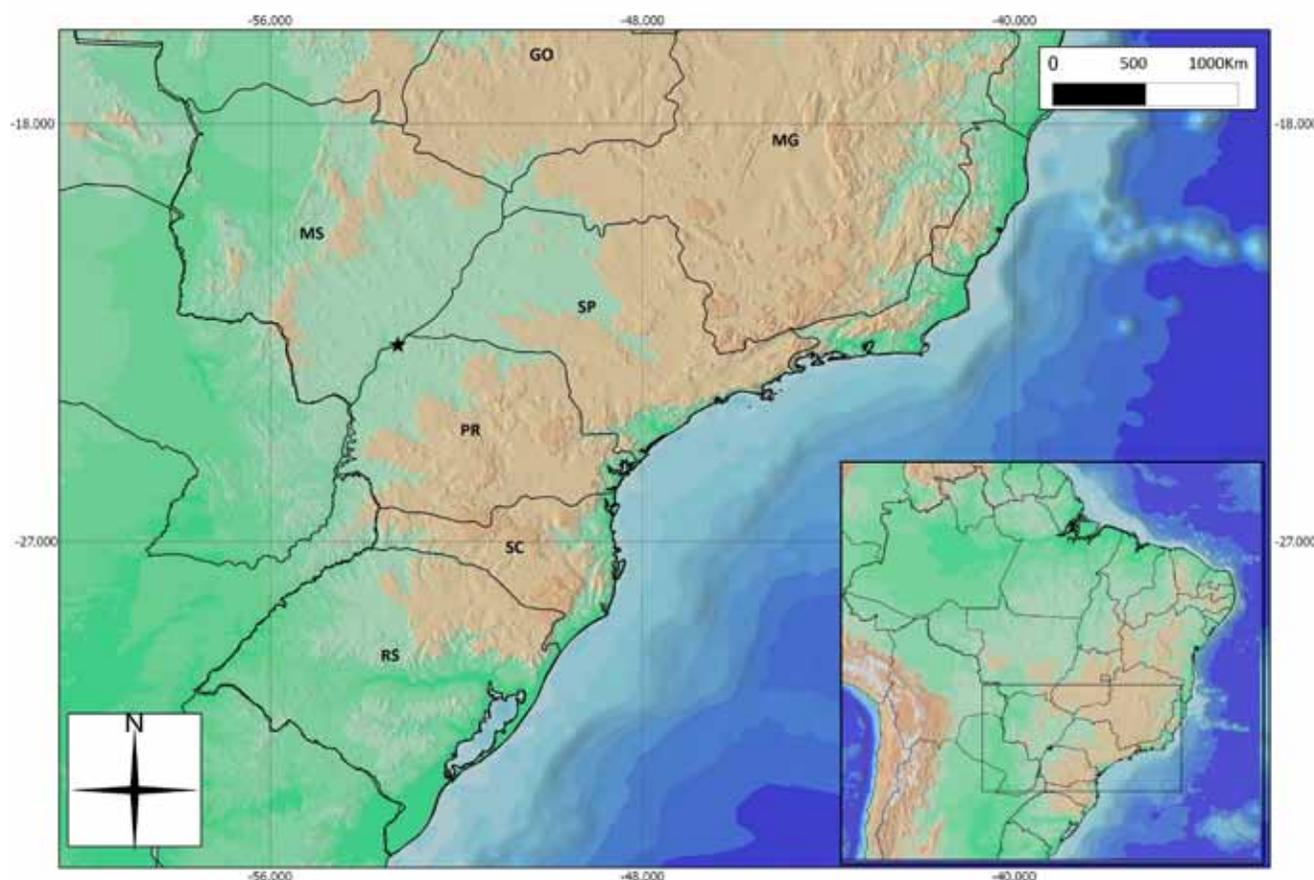


FIG. 1. Location of BAP/Nupelia in the municipality of Porto Rico, state of Paraná, Brazil.

Localización de BAP / Nupelia en el municipio de Puerto Rico, estado de Paraná, Brasil.

nanus were registered sharing microhabitat with *D. minutus*. Our observations suggest that there may be ecological competition between *D. nanus* and *D. minutus*.

***Hypsiboas albopunctatus* (Spix, 1824)**

Hypsiboas albopunctatus belongs to the *Hypsiboas albopunctatus* group, which is broadly distributed in South America (Frost 2013). Individuals presented white spots hidden on posterior surfaces of femur, which make them differ from other similar species. They occur in tropical rainforest and open areas and adapt well to disturbed environments (Aquino *et al.* 2010a). In this study, *H. albopunctatus* was abundant and their habitat was open areas at temporary ponds. Males were found vocalizing both on bushes and small-leaved grasses. Further information about biology aspects of this specie can be found in Guimarães *et al.* (2011).

