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## Amphibians and reptiles of the Parque Estadual Turístico do Alto Ribeira (PETAR), SP: an Atlantic Forest remnant of Southeastern Brazil

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**Abstract:** The herpetofauna of São Paulo State, Brazil, can be characterized as the most well-known in the country. However, despite the large number of studies in this area, there are still many sampling gaps within biomes such as the Atlantic Forest that are considered global conservation priorities due to the high rate of endemism and human disturbance. As a result of political and historical pressure, this biome has been reduced to less than 12% of its original extent and, despite its importance for global biodiversity conservation, only a small percentage of its original vegetation cover (1%) has some form of legal protection. This is the case of the Parque Estadual Turístico do Alto Ribeira (PETAR) which, together with the Parque Estadual de Intervalos, Parque Estadual Carlos Botelho and Mosaico de Unidades de Conservação de Jacupiranga, forms of an ombrophilous forest continuum of 360 thousand ha in the south of São Paulo State. This study presents a list of amphibians and reptiles from the PETAR, with information on the local distribution and habitat use of the species. The survey was conducted from October to December 2009, completing a total of 15 sampling days using four complementary methods of active sampling: visual encounters, auditory encounters, searches by car and incidental encounters. We recorded a total of 91 species belonging to 53 genera and 24 families. This high diversity can be attributed to the existence of a wide variety of habitats and microhabitats in this region, such as the various aquatic sites used by many species of anuran amphibians. Moreover, the PETAR features a large altitudinal gradient (80 - 1,160 m elevation) that gives a large climatic, geological and hydrological heterogeneity to the area. This inventory is an important contribution to the expansion of knowledge about these assemblages in the Atlantic Forest to the south of Serra de Paranapiacaba mountain range, and provides support for the conservation of these groups in São Paulo State.

**Keywords:** *herpetofauna, conservation, Atlantic Forest, Apiaí, Iporanga, Vale do Ribeira.*

ARAUJO, C.O., CONDEZ, T.H., BOVO, R.P., CENTENO, F.C. & LUIZ, A.M. **Anfíbios e répteis do Parque Estadual Turístico do Alto Ribeira (PETAR), SP: um remanescente de Mata Atlântica do Sudeste do Brasil.** *Biota Neotrop.* 10(4): <http://www.biotaneotropica.org.br/v10n4/pt/abstract?inventory+bn01710042010>.

**Resumo:** Apesar do grande número de estudos realizados com a herpetofauna do Estado de São Paulo, que a caracteriza como a mais conhecida no país, ainda existem vazios amostrais dentro de biomas considerados mundialmente como prioritários para a conservação pelo elevado grau de endemismo e pressão antrópica, como é o caso da Mata Atlântica. Como resultado de pressões políticas e históricas, o bioma foi reduzido a menos de 12% de sua extensão original e apesar de sua importância para a conservação da biodiversidade mundial, apenas uma porcentagem mínima de sua cobertura vegetal original (1%) encontra-se protegida sob alguma forma legal de proteção. Este é o caso do Parque Estadual Turístico do Alto Ribeira (PETAR) que juntamente com o Parque Estadual de Intervalos, Parque Estadual Carlos Botelho e Mosaico de Unidades de Conservação de Jacupiranga formam um extenso contínuo ecológico de 360 mil ha de floresta ombrófila no sul do estado. O presente estudo apresenta a lista de anfíbios e répteis do PETAR, com informações sobre a distribuição local e uso de habitat destas espécies. O inventário foi realizado de outubro a dezembro 2009, totalizando 15 dias de amostragens que foram realizadas por meio de quatro métodos complementares de amostragem ativa: procura visual, procura auditiva, procura de carro e encontro ocasional. Foram registradas no total 91 espécies pertencentes a 53 gêneros e 24 famílias. Esta alta diversidade pode ser atribuída à existência de uma grande variedade de habitats e

microhabitats nesta localidade, como os diversos sítios aquáticos utilizados por várias das espécies de anfíbios anuros amostradas. Além disso, o PETAR apresenta um amplo gradiente altitudinal (80 - 1.160 m) que confere uma grande heterogeneidade climática, geológica e hidrológica a área. Neste sentido, este inventário é uma importante contribuição para a ampliação do conhecimento destas taxocenoses de floresta ombrófila presentes na porção mais ao sul da Serra de Paranapiacaba, fornecendo subsídios para a adoção de medidas visando à conservação dessas taxocenoses no Estado de São Paulo.

**Palavras-chave:** *herpetofauna, conservação, Mata Atlântica, Apiaí, Iporanga, Vale do Ribeira.*

## Introduction

The Atlantic Forest is highly diverse, showing high rates of endemism per unit area, which places it fifth amongst the 34 global conservation priority hotspots (Myers et al. 2000, Mittermeier et al. 2004, Fonseca et al. 2004). As a result of political and historical pressure, the Atlantic Forest has been reduced due to land loss and fragmentation, resting less than 12% of its original 1.3 million km<sup>2</sup>, which corresponded to about 15% of the Brazilian territory (Morellato & Haddad 2000, Fundação... & Instituto... 2008, Ribeiro et al. 2009). Despite its importance for global biodiversity conservation (Myers et al. 2000), only a small percentage of the original vegetation cover (1%) is safeguarded under some form of legal protection (Wilson 1997). Recent estimates indicate that this biome is made up of discontinuous fragments, most of which (80%) are smaller than 50 ha (Ribeiro et al. 2009).

Even with this drastic reduction in area, the Atlantic Forest is the biome in Brazil with the highest species richness of anuran amphibians, with more than 400 known species, and approximately 85% of these (about 340 species) are endemic to the biome, which also harbors a large number of undescribed species (Cruz & Feio 2007, Haddad et al. 2008). Additionally, 27 of the 39 reproductive modes known in the world are present in this environment (Haddad & Prado 2005). This biome also exhibits high species richness of snakes (134 species), although the species richness and endemism of lizards in the Atlantic Forest (40 endemic species) is much lower when compared to the Amazon Forest, with 81 endemic species (Rodrigues 2005).

In São Paulo State, there are 236 known species of amphibians (Araújo et al. 2009b) and 200 species of reptiles (Rossa-Feres et al. 2008), which represent 27% and 27.7% of the Brazilian species richness, respectively (Sociedade... 2010, Bérnills 2010). The herpetofauna of São Paulo state is composed of the species found in the ombrophilous forest of the coastal slopes and the Serra do Mar, Mantiqueira and Bocaina mountain ranges as well as species found in areas with open vegetation formations (Cerrado phytophysognomies) and deciduous forest (Rossa-Feres et al. 2008). Only 14% (3.5 million ha) of the area of São Paulo State is still covered by natural vegetation including all phytophysognomies (Kronka et al. 2005).

Most studies on species composition, ecology and natural history of the herpetofauna in São Paulo State has been developed in the coastal rainforest and Atlantic Plateau localities (e.g., Heyer et al. 1990, Sazima & Haddad 1992, Marques et al. 2004, Cicchi et al. 2007, Malagoli 2008, Condez et al. 2009, Hartmann et al. 2009, Marques et al. 2009, Narvaes et al. 2009, Verdade et al. 2009).

