Biota Neotropica 16(1): e20150093, 2016
www.scielo.br/bn

biotaneotropica
ISSN 1676-0611 (online edition)

inventory

Amphibians of varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil

Werther Pereira Ramalho[1,2,5], Murilo Sousa Andrade[3], Lucicléia Railene Assis de Matos[4] &

Lisandro Juno Soares Vieira[1]

[1]*Universidade Federal do Acre, Programa de Pós-Graduação em Ecologia e Manejo de Recursos Naturais, Rio Branco, AC, Brazil.*
[2]*Instituto Boitatá de Etnobiologia e Conservação da Fauna, Goiânia, GO, Brazil.*
[3]*Universidade Federal de Goiás, Instituto de Ciências Biológicas Laboratório de Ecologia de Comunidades, Goiânia, GO, Brazil.*
[4]*Universidade Federal do Acre, Laboratório de Herpetologia, Rio Branco, AC, Brazil.*
[5]*Corresponding author: Werther Pereira Ramalho, e-mail: wertherpereira@hotmail.com*

RAMALHO, W.P., ANDRADE, M.S., MATOS, L.R.A., VIEIRA, L.J.S. **Amphibians of varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil.** Biota Neotropica. 16(1): e20150093. http://dx.doi.org/10.1590/1676-0611-BN-2015-0093

Abstract: Despite the historical knowledge on amphibians of the Purus River basin, basic information on assemblages is fragmented, with gaps in knowledge existing at various scales, which limits conservation strategies. This study provides information on the composition, richness and abundance of the amphibian fauna in varzea environments and floating meadows of the oxbow lakes of the Middle Purus River between the Boca do Acre and Pauiní municipalities, Amazonas, Brazil. We sampled six oxbow lakes using forty-seven 200-meter transects, distributed among the "floating meadows," "high varzea" and "low varzea," from April to January 2014. We recorded 59 species, with the family Hylidae being predominant. This amphibian fauna represents approximately 19% of the species known for the Amazon, 28% for Amazonas State and 45% of the species recorded so far in the Purus River, increasing the richness of the basin to 132 species. Eight species were considered rare, and 29 are endemic to the Amazon. This study adds to the knowledge on the amphibian species of the Amazonian lowlands, including the expansion of known distributions, as well as increases the knowledge of several species that are locally rare, endemic and/or that are data deficient regarding distribution and ecology.
Keywords: *Amazon, floodplain, flood pulse, diversity, conservation.*

RAMALHO, W.P., ANDRADE, M.S., MATOS, L.R.A., VIEIRA, L.J.S. **Anfíbios de ambientes de várzea e bancos de macrófitas dos lagos de meandros do médio rio Purus, Amazonas, Brasil.** Biota Neotropica. 16(1): e20150093. http://dx.doi.org/10.1590/1676-0611-BN-2015-0093

Resumo: Apesar do histórico conhecimento sobre anfíbios ao longo da bacia do rio Purus, informações básicas sobre as taxocenoses encontram-se fragmentadas, formando lacunas no conhecimento do grupo em diversas escalas e restringindo estratégias de conservação. Este estudo apresenta a composição, a riqueza e a abundância da fauna de anfíbios em ambientes de várzea e bancos de macrófitas de lagos de meandro do médio Rio Purus, entre os municípios de Boca do Acre e Pauiní, Amazonas, Brasil. Conduzimos amostragens em seis lagos de meandro, através de 47 transectos de 200 metros, distribuídos entre os ambientes "banco de macrófitas", "várzea alta" e "várzea baixa", entre abril de 2013 e janeiro de 2014. Registramos 59 espécies, com predomínio de espécies da família Hylidae. Essa fauna de anfíbios representa aproximadamente 19% das espécies conhecidas para a Amazônia, 28% para o estado do Amazonas e 45% do registrado até o momento para o rio Purus, elevando a riqueza da bacia para 132 espécies. Oito espécies foram consideradas raras e 29 são endêmicas da Amazônia. Este estudo contribui para o conhecimento das espécies de anfíbios das terras baixas na Amazônia, incluindo a ampliação da distribuição e aumento do conhecimento sobre diversas espécies localmente raras, endêmicas e/ou com deficiência de dados sobre distribuição e ecologia.
Palavras-chave: *Amazônia, planície de inundação, pulso de inundação, diversidade, conservação.*

Introduction

The complex evolutionary history, intricate topography and climate of South America have produced a rich and highly diverse herpetofauna (Duellman 1979, 1999). There are more than 1,026 amphibian species in Brazil (Segalla et al. 2014), and at least 315 anurans, 16 gymnophionans and five caudates are known in the Brazilian Amazon, representing approximately one-third of the total of amphibians recorded for the country (Avila-Pires et al. 2007, Hoogmoed 2012, Toledo & Batista 2012, Neckel-Oliveira et al. 2013). The state of Amazonas, extending approximately 1,570,745.68 km^2, currently has 212 species of anurans (Toledo