***Hypsiboas raniceps* Cope, 1862 (Figure 2C)**

This tree frog belong to the *Hypsiboas albopunctatus* group and occurs in Amazonian Colombia, Venezuela, French Guiana, eastern Brazil, Paraguay, northern Argentina, and eastern Bolivia (Frost 2013). This species differ from *H. albopunctatus* in being larger in size, and by having horizontal stripes on dorsum and dark stripes hidden on posterior part of thighs. They can be found on leaves or

branches in tropical rainforest and Amazonian savannah and can occur in degraded areas (La Marca *et al.* 2004). Such as observed in *H. albopunctatus*, males of *H. raniceps* were found vocalizing both on bushes and grasses, which suggests that is very plausible that those species compete for resources.

***Pseudis* sp. (Figure 2D)**

The specimens studied during our study belongs to the genus *Pseudis*, but the phylogenetic status of this group is still in great debate, according to Faivovich *et al.* (2005). In the studied region we believe that a complex of species can be found in this genus, so we chose to identify it only as *Pseudis* sp. Adults vary between 36.71 to 55.29 mm in snout-vent length and in their adult size are smaller than their tadpoles observed in the study area. In life they presented green color with dark spots on their backs and white color on their bellies, with conspicuous dark strips on ventral surface of thighs. The habitat registered for *Pseudis* sp. in this study was temporary ponds and streams; most individuals were found floating within the ponds. They were the only hylids registered that float on the water surface and anchor themselves to the aquatic vegetation by holding leaves with their hands: and, as stated by Brandão *et al.* (2003), morphological adaptations such as toe-webbing prove to be useful

in these environments.

***Scinax fuscovarius* (A. Lutz, 1925)**

Scinax fuscovarius belongs to the *Scinax ruber* clade and presents a wide distribution in the Neotropical region, being found in Southeastern Brazil, northern Argentina, Paraguay and Bolivia (Frost 2013). They have pale bellies, and vary in color on dorsal surfaces from pale to dark brown background with darker spots. They are common in open habitats like pasture lands and crops and can be found inside houses and disturbed areas (Aquino *et al.* 2010b). In Porto Rico, *S. fuscovarius* was abundant and the habitat was stream and temporary ponds in open areas, where individuals were vocalizing at the edge of ponds, hidden in small-leaved grasses.

***Scinax nasicus* (Cope, 1862) (Figure 2E)**

This species belongs to *Scinax ruber* clade and occurs in Paraguay, northwest and central of Argentina, Uruguay, eastern Bolivia and southern Brazil (Frost 2013). All specimen present flat triangular head, visible tympanum, foots with a large inter-digital membrane, and tubercles on skin; in life they present a yellowish gray color on dorsum. They are smallest than *S. fuscovarius* and differ on the spotted pattern on the back, as well as differ in their advertisement calls. This species occurs in forest, shrublands and grasslands located in open areas (Kwet *et al.* 2004). In the study area, only three individuals were registered and the habitat of this species was temporary ponds in open areas. Males were recorded vocalizing on leaves in bushes at 40 cm above the ground, along the edge of water bodies during the month of December 2011. The recorded advertisement call of one individual was useful to compare with and to differentiate from other similar species in the group.

***Trachycephalus typhonius* (Linnaeus, 1758) (Figure 2F)**

This species belongs to the *Phyllodytes luteolus* group and occurs on Mexico, Central America to Amazon Basin of Colombia, Ecuador, Peru, Venezuela, Brazil, Guianas, Paraguay, northern Argentina and Trinidad and Tobago (Frost 2013). Individuals registered in study area have head wider than longer with a tympanum distinct and large, the skin in dorsal view is glandular with uniform colored flanks, webbing between toes and fingers, and males having paired lateral vocal sacs, one on each side of the head, and other diagnostic characters found in Prus (2008). They can be found in open habitats, such as: savannahs, dry and moist forests, and within second growth forest and farmlands in disturbed areas (La Marca *et al.* 2010). The habitat registered in Porto Rico for this species was streams, where males were found vocalizing in choruses at tree-branches and at the edge and within ponds, in only one night with heavy rains (188 mm).