This large number of studies characterizes the herpetofauna of São Paulo State as the best known in Brazil. However there are still gaps regarding species distribution along rainforest continuums, such as the Parque Estadual Turístico do Alto Ribeira (PETAR). This protected area has 35,712 ha and, together with the Parque Estadual de Intervalos (41,987 ha), Parque Estadual Carlos Botelho (37,644 ha) and the Mosaico de Unidades de Conservação de Jacupiranga (243,800 ha) forms an extensive ecological continuum

in the Serra de Paranapiacaba mountain range. These areas have added about 360 thousand ha of protected rainforest to the South of São Paulo State (Fundação Florestal 2009a). The aim of this study was to expand the current knowledge about the herpetofauna in this region, link the local distribution and habitat use of the amphibians and reptiles to the environmental conditions found in this protected area and generate data for the conservation of these assemblages in São Paulo State.

## Methods

### 1. Study area

The Parque Estadual Turístico do Alto Ribeira (PETAR) is located in the region of the Alto Vale do Rio Ribeira de Iguape, where the Serra de Paranapiacaba mountain range retreats toward the Southwestern part of São Paulo State, close to the border with Paraná State (Kronka et al. 2005). The park is located between latitudes 24° 17' and 24° 38' and longitudes 48° 27' and 48° 44', including Apiaí (8,360 ha) and Iporanga (27,352 ha) municipalities (São Paulo 1958, 1997) (Figure 1).

The PETAR lies in a mountainous area which has a rounded surface over intrusive granites and phyllites and a topographic roughness over the limestone areas, featuring residual karst topography (Instituto... 1987, Karmann 1994). As a result of the presence of large amounts of limestone, this remarkable conservation unit has about 300 caves showing great speleothem diversity (Fundação Florestal 2009b). The climate is classified as humid subtropical with no dry season and cool summers (Cfb; Köppen-Geiger) (Peel et al. 2007). Mean annual temperatures are usually between 20 and 22 °C, and the annual temperature range is relatively low (Nimer 1977). The site has a high pluviometric index, with an average annual rainfall ranging from 1,500 and 2,000 mm. The highest average monthly rainfall occurs in January and the lowest in August (Lepsch et al. 1990). Located on the left margin of the medium and upper course of the Ribeira river, the park is drained by the Betari, Iporanga and Pilões river basins, the sources of which are found on the border of the Guapiara plateau between 900 and 1,100 m elevation, reaching the Ribeira River between 80 and 70 m (Karmann & Ferrari 2002).

This state park is subdivided into four research and visitation centers (núcleos) in Iporanga municipality and two vigilance stations (bases) in Apiaí municipality (Figure 1c). The vegetation cover in the area is formed predominantly by dense ombrophilous forest (78%), with some stretches of open ombrophilous forest (16%), which is dominated by species of Bambusoideae that replace the typical arboreal physiognomy of the dense forest. These two vegetation types are represented by montane formations between 400 and 1,000 m above sea level (Base Areado, Base Bulha d'água and Capinzal and Núcleo Caboclos) and submontane formations between 30 and 400 m above sea level (Núcleo Casa de Pedra, Núcleo Ouro Grosso and Núcleo Santana). The alluvial formation of the dense ombrophilous forest is found along the watercourses and corresponds to 1% of the area (N. M. Ivanauskas, unpublished data).

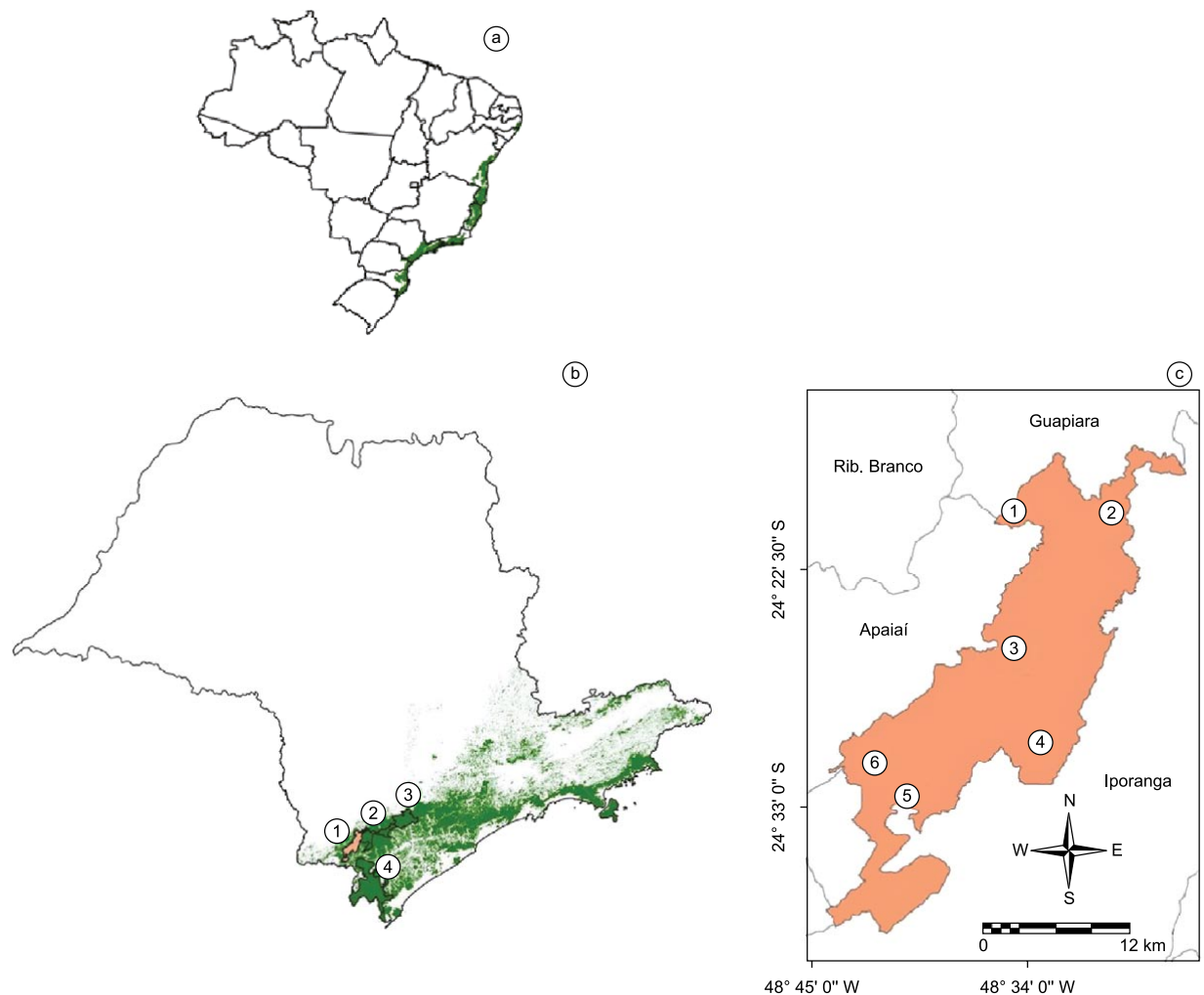
## 2. Data collection

We conducted the survey of amphibian and reptile species between October and December 2009 during three field trips lasting six days each, totaling 15 sampling days in all centers (Caboclos, Casa de Pedra, Ouro Grosso and Santana) and stations (Areado, Bulha d'água and Capinzal) of this protected area (Figure 1c). Four complementary methods of active sampling were used: visual encounters, auditory encounters, searches by car and incidental encounters (Crump & Scott Jr. 1994, Sawaya 2004).