FAMILY LEIUPERIDAE

***Eupemphix nattereri* Steindachner, 1863 (Figure 2G)**

This species belongs to the *Physalaemus biligonigerus* group (Nascimento *et al.* 2005) and occurs on Central and southeastern Brazil; Paraguay and Bolivia (Frost 2013). The most remarkable

trait of this species is a pair of large inguinal glands with dark ocellus and color pattern in dorsal view is brown with dark spots. When threatened by a potential predator, the frog exhibits these ocelli (deimatic behaviour) as a defensive behaviour against predators (Nascimento *et al.* 2005). They inhabit savannahs and grassland habitats, are adapted to semi-arid climate but do not adapt well to human impacts (Aquino *et al.* 2004). The habitat of *E. nattereri* in the study area was temporary ponds in degraded area caused by crops and pasture. Males were found vocalizing in choruses at water level and inhabits emergent vegetation at the edge of ponds.

***Physalaemus cuvieri* Fitzinger, 1826**

Physalaemus cuvieri belongs to the *Physalaemus cuvieri* group, with a wide distribution in the Neotropical region (Frost 2013). All specimens in the study area presented the diagnostic characters of the species given by Nascimento *et al.* (2005), such as: variable texture on dorsum, without glands, and presence or absence of inguinal glands but, when present, being smaller than those of *E. nattereri*; red or orange inner thigh. They are adaptive and can be found in open grassland, flooded savannahs, and pastureland (Mijares *et al.* 2010). In Porto Rico, the habitat used by this species is temporary ponds located in areas with crops and pasture, being abundant in the study area. *Physalaemus cuvieri* shared microhabitats with *E. nattereri* and seems to be a niche overlapping for this species.

FAMILY LEPTODACTYLIDAE

***Leptodactylus fuscus* (Schneider, 1799)**

Leptodactylus fuscus belongs to the *Leptodactylus fuscus* group, with wide distribution in South America (Frost 2013). We identified individuals by advertisement call, following Freitas *et al.* (2001) and diagnostic characters of the species found in Bastos *et al.* (2003), such as: long snout on lateral and dorsal view, sometimes with a pale dorsal line and with black vocal sac in males. They can be found in open areas, such as: savannahs, grasslands, marshy areas and also in degraded forests or urban habitats (Reynolds *et al.* 2004). The habitat registered for this species in Porto Rico was temporary ponds in open areas located in crops and pasture. Males were found vocalizing at the onset of first rains localized at the pond margins near to subterranean chambers built for shelter and reproduction. Additional information about reproductive biology is found in Martins (1988).

***Leptodactylus labyrinthicus* (Spix, 1824)**

Leptodactylus labyrinthicus belongs to the *L. pentadactylus* group and can be found in central and southeastern Brazil and Paraguay (Frost 2013). All individuals recorded in the study area have white stripes on upper lip and red coloration on internal parts of thigh and groin. They also have thorns in prepollex. They can be found in dry and moist tropical forests, in open areas and savannahs (Heyer *et al.* 2004a). The habitat recorded in this study for *L. labyrinthicus* was temporary ponds in open habitats. They utilized burrows or depressions at the edge of temporary ponds or they inhabited



FIG. 2. Representatives of anuran species found in the municipality of Porto Rico, state of Paraná, Brazil. **A)** *Rhinella schneideri*, **B)** *Dendropsophus nanus*, **C)** *Hypsiboas raniceps*, **D)** *Pseudis* sp., **E)** *Scinax nasicus*, **F)** *Trachycephalus typhoneus*, **G)** *Eupemphix nattereri*, **H)** *Leptodactylus* sp.

Representantes de las especies de anuros que se encuentran en el municipio de Porto Rico, estado de Paraná, Brasil. A) *Rhinella schneideri*, *B)* *Dendropsophus nanus*, *C)* *Hypsiboas raniceps*, *D)* *Pseudis* sp., *E)* *Scinax nasicus*, *F)* *Trachycephalus typhoneus*, *G)* *Eupemphix nattereri*, *H)* *Leptodactylus* sp.

shallow waters covered by vegetation as microhabitat. Males were found fortuitously or by their vocalizations. Additional information about this species can be found in Zina and Haddad (2005).

***Leptodactylus latrans* (Steffen, 1815)**

This species belongs to the *L. ocellatus* group and is well distributed in Tropical South America (Frost 2013). All individuals observed in the study area were identified by diagnostic characters for this species given by Bastos *et al.* (2003), such as: dark triangle spot between eyes, robust body, males with dark thorns on prepollex in their hands; in life they were green color on dorsum and white on venter. They can be found in savannahs, open areas such as grasslands, and along riverbanks in tropical forest and forest edge (Heyer *et al.* 2010a). The habitat registered for this species in Porto Rico was temporary ponds localized in open areas, where individuals were found at the edge of ponds or moving possibly from one to another water body. In this study, no individuals were recorded vocalizing.