Visual Encounters (VE) and Auditory Encounters (AE) were made during the day and at night by a team of four or five people in pre-defined transects (13 forest trails and nine caves). All microhabitats that were visually accessible in forest trails, including anuran breeding sites (e.g., bromeliads, leaf litter, logs, temporary and permanent ponds, swamps, floodplains, streams and creeks) were examined. The duration of each sampling ranged between five and ten hours a day, resulting in a total effort of approximately 435 hours of active search. The sampling effort per person was 93 hours and 40 minutes of active search. Santana and Caboclos received greater sampling effort (120 and 105 hours, respectively), followed by Bulha

d'água and Capinzal (72 hours), Areado (60 hours), Casa de Pedra (53 hours) and Ouro Grosso (25 hours). The searches by car (SC) method included individuals sighted on roads traveled within and in the immediate surroundings of the PETAR. The Incidental Encounters method (IE) consisted of a record of random specimens found during activities that were not part of the sampling methods described above. Although the sampling effort is not considered, this method is useful for records of species richness, more comprehensive species lists and for obtain data of species behavior (e.g., use of habitat, diet, reproductive activity) (Sawaya 2004).

For all the specimens captured we recorded the following information: location, geographic coordinates (from the GPS), date and time of collection, type of environment (open or forest), type of substrate (e.g., water, soil, vegetation, trunk), activity (e.g., calling, moving), weather conditions (e.g., temperature, humidity), and elevation. This inventory provided subsidies for the PETAR management plan so the specimens were collected with an authorization issued by the Fundação Florestal - Secretaria do Meio Ambiente do Estado de São Paulo and were deposited in the Coleção de Anfíbios do Departamento de Zoologia da Universidade



**Figure 1.** Original cover of the Atlantic Forest (ombrophilous dense forest phytophysiology) in Brazil (a) (source: IBGE); original distribution of the Atlantic forest (ombrophilous dense forest) in São Paulo State and position of the main conservation units at the Vale do Ribeira (b): 1 = PETAR; 2 = P. E. Intervalles; 3 = P. E. Carlos Botelho; 4 = Mosaico de Unidades de Conservação do Jacupiranga (source: Biota/FAPESP); and sampled sites in the PETAR (c): 1 = Base Areado; 2 = Base Bulha d'água and Capinzal; 3 = Núcleo Caboclos; 4 = Núcleo Casa de Pedra; 5 = Núcleo Ouro Grosso; 6 = Núcleo Santana.

Estadual Paulista “Júlio de Mesquita Filho”, campus de Rio Claro (CFBH), the Coleção Herpetológica “Alphonse Richard Hoge” do Instituto Butantan (IBSP and CRIB) and the Coleção Herpetológica do Museu de Zoologia da Universidade de São Paulo (MZUSP) (see Appendix 1).

In addition to the field samples, secondary records of species found in Apiaí and Iporanga municipalities were obtained from collection catalogs of the main scientific collections of amphibians and reptiles in São Paulo State: Coleção de Anfíbios do Departamento de Zoologia, Universidade Estadual Paulista “Júlio de Mesquita Filho”, campus de Rio Claro (CFBH), Coleção Herpetológica “Alphonse Richard Hoge” do Instituto Butantan (IBSP), Coleção Herpetológica do Museu de Zoologia, Universidade de São Paulo (MZUSP) and Museu de História Natural, Universidade Estadual de Campinas (ZUEC). Among these records, species that showed taxonomic uncertainties were disregarded. Only taxonomically defined species or those registered as “cf.” (*confer*) were included in the count of species richness and were used for determining the composition of species in this locality. The nomenclature follows the recent taxonomic proposals for amphibians (Faivovich et al. 2005, Frost et al. 2006, Grant et al. 2006, Wilkinson & Nussbaum 2006, Chaparro et al. 2007, Heinicke et al. 2007, Hedges et al. 2008, Guayasamin et al. 2009, Lavilla et al. 2010, Frost 2010) and reptiles (Frost et al. 2001, Curcio et al. 2009, Fenwick et al. 2009, Mott & Vieites 2009, Zaher et al. 2009).

## Results and Discussion

### 1. Species composition

We recorded for the PETAR and Apiaí and Iporanga municipalities, a total of 60 species of amphibians and 31 reptiles, which confirms high species richness for the herpetofauna in this region, hitherto relatively unknown. Twelve families of anuran amphibians were recorded: Brachycephalidae (3 species), Bufonidae (2), Centrolenidae (1), Ceratophryidae (1), Craugastoridae (1), Cycloramphidae (4), Hemiphractidae (2), Hylidae (28), Hylodidae (4), Leiuperidae (4), Leptodactylidae (6) and Microhylidae (2), as well as two species of caecilians (Caeciliidae) (Table 1).

Considering the reptiles, we observed only one species of amphisbaena (Amphisbaenidae), and five families of lizards: Anguidae (1 species), Gekkonidae (1), Gymnophthalmidae (3), Leiosauridae (1) and Teiidae (1). The snakes found belonged to six families: Anomalepididae (1), Colubridae (3), Dipsadidae (13), Elapidae (1), Tropidophiidae (1) and Viperidae (3). Only one species of turtle was sampled in the region (Chelidae) (Table 2).

During the field surveys in the PETAR (October to December 2009), we recorded 50 species of anuran amphibians and 20 reptiles (Figures 2 and 3). Of this total, 24 species of anuran amphibians and 13 reptiles represent new records for the locality. Of the data obtained from scientific collections, only 10 species of amphibians and 11 reptiles were not found during this survey (Tables 1 and 2).

The addition of 37 new records of species from these assemblages to the locality by means of a short sampling effort (15 days) suggests that there are still gaps in our knowledge of species from protected areas in São Paulo State, even in localities in the Atlantic Forest for which a large number of studies has already been made with these taxonomic groups.

We recorded some species listed as Data Deficient (DD) in the list of endangered species for São Paulo State (São Paulo 2008) and in the IUCN red list of threatened species (International... 2010). The species *Aplastodiscus cf. ehrhardti* and *Placosoma cordylinum champsonotus* are present in the state list and *Cycloramphus eleutherodactylus*,

*C. lutzorum*, *Hylodes heyeri* and *Luetkenotyphlus brasiliensis* are found on the IUCN list (Tables 1 and 2). It is possible that the snake *Corallus cropanii* occurs in this protected area, because the four individuals of the species that are deposited in research collections were collected in Eldorado, Miracatu, Pedro de Toledo and Sete Barras, all municipalities near to the PETAR (Franco et al. 2009). Because it is extremely rare, this species is classified as critically endangered in the Brazilian list of endangered species (Instituto... 2003).

### 2. Considerations on the use of habitat and altitudinal gradient

Of the 50 species of anuran amphibians sampled in this study, few were exclusively found in open environments, namely: *Aplastodiscus perviridis*, *Dendropsophus elegans*, *D. werneri*, *Hypsiboas albomarginatus*, *H. pardalis*, *H. prasinus*, *Leptodactylus latrans*, *L. mystacinus*, *Physalaemus cuvieri*, *P. spiniger* and *Scinax berthae*. Nineteen species were found closely associated with forest environments: *Aplastodiscus cf. ehrhardti*, *Bokermannohyla circumdata*, *Chiasmocleis leucosticta*, *Crossodactylus caramaschii*, *Cycloramphus eleutherodactylus*, *C. lutzorum*, *Flectonotus fissilis*, *F. ohausi*, *Haddadus binotatus*, *Hylodes cardosoi*, *H. heyeri*, *Ischnocnema guentheri*, *I. parva*, *Ischnocnema sp.* (aff. *bolbodactyla*), *Leptodactylus cf. marmoratus*, *Macrogenioglottis alipioi*, *Paratelmatobius sp.* (aff. *cardosoi*), *Physalaemus maculiventris* and *Vitreorana uranoscopa*. The other species (20) were found in both types of environment (Table 3). More detailed information on the habitats used by species of anuran amphibians in this study can be found in Table 3.

The reptiles captured in open environments were *Amphisbaena microcephala*, *Hydromedusa tectifera*, *Liophis miliaris*, *Ophiodes striatus* and *Thamnodynastes nattereri*, and in forested areas, *Chironius bicarinatus*, *Dipsas alternans*, *Enyalius iheringii*, *Oxyrhopus clathratus*, *Tropidophis paucisquamis* and *Xenodon newwiedii*. The other species (9) were captured in both types of environment (Table 4). Additional information on habitat use of the sampled reptiles for the PETAR can be found in Table 4.

Few studies on these assemblages try to associate the species with the altitudinal gradient present in the studied localities (e.g., Giaretta et al. 1999, Sawaya 1999, Guix et al. 2000, Araujo et al. 2009a, Centeno 2009, Forlani et al. 2010), although it is an essential component to help explain the patterns of geographic distribution of many species from the Atlantic Forest. Reportedly, this biome has a very complex topographical compartmentalization, with sub-areas that vary greatly between one another, such as the tropical slopes of the Serra do Mar and Mantiqueira mountain ranges and the Planalto Paulista (Ab'Saber 2005). This very rugged relief provides a large number of habitats and microhabitats, which could be one of the factors responsible for the high species richness, high rates of endemism (Cruz & Feio 2007, Haddad et al. 2008) and diversity of reproductive modes found among the anuran amphibians in this biome (Haddad & Prado 2005).

In the study area, the highest altitudes were recorded in Areado (850 to 980 m), mid-altitudes in Bulha d'água and Capinzal and Caboclos (500 to 730 m) and the lowest altitudes in Casa de Pedra, Ouro Grosso and Santana (130 to 460 m) (Tables 3 and 4). According to this classification, the species of anuran amphibians in the PETAR were grouped into three categories. In the first, we allocated the species that were distributed widely throughout the altitudinal gradient present in the PETAR (most species), and sampled at the three altitude classes (high, mid-altitude and low). A total of 17 species occur in this category: *Bokermannohyla hylax*, *Dendropsophus elegans*, *D. microps*, *D. minutus*, *Hypsiboas bischoffi*, *H. faber*, *H. prasinus*,

**Table 1.** Species composition of amphibians from the PETAR and surrounding areas (Apiá and Iporanga municipalities, São Paulo State, Brazil) in the present study (primary data) and by consulting the catalogs of the main scientific collections of São Paulo State (secondary data): C = Coleção de Anfíbios do Departamento de Zoologia da Universidade Estadual Paulista, campus de Rio Claro (CFBH), M = Coleção Herpetológica do Museu de Zoologia da Universidade de São Paulo (MZUSP) and Z = Museu de História Natural da Universidade Estadual de Campinas (ZUEC).

Family	Species	Primary data	Secondary data
<b>Ordem Anura</b>			
Brachycephalidae	<i>Ischnocnema guenterii</i> (Steindachner, 1864)	•	-
	<i>Ischnocnema parva</i> (Girard, 1853)	•	-
	<i>Ischnocnema</i> sp. (aff. <i>bolbodactyla</i> )	•	-
Bufonidae	<i>Rhinella icterica</i> (Spix, 1824)	•	C; M
	<i>Rhinella ornata</i> (Spix, 1824)	•	C; M; Z
Centrolenidae	<i>Vitreorana uranoscopa</i> (Müller, 1924)	•	C
Ceratophryidae	<i>Ceratophrys aurita</i> (Raddi, 1823)	-	M
Craugastoridae	<i>Haddadus binotatus</i> (Spix, 1824)	•	-
Cycloramphidae	<i>Cycloramphus eleutherodactylus</i> (Miranda-Ribeiro, 1920)**	•	C; M
	<i>Cycloramphus lutzorum</i> Heyer, 1983**	•	C; M
	<i>Macrogenioglotus alipioi</i> Carvalho, 1946	•	-
	<i>Proceratophrys boiei</i> (Wied-Neuwied, 1825)	•	C; M; Z
	<i>Flectonotus fissilis</i> (Miranda Ribeiro, 1920)	•	C
Hemiphractidae	<i>Flectonotus ohausi</i> (Wandolleck, 1907)	•	-
	<i>Aplastodiscus callipygius</i> (Cruz & Peixoto, 1985)	•	-
Hylidae	<i>Aplastodiscus</i> cf. <i>ehrdardi</i> (Müller, 1924)*	•	-
	<i>Aplastodiscus perviridis</i> A. Lutz, 1950	•	-
	<i>Bokermannohyla circumdata</i> (Cope, 1871)	•	-
	<i>Bokermannohyla hylax</i> (Heyer, 1985)	•	C; M
	<i>Dendropsophus berthaltutzei</i> (Bokermann, 1962)	-	C
	<i>Dendropsophus elegans</i> (Wied-Neuwied, 1824)	•	C; M
	<i>Dendropsophus microps</i> (Peter, 1872)	•	C; M
	<i>Dendropsophus minutus</i> (Peters, 1872)	•	C; M; Z
	<i>Dendropsophus seniculus</i> (Cope, 1868)	•	C
	<i>Dendropsophus werneri</i> (Cochran, 1952)	•	C; Z
	<i>Hypsiboas albomarginatus</i> (Spix, 1824)	•	C; M
	<i>Hypsiboas bischoffi</i> (Boulenger, 1887)	•	C; M
	<i>Hypsiboas faber</i> (Wied-Neuwied, 1821)	•	M
	<i>Hypsiboas pardalis</i> (Spix, 1824)	•	-
	<i>Hypsiboas prasinus</i> (Burmeister, 1856)	•	-
	<i>Hypsiboas semilineatus</i> (Spix, 1824)	-	C; M
	<i>Phyllomedusa distincta</i> A. Lutz, 1950	•	C; M; Z
	<i>Scinax berthae</i> (Barrio, 1962)	•	-
	<i>Scinax</i> cf. <i>perpusillus</i> (A. Lutz & B. Lutz, 1939)	•	-
	<i>Scinax crospedospilus</i> (A. Lutz, 1925)	•	M
	<i>Scinax fuscovarius</i> (A. Lutz, 1925)	-	M
	<i>Scinax hayii</i> (Barbour, 1909)	-	Z
	<i>Scinax perereca</i> Pombal, Haddad & Kasahara, 1995	•	C
	<i>Scinax rizibilis</i> (Bokermann, 1964)	•	Z
	<i>Scinax</i> sp. (gr. <i>catharinae</i> )	•	-
	<i>Sphaenorhynchus caramaschii</i> Toledo, Garcia, Lingnau & Haddad, 2007	•	-
	<i>Sphaenorhynchus surdus</i> (Cochran, 1953)	•	C
Hylodidae	<i>Crossodactylus caramaschii</i> Bastos & Pombal, 1995	•	C; M; Z
	<i>Hylodes cardosoi</i> Lingnau, Canedo & Pombal, 2008	•	-
	<i>Hylodes</i> cf. <i>asper</i> (Müller, 1924)	-	M

\*Species classified as Data Deficient (DD) according to the list of endangered species in São Paulo State (São Paulo 2008); \*\*Species classified as Data Deficient (DD) according to IUCN red list of threatened species (International... 2010).