***Leptodactylus mystacinus* (Burmeister, 1861)**

This species belongs to the *Leptodactylus fuscus* group and can occur on Bolivia, eastern Brazil to Uruguay and through Paraguay to central Argentina (Frost 2013). Specimens presented a large tympanum, a dark band from snout to tympanum and in lateral view presented dark stripes with small dark spots (diagnostic characters, according to Maffei *et al.* 2011). They can be tolerant to different environments in grasslands of the Cerrado or Chaco (Heyer *et al.* 2010b). Individuals were abundant in Porto Rico and vocalized only

by the streams, without crops or pasture. Specimens were registered on the border of shallow ponds and we rapidly identify them by their advertisement call. Details about reproductive biology can be found on Filho and Giaretta (2008).

***Leptodactylus podicipinus* (Cope, 1862)**

This species belongs to the *L. melanotus* group and have a wide distribution in the Neotropical region (Frost 2013). Individuals presented diagnosis characters for this species given by Lema and Martins (2011), such as: presence of prepollex in males, snout short, granules on the skin of dorsum; life color is greenish gray on dorsum and pale yellow with paler spots on venter. *L. podicipinus* can be found in open areas like grasslands and appears to adapt well to anthropogenic disturbance (Heyer *et al.* 2004b). *Leptodactylus podicipinus* emits calls every night during the reproductive season. In this study they were abundant and used temporary ponds in crops and pasturelands and occupied streams as habitat. Individuals were registered at the edge of the ponds, under the vegetation or in shallow water.

***Leptodactylus* sp. (Figure 2E)**

This unidentified species belongs to the *L. melanotus* group. One individual was captured at the edge of a body of water. They are very similar to *L. podicipinus* in size and with the posterior thigh patterns entirely mottled, but did not exhibit the distinct pale belly spots exhibited by individuals of *L. leptodactyloides*; in life, color is greenish gray. Males were rare in Porto Rico and were recorded in temporary ponds and stream areas sympatrically with *L. podicipinus*. Advertisement calls present low frequencies and, to our hearing, have some differences from other sympatric species; however, not a single individual was recorded because they were rare in the study area and difficult to find because they were hidden in vegetation.

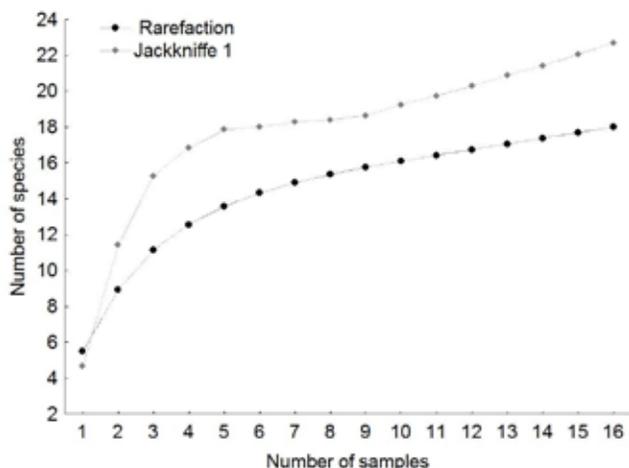


FIG. 3. Species accumulation curve of estimated species richness (gray symbol) and observed species richness (black symbol) of anurans from a degraded area in the municipality of Porto Rico, state of Paraná, Brazil.

Curva de acumulación especies de riqueza de especies estimada (símbolo gris) y la riqueza de especies observada (símbolo negro) de los anuros de una zona degradada en el municipio de Puerto Rico, estado de Paraná, Brasil.

FAMILY MICROHYLIDAE

***Elachistocleis bicolor* (Guérin-Ménéville, 1838)**

Elachistocleis bicolor occurs in Central Argentina and Uruguay through Paraguay to southeastern Bolivia and Amazonian Brazil. The species has been involved in confusion with *Elachistocleis ovalis* since 1841, because of some similar characters. Ventral coloration can be a useful character to distinguish these two species. Here we found individuals with greenish yellow belly in life. The population we study is located at the southern portion of the generic range, corresponding to this species (Lavilla *et al.* 2003). The habitat type for this species is temporary ponds in open areas disturbed by anthropic impacts with crops and pasture. Individuals were abundant in the area during the reproductive season (between October and March). Males were registered vocalizing at the border of shallow ponds, where there is more vegetation to clasp, maintaining only the heads above the water surface.