Table 1. Continued...

Family	Species	Primary data	Secondary data
Leiuperidae	<i>Hylodes heyeri</i> Haddad, Pombal & Bastos, 1996**	●	C; M; Z
	<i>Physalaemus cuvieri</i> Fitzinger, 1826	●	-
	<i>Physalaemus maculiventris</i> (Lutz, 1925)	●	-
	<i>Physalaemus olfersii</i> (Lichtenstein & Martens, 1856)	●	C
	<i>Physalaemus spiniger</i> (Miranda-Ribeiro, 1926)	●	C
Leptodactylidae	<i>Leptodactylus</i> cf. <i>marmoratus</i> (Steindachner, 1867)	●	-
	<i>Leptodactylus flavopictus</i> Lutz, 1926	-	M
	<i>Leptodactylus latrans</i> (Steffen, 1815)	●	-
	<i>Leptodactylus mystacinus</i> (Burmeister, 1861)	●	-
	<i>Leptodactylus notoaktites</i> Heyer, 1978	●	C; M; Z
	<i>Paratelmatobius</i> sp. (aff. <i>cardoso</i> )	●	-
Microhylidae	<i>Chiasmocleis leucosticta</i> (Boulenger, 1888)	●	-
	<i>Myersiella microps</i> (Duméril & Bibron, 1841)	-	M
<b>Ordem Gymnophiona</b>			
Caeciliidae	<i>Luetkenotyphlus brasiliensis</i> (Lütken, 1852)**	-	M
	<i>Siphonops annulatus</i> (Mikan, 1820)	-	M

\*Species classified as Data Deficient (DD) according to the list of endangered species in São Paulo State (São Paulo 2008); \*\*Species classified as Data Deficient (DD) according to IUCN red list of threatened species (International... 2010).

*Ischnocnema guenterii*, *Leptodactylus notoaktites*, *Physalaemus cuvieri*, *Proceratophrys boiei*, *Rhinella icterica*, *Scinax perereca*, *S. rizibilis* and *Scinax* sp. (gr. *catharinae*). Although *Leptodactylus latrans* and *Phyllomedusa distincta* were not observed in the mid-altitudes, these species were included in the category referred above since they probably occur throughout the gradient present in the park (Table 3).

The species recorded at high and mid-altitudes were placed in the second category (8 species), namely: *Aplastodiscus callipygius*, *A. perviridis*, *Bokermannohyla circumdata*, *Dendropsophus seniculus*, *Hypsiboas pardalis*, *Ischnocnema parva*, *Physalaemus olfersii* and *Scinax crospedospilus* (Table 3).

Species observed in the mid-altitudes and low altitudes are part of the third category and include (10 species): *Aplastodiscus* cf. *ehrharti*, *Cycloramphus eleutherodactylus*, *Dendropsophus werneri*, *Flectonotus fissilis*, *Hylodes heyeri*, *Leptodactylus* cf. *marmoratus*, *Physalaemus spiniger*, *Rhinella ornata*, *Scinax* cf. *perpusillus* and *Vitreorana uranoscopa* (Table 3).

Of the 15 remaining species, ten correspond to single records, and in these cases, any inference about the altitudinal distribution of these species would be hasty (Table 3).

With regard to the reptiles, only the most abundant species were considered for this classification (7 species). Only *Bothropoides jararaca* was observed widely distributed amongst the three altitudinal categories. *Tomodon dorsatus* was not sampled in mid-altitudes, although it is likely that the species also occurs throughout the altitudinal gradient present in the PETAR. The species *Sibynomorphus mikanii*, *Tropidophis paucisquamis* and *Enyalius iheringii* may be included in the second category (high and mid-altitude). Only *Bothrops jararacussu* and *Micrurus corallinus* were recorded in the mid- and low altitudes of the park (third category). It was not possible to categorize the other 13 species into altitude classes due to the small number of records (Table 4).

The PETAR has specialized fauna that inhabit caves, with several adaptations such as depigmentation, reduced sight organs and well-developed tactile organs such as the classic case of the blind catfish *Pimelodella kronei*, restricted to the caves associated with the Iporanga river (Trajano 1991). During the sampling

period we observed the following species of anuran amphibians inside caves: *Cycloramphus eleutherodactylus*, *Hylodes cardosoi*, *H. heyeri*, *Rhinella icterica* and *Bokermannohyla hylax* (Figure 4). *Cycloramphus eleutherodactylus* was the most frequent species of anuran associated to this type of habitat sampled in the Caboclos, Ouro Grosso and Santana centers. These observations may contribute to understand habitat use of this species. To date, there are two similar records for *C. eleutherodactylus* at the Parque Estadual de Intervales, Iporanga municipality, São Paulo State and in Sengés municipality, Paraná State (A. M. X. Lima, personal communication). Other records for species of anuran amphibians inside caves in Brazil include surveys in Bonito municipality, Mato Grosso do Sul State (Pinto-da-Rocha & Sessegolo 2001) and in Laranjeiras municipality, Sergipe State (Ferreira et al. 2009).

### 3. Amphibian and reptile species richness at the Vale do Ribeira ecological continuum

The species composition of anuran amphibians found in the PETAR is quite similar to that found in other conservation units of the Vale do Ribeira ecological continuum, such as Intervales (Guix et al. 2000, Bertoluci 2001) and Carlos Botelho state parks (Guix et al. 2000, Bertoluci et al. 2007, Moraes et al. 2007, Forlani et al. 2010), as well as the Mosaico de Unidades de Conservação do Jacupiranga (Domenico 2008) which is located further south from this extensive dense forest (Figure 1b). The great similarity found between the anuran amphibian assemblages in Carlos Botelho and Intervales state parks and its relationships with other assemblages in Brazil had already been pointed out in previous studies (Araujo et al. 2009a). Regarding the composition of species of reptiles, there is also a similarity between the assemblages in the Parque Estadual de Intervales (Sazima 2001), Parque Estadual Carlos Botelho (Forlani et al. 2010) and Mosaico de Unidades de Conservação do Jacupiranga (Domenico 2008).

Comparing the species richness of the herpetofauna in these protected areas, we observed that the PETAR (60 species of amphibians and 31 reptiles) together with the Parque Estadual Carlos Botelho (65 amphibians and 59 reptiles) assume a prominent position, showing a high richness of species when compared to other protected areas in the region, such as the Parque Estadual



## Amphibians and reptiles of the PETAR



**Figure 2.** Amphibian species sampled at the Parque Estadual Turístico do Alto Ribeira (PETAR), São Paulo State, Brazil. a = *Ischnocnema guenterii*; b = *Ischnocnema parva*; c = *Ischnocnema* sp. (aff. *bolbodactyla*); d = *Rhinella icterica*; e = *Rhinella ornata*; f = *Vitreorana uranoscopa*; g = *Haddadus binotatus*; h = *Cycloramphus eleutherodactylus*; i = *Cycloramphus lutzorum*; j = *Macrogenioglottus alipioi*; k = *Proceratophrys boiei*; l = *Flectonotus fissilis*; m = *Flectonotus ohausi*; n = *Aplastodiscus callipygius*; o = *Aplastodiscus* cf. *ehrharti*; p = *Aplastodiscus perviridis*; q = *Bokermannohyla circumdata*; r = *Bokermannohyla hylax*; s = *Dendropsophus elegans*; t = *Dendropsophus microps*; u = *Dendropsophus minutus*; v = *Dendropsophus seniculus*; w = *Dendropsophus werneri*; x = *Hypsiboas albomarginatus*; y = *Hypsiboas bischoffi*; z = *Hypsiboas faber*; a1 = *Hypsiboas pardalis*; b1 = *Hypsiboas prasinus*; c1 = *Phyllomedusa distincta*; d1 = *Scinax berthae*; e1 = *Scinax* cf. *perpusillus*; f1 = *Scinax crospedospilus*; g1 = *Scinax perereca*; h1 = *Scinax rizibilis*; i1 = *Scinax* sp. (gr. *catharinae*); j1 = *Sphaenorhynchus caramaschii*; k1 = *Sphaenorhynchus surdus*; l1 = *Crossodactylus caramaschii*; m1 = *Hylodes heyeri*; n1 = *Physalaemus cuvieri*; o1 = *Physalaemus maculiventris*; p1 = *Physalaemus olfersii*; q1 = *Physalaemus spiniger*; r1 = *Leptodactylus* cf. *marmoratus*; s1 = *Leptodactylus latrans*; t1 = *Leptodactylus notoaktites*; u1 = *Paratelmatobius* sp. (aff. *cardosoi*); v1 = *Chiasmocleis leucosticta*. All individuals were found at the study locality. Photos: Cybele O. Araujo; except c, e, h, s, t, v, k1, l1, o1, v1 (Thais H. Condez), a1, c1, e1, f1, u1 (Amom M. Luiz), i (Mauricio C. Forlani), g1 (Fernanda C. Centeno).



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Figure 2. Continued...



**Figure 2.** Continued...

de Intervalos (48 amphibians and 29 reptiles) and the Mosaico de Unidades de Conservação do Jacupiranga (39 amphibians and 49 reptiles) (Bertoluci 2001, Sazima 2001, Domenico 2008, Forlani et al. 2010).

Considering the small number of days devoted to the sampling of the assemblages in this study (15 days) and that only active search methods were used, it is likely that more species will be added to this list with the increase in sampling effort and the use of complementary methods such as passive collection (e.g., pitfall

traps), ideal for sampling species that inhabit the leaf litter or with fossorial habits. Although the Parque Estadual Carlos Botelho shows the highest richness of amphibians and reptiles, this locality has been more intensively studied throughout several years and using various methods of capture (Guix et al. 2000, Bertoluci et al. 2007, Moraes et al. 2007, Forlani et al. 2010). Thus, it is likely that with increased sampling effort in other protected areas present in this forest continuum, greater similarity in species composition and richness will be found.



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**Figure 3.** Reptile species sampled at the Parque Estadual Turístico do Alto Ribeira (PETAR), São Paulo State, Brazil. a = *Ophiodes striatus*; b = *Hemidactylus mabouia*; c = *Placosoma cordylinum champsonotus*; d = *Enyalius iheringii*; e = *Tupinambis merianae*; f = *Chironius bicarinatus*; g = *Spilotes pullatus*; h = *Dipsas alternans*; i = *Liophis miliaris*; j = *Oxyrhopus clathratus*; k = *Sibynomorphus neuwiedi*; l = *Thamnodynastes nattereri*; m = *Tomodon dorsatus*; n = *Xenodon neuwiedii*; o = *Micrurus corallinus*; p = *Tropidophis paucisquamis*; q = *Bothropoides jararaca*; r = *Bothrops jararacussu*. All individuals were found at the study locality. Photos: Cybele O. Araujo; except e, n, o, r (Fernanda C. Centeno), g, q (Thais H. Condez).

**Table 2.** Species composition of reptiles from the PETAR and surrounding areas (Apiá and Iporanga municipalities, São Paulo State, Brazil) in the present study (primary data) and by consulting the catalogs of the main scientific collections of São Paulo State (secondary data): I = Coleção Herpetológica “Alphonse Richard Hoge” do Instituto Butantan (IBSP), M = Coleção Herpetológica do Museu de Zoologia da Universidade de São Paulo (MZUSP) and Z = Museu de História Natural da Universidade Estadual de Campinas (ZUEC).

Family	Species	Primary data	Secondary data
<b>Ordem Squamata (Amphisbenia)</b>			
Amphisbaenidae	<i>Amphisbaena microcephala</i> (Wagler, 1824)	●	-
<b>Ordem Squamata (Lacertilia)</b>			
Anguidae	<i>Ophiodes striatus</i> (Spix, 1825)	●	-
Gekkonidae	<i>Hemidactylus mabouia</i> (Moreau de Jonnès, 1818)	●	-
Gymnophthalmidae	<i>Colobodactylus taunayi</i> (Amaral, 1933)	-	M
	<i>Placosoma cordylinum champsonotus</i> (Werner, 1910)*	●	-
	<i>Placosoma glabellum</i> (Peters, 1870)	-	M
Leiosauridae	<i>Enyalius iheringii</i> Boulenger, 1885	●	-
Teiidae	<i>Tupinambis merianae</i> (Duméril & Bibron, 1839)	●	-
<b>Ordem Squamata (Ophidia)</b>			
Anomalepididae	<i>Liotyphlops beui</i> (Amaral, 1924)	-	M
Colubridae	<i>Chironius foveatus</i> (Bailey, 1945)	-	I
	<i>Chironius bicarinatus</i> (Wied, 1820)	●	-
Dipsadidae	<i>Spilotes pullatus</i> (Linnaeus, 1758)	●	I; M
	<i>Dipsas alternans</i> (Fischer, 1885)	●	-
	<i>Echianthera undulata</i> (Wied, 1824)	-	M
	<i>Erythrolamprus aesculapii</i> (Linnaeus, 1766)	-	Z
	<i>Imantodes cenchoa</i> (Linnaeus, 1758)	-	I
	<i>Liophis miliaris</i> (Linnaeus, 1758)	●	-
	<i>Oxyrhopus clathratus</i> Duméril, Bibron & Duméril, 1854	●	I
	<i>Philodryas olfersii</i> (Lichtenstein, 1823)	-	M
	<i>Sibynomorphus mikanii</i> (Schlegel, 1837)	-	I
	<i>Sibynomorphus neuwiedi</i> (Ihering, 1911)	●	-
	<i>Thamnodynastes nattereri</i> (Mikan, 1828)	●	-
	<i>Tomodon dorsatus</i> Duméril, Bibron & Duméril, 1854	●	-
	<i>Tropidodryas striaticeps</i> (Cope, 1869)	-	Z
	<i>Xenodon neuwiedii</i> Günther, 1863	●	I; M
Elapidae	<i>Micrurus corallinus</i> (Merrem, 1820)	●	I; M; Z
Tropidophiidae	<i>Tropidophis paucisquamis</i> (Müller, 1901)	●	Z
Viperidae	<i>Bothropoides jararaca</i> (Wied, 1824)	●	M
	<i>Bothrops jararacussu</i> Lacerda, 1884	●	I; M
	<i>Crotalus durissus terrificus</i> (Laurenti, 1768)	-	I
<b>Ordem Testudines</b>			
Chelidae	<i>Hydromedusa tectifera</i> Cope, 1869	●	-

\*Species classified as Data Deficient (DD) according to the list of endangered species in São Paulo State (São Paulo 2008).