DISCUSSION

The total number of species recorded in this study correspond to 12.6% of the 143 species known (Toledo and Batista 2012) for the

TABLE 1. Anuran species found in the municipality of Porto Rico, state of Paraná, Brazil, from March 2010 to December 2011.**TABLA 1.** Especies de anuros del municipio de Porto Rico, estado de Paraná, Brasil, desde marzo 2010 hasta diciembre 2011.

| Families and species | Environments | |
|--|--------------|-----------------------|
| | A1 Stream | A2 Temporary ponds |
| BUFONIDAE | | |
| <i>Rhinella schneideri</i> Werner, 1894 | X | X |
| HYLIDAE | | |
| <i>Dendropsophus minutus</i> (Peters, 1872) | | X |
| <i>Dendropsophus nanus</i> (Boulenger, 1889) | X | X |
| <i>Hypsiboas albopunctatus</i> (Spix, 1824) | | X |
| <i>Hypsiboas raniceps</i> Cope, 1862 | | X |
| <i>Pseudis</i> sp. | X | X |
| <i>Scinax fuscovarius</i> (A. Lutz, 1925) | X | X |
| <i>Scinax nasicus</i> (Cope, 1862) | | X |
| <i>Trachycephalus typhonius</i> (Linnaeus, 1758) | X | |
| LEIUPERIDAE | | |
| <i>Eupemphix nattereri</i> Steindachner, 1863 | | X |
| <i>Physalaemus cuvieri</i> Fitzinger, 1826 | | X |
| LEPTODACTYLIDAE | | |
| <i>Leptodactylus fuscus</i> (Schneider, 1799) | | X |
| <i>Leptodactylus labyrinthicus</i> (Spix, 1824) | | X |
| <i>Leptodactylus latrans</i> (Steffen, 1815) | | X |
| <i>Leptodactylus mystacinus</i> (Burmeister, 1861) | X | |
| <i>Leptodactylus podicipinus</i> (Cope, 1862) | X | X |
| <i>Leptodactylus</i> sp. | X | X |
| MICROHYLIDAE | | |
| <i>Elachistocleis bicolor</i> (Valenciennes in Guérin-Ménéville, 1838) | | X |
| Families and species | 8 | 16 |

Paraná state, which is somewhat lower than that found in other localities of the Paraná state located in the SSF domain: Londrina (27 species; Machado *et al.* 1999, Bernarde and Machado 2000), Três Barras do Paraná (23 species; Bernarde and Machado 2000) and Fênix (19 species; Mikich and Oliveira 2003). In the same state, a protected SSF remnant - Estação Ecológica do Caiuá, harbors similar richness than that at Porto Rico municipality (19 species; F.H. Oda, pers. comm.). The lower richness observed in this study can be attributed to the fact that the sampled area is covered only by two different kinds of environments (forest and pasture) which are under anthropogenic pressure. Nevertheless, this study provides a preliminary view about the anurofauna of northwest Paraná state in Brazil with really important records that add to the scarce knowledge about the herpetofauna of this region.

Originally covered by Seasonally Semi-deciduous Forest (Maack 1981), the northwestern region of Paraná since the early 60's has been subjected to intense logging, agriculture and livestock activities. Total area of remnants of original vegetation in the region nearly two decades ago was estimated not to surpass 1% (Campos 1999). The resulting massive and permanent loss of native vegetation might have resulted in changes in community composition, and in a successful colonization of the area by more generalist species, well adapted to open, and disturbed areas (Haddad 1998).

Cumulative species curve did not show tendency to stabilization, indicating that there may still be an increase of species to local richness, as suggested by the records of *Pseudis* sp. and *Leptodactylus* sp. Long-term studies, inventory of new areas, and association of different sampling methods are needed to better

understand local anuran fauna, since not all species that occur in the region of Porto Rico (22 species; I.P. Affonso, unpublished data) were found in this study.

The high richness in pasture area can be explained by the fact that most of these species use breeding-sites associated with disturbed areas or open environments (Bernarde and Kokubum 1999; Vasconcelos and Rossa-Feres 2005; Santos *et al.* 2007, 2009). Moreover, temporary environments (as artificial temporary ponds amidst pasture areas), where the tadpole's predators are less abundant or absent, can attract greater number of anurans than the permanent water bodies (Woodward 1983, Skelly 1997), allowing the larvae to exploit food resources before colonization of insects and fish, while at the same time, avoid predators (Barreto and Moreira 1996, Eterovick and Sazima 2000, Prado *et al.* 2005).

Our study presents an important contribution to the knowledge of the anuran fauna of the Seasonally Semi-deciduous Forest, especially in view of the massive and rapid habitat loss in northwestern Paraná state. These data are preliminary results that can contribute to future studies in the same area. The entire region is poorly studied which requires other studies, mainly in remnants of significant size, for a better understanding of the distributions of anurans in areas under anthropogenic pressure.

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