**Table 3.** Altitudinal gradient, type of environment, and locality where amphibians were sampled in the PETAR, between October and December 2009. Type of environment (open): bromeliad at forest edge (brfe); creek (cr); creek at forest edge (crfe); dirt road (dr); lake (l); lake at forest edge (lfe); swamp (sw); swamp at forest edge (swfe); temporary pond on the road (tpr). Type of environment (forest): bamboo thicket (bt); bromeliad (br); bromeliad at riparian stream (brs); cave (ca); inside forest (f); lake (l); leaf litter inside the forest (llf); leaf litter at riparian creek (llrc); leaf litter at riparian stream (llrs); riparian creek (rc); riparian stream (rs); rocks (r); stream (s); temporary pond inside the forest (tpf). Locality (centers and stations of the PETAR): Areado (A); Bulha d'água and Capinzal (B); Caboclos (C); Casa de Pedra (CP); Ouro Grosso (OG); Santana (S).

Species	Altitudinal gradient (m)	Type of environment		Locality (centers and stations)		
		Open	Forest	(850 - 980 m)	(500 - 730 m)	(130 - 460 m)
<i>B. hylax</i>	246 - 851	swfe	ca; f; rs	A	B; C	S
<i>D. elegans</i>	190 - 891	sw		A	C	OG
<i>D. microps</i>	190 - 902	sw	l	A	B; C	OG; S
<i>D. minutus</i>	134 - 918	crfe; sw	l; rc; rs	A	B; C	CP; OG
<i>H. bischoffi</i>	155 - 901	crfe; sw; swfe	f; l; rs	A	B; C	CP; OG; S
<i>H. faber</i>	141 - 891	crfe; sw	f; l; rs	A	B; C	CP; OG
<i>H. prasinus</i>	141 - 900	l; sw		A	B	CP
<i>I. guentheri</i>	261 - 911		llf	A	B; C	CP; S
<i>L. latrans</i>	190 - 896	dr; l; sw		A		OG
<i>L. notoaktites</i>	190 - 904	cr; dr; sw	llf; llrs	A	B; C	OG; S
<i>P. distincta</i>	134 - 918	crfe; swfe	f; rs	A		CP
<i>P. cuvieri</i>	190 - 900	dr; sw		A	B	OG
<i>P. boiei</i>	454 - 896	dr; sw	llf; llrc; llrs	A	B; C	CP
<i>R. icterica</i>	134 - 900	dr; sw	ca; llf	A	B; C	CP; S
<i>S. perereca</i>	190 - 918	sw	l; rc; rs	A	C	OG
<i>S. rizibilis</i>	190 - 902	sw	f; l	A	C	OG
<i>Scinax</i> sp. (gr. <i>catharinae</i> )	246 - 905	swfe	f	A	C	S
<i>A. callipygius</i>	606 - 918	swfe	f; rs	A	C	
<i>A. perviridis</i>	721 - 891	sw		A	B	
<i>B. circumdata</i>	620 - 906		f; rs	A	B; C	
<i>D. seniculus</i>	610 - 883	sw	l	A	C	
<i>H. pardalis</i>	569 - 894	lfe; sw		A	B; C	
<i>I. parva</i>	611 - 911		llf	A	C	
<i>P. olfersii</i>	569 - 911	sw	l; llf; llrs	A	B; C	
<i>S. crospeospilus</i>	566 - 980	sw	bt	A	C	
<i>A. cf. ehrhardti</i>	454 - 614		f		B	CP
<i>C. eleutherodactylus</i>	216 - 606		ca; r		C	CP; OG; S
<i>D. werneri</i>	190 - 569	sw			C	OG
<i>F. fissilis</i>	287 - 611		br; brs		B; C	CP; OG; S
<i>H. heyeri</i>	287 - 622		ca; s		C	S
<i>L. cf. marmoratus</i>	280 - 697		llf; llrs		B; C	CP; S
<i>P. spiniger</i>	190 - 620	sw; swfe; tpr			B; C	CP; OG
<i>R. ornata</i>	216 - 620	sw; tpr	llf		B; C	OG
<i>S. cf. perpusilus</i>	246 - 697	brfe	br; brs		B; C	S
<i>V. uranoscopa</i>	246 - 620		rs		B	S
<i>F. ohausi</i>	905		f	A		
<i>L. mystacinus</i>	890	sw		A		

\*Species that occurred at altitudes below the predominant gradient of altitudes sampled at Núcleo Caboclos



Table 3. Continued...

Species	Altitudinal gradient (m)	Type of environment		Locality (centers and stations)		
		Open	Forest	(850 - 980 m)	(500 - 730 m)	(130 - 460 m)
<i>Paratelmatobius</i> sp. (aff. <i>cardosoi</i> )	915		tpf	A		
<i>S. berthae</i>	894	sw		A		
<i>S. caramaschii</i>	891 - 918	sw	rs	A		
<i>H. cardosoi</i>	602 - 611		ca; s		C	
<i>Ischnocnema</i> sp. (aff. <i>bolbodactyla</i> )	602 - 611		llf		C	
<i>C. leucosticta</i> *	408		llf		C	
<i>C. caramaschii</i>	265		s			S
<i>C. lutzorum</i>	265		s			S
<i>H. binotatus</i>	454		llf			CP
<i>H. albomarginatus</i>	190	sw				OG
<i>M. alipioi</i> *	277 - 328		llf		C	S
<i>P. maculiventris</i>	326		tpf			S
<i>S. surdus</i>	190 - 198	sw	rs			OG

\*Species that occurred at altitudes below the predominant gradient of altitudes sampled at Núcleo Caboclos

**Table 4.** Altitudinal gradient, type of environment, and locality where the reptiles were sampled in the PETAR, between October and December 2009. Type of environment (open): dirt road (dr); forest edge (fe); swamp (sw). Type of environment (forest): inside forest (f); lake (l); leaf litter inside the forest (llf); riparian stream (rs). Locality (centers and stations of the PETAR): Areado (A); Bulha d'água and Capinzal (B); Caboclos (C); Casa de Pedra (CP); Ouro Grosso (OG); Santana (S).

Species	Altitudinal gradient (m)	Type of environment		Locality (centers and stations)		
		Open	Forest	(850 - 980 m)	(500 - 730 m)	(130 - 460 m)
<i>B. jararaca</i>	261 - 900	dr; sw	f; llf; rs	A	C	OG; S
<i>T. dorsatus</i>	216 - 881	fe	llf	A		OG; S
<i>S. neuwiedi</i>	603 - 896	dr	llf	A	C	
<i>T. paucisquamis</i>	505 - 902		l; llf	A	C	
<i>E. iheringii</i>	530 - 915		f	A	C	
<i>B. jararacussu</i>	141 - 615	dr; sw	llf		C	CP; S
<i>M. corallinus</i>	391 - 611	fe	llf		C	CP
<i>D. alternans</i>	883		f	A		
<i>H. tectifera</i>	896	sw		A		
<i>T. nattereri</i>	857 - 890	sw		A		
<i>C. bicarinatus</i>	614		f		C	
<i>L. miliaris</i>	566	sw			C	
<i>O. striatus</i>	620	fe			B	
<i>A. microcephala</i>	377	dr				S
<i>H. mabouia</i>	246 - 283	fe	f			S
<i>O. clathratus</i>	243		llf			S
<i>P. cordylinum</i>	283 - 293	fe	f			S
<i>champsionotus</i>						
<i>S. pullatus</i>	281 - 380	dr	llf			S
<i>T. merianae</i>	131 - 266	dr	llf			S
<i>X. neuwiedii</i>	312		llf			S



**Figure 4.** Caves sampled at the Parque Estadual Turístico do Alto Ribeira (PETAR), Iporanga municipality, São Paulo State, Brazil: Casa de Pedra cave, Núcleo Casa de Pedra (a); Morro Preto cave, Núcleo Santana (b); Couto cave, Núcleo Santana (c). Amphibian species observed in caves at the PETAR: *Bokermannohyla hylax* inside Chapéu Mirim II cave, Núcleo Caboclos (d); *Cycloramphus eleutherodactylus* inside Cafezal cave, Núcleo Santana (e); *Hylodes cardosoi* inside Chapéu Mirim I cave, Núcleo Caboclos (f). Photos: Fernanda C. Centeno (a, c, e); Rafael P. Bovo (d, f); Thais H. Condez (b).

## Final Comments

The Parque Estadual Turístico do Alto Ribeira is characterized for harboring a great diversity of amphibians and reptiles (91 species), emphasizing the need for maintaining the natural characteristics of this important Atlantic Forest remnant in the South of São Paulo State. This diversity can be attributed to the existence of a large variety of habitats and microhabitats such as the many aquatic sites used by various species of anuran amphibians. Moreover, the PETAR features a large altitudinal gradient (80 - 1,160 m elevation), which confers a high degree of climatic, geological and hydrological heterogeneity

to the area that is, to some extent, also responsible for the increased richness of the local herpetofauna. In evolutionary terms, this environmental heterogeneity, which is a reflection of the different historical processes that occurred across the Atlantic Forest, has led to the isolation among populations and consequently to the existence of high endemism and high rates of speciation within the assemblages found in this biome (Carnaval et al. 2009).

Considering that the Atlantic Forest biome has been reduced to less than 12% of its original extent (Ribeiro et al. 2009) and only a small percentage of its original forest cover (1%) is protected (Wilson 1997), it is essential to keep up the maintenance and management

of these scarce remnants in São Paulo State, such as the PETAR and other protected areas that make up the Vale do Ribeira, Serra do Paranapiacaba and Serra do Mar forest continuum.

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## Appendix 1

**Appendix 1.** Amphibian and reptile species collected at the PETAR (Apiá and Iporanga municipalities, São Paulo state, Brazil) and deposited in the Coleção de Anfíbios CFBH, Departamento de Zoologia, Instituto de Biociências, Universidade Estadual Paulista “Júlio de Mesquita Filho”, campus de Rio Claro, São Paulo State, Coleção Herpetológica “Alphonse Richard Hoge”, Instituto Butantan (IBSP and CRIB), São Paulo State and Coleção Herpetológica do Museu de Zoologia da Universidade de São Paulo, São Paulo State (MZUSP).

*Aplastodiscus callipygius* (CFBH 25591, 25628); *Aplastodiscus* cf. *ehrharti* (CFBH 25647); *Aplastodiscus perviridis* (CFBH 25648, 25592); *Bokermannohyla circumdata* (CFBH 25649-25651, 26707, 26757, 26773, 26774); *Bokermannohyla hylax* (CFBH 25652, 25593, 25675, 26723, 26724, 26775-26779); *Chiasmocleis leucosticta* (CFBH 25629); *Crossodactylus caramaschii* (CFBH 25676, 25677); *Cycloramphus eleutherodactylus* (CFBH 25678-25680); *Dendropsophus elegans* (CFBH 25597, 25598, 26708-26710, 26743-26747); *Dendropsophus microps* (CFBH 25594-25596, 26725, 26742, 26781-26785); *Dendropsophus minutus* (CFBH 25653, 25654, 25599, 26711-26714, 26734, 26735, 26790); *Dendropsophus seniculus* (CFBH 25600, 25630, 25631); *Dendropsophus werneri* (CFBH 25688-25690, 26750, 26791-26794); *Flectonotus fissilis* (CFBH 25632-25634); *Flectonotus ohausi* (CFBH 25601); *Haddadus binotatus* (CFBH 25698, 25699); *Hylodes cardosoi* (CFBH 25635-25637, 26795, 26796); *Hylodes heyeri* (CFBH 25638, 25681, 25682, 26797-26803); *Hypsiboas albomarginatus* (CFBH 25691); *Hypsiboas bischoffi* (CFBH 25655-25657, 26722, 26736, 26765-26769); *Hypsiboas faber* (CFBH 25658, 25602, 25692, 26751, 26752, 26808); *Hypsiboas pardalis* (CFBH 25659, 25603); *Hypsiboas prasinus* (CFBH 25660, 25604, 25605, 26715); *Ischnocnema guenterii* (CFBH 25661, 25606, 25607, 26716, 26726, 26727, 26737, 26809-26811); *Ischnocnema parva* (CFBH 25608-25610, 26717, 26812); *Ischnocnema* sp. (aff. *bolbodactyla*) (CFBH 25639-25641); *Leptodactylus* cf. *marmoratus* (CFBH 25662, 25663, 26733, 26738, 26739, 26770, 26771, 26813, 26814); *Leptodactylus latrans* (CFBH 25613-25615); *Leptodactylus notoaktites* (CFBH 25611, 25612, 25664, 26718, 26728, 26815-26818); *Macrogenioglotus alipioi* (CFBH 25683, 25642); *Paratelmatobius* sp. (aff. *cardosoi*) (CFBH 25616); *Phyllomedusa distincta* (CFBH 25617, 25618, 25700, 26740); *Physalaemus cuvieri* (CFBH 25619, 25665, 25666); *Physalaemus maculiventris* (CFBH 25684, 25685, 26729-26732); *Physalaemus olfersii* (CFBH 25620, 25667, 26719, 26772, 26819); *Physalaemus spiniger* (CFBH 25668, 25701, 26741, 26820); *Proceratophrys boiei* (CFBH 25643, 25669, 25702, 26821-26825); *Rhinella icterica* (CFBH 25621, 25670, 25671, 26826, 26827); *Rhinella ornata* (CFBH 25672, 25673, 25693); *Scinax berthae* (CFBH 25703); *Scinax* cf. *perpusillus* (CFBH 25644, 25674); *Scinax crospedospilus* (CFBH 25622, 25645); *Scinax perereca* (CFBH 25623, 25694, 26720, 26721, 26753, 26828, 26829); *Scinax rizibilis* (CFBH 25624-25626, 26754, 26755, 26830, 26831); *Scinax* sp. (gr. *catharinae*) (CFBH 25646, 25686); *Sphaenorhynchus caramaschii* (CFBH 25627); *Sphaenorhynchus surdus* (CFBH 25695-25697, 26756); *Vitreorana uranoscopa* (CFBH 25687); *Bothropoides jararaca* (IBSP 77840-77849); *Bothrops jararacussu* (IBSP 77851-77853); *Chironius bicarinatus* (IBSP 77855); *Dipsas alternans* (IBSP 77856); *Enyalius iheringii* (CRIB 0717, MZUSP 100004-100009); *Hemidactylus mabouia* (CRIB 0718); *Hydromedusa tectifera* (CRIB 0716); *Erythrolamprus miliaris* (IBSP 77857); *Micrurus corallinus* (IBSP 77854); *Ophiodes striatus* (CRIB 0719, MZUSP 100010); *Oxyrhopus clathratus* (IBSP 77858); *Placosoma cordylinum champsonotus* (CRIB 0720, MZUSP 100011); *Sibynomorphus neuwiedi* (IBSP 77859, 77860); *Spilotes pullatus* (IBSP 77861, 77862); *Thamnodynastes nattereri* (IBSP 77864-77866); *Tomodon dorsatus* (IBSP 77867-77869); *Tropidophis paucisquamis* (IBSP 77870-77874); *Xenodon neuwiedii* (IBSP 77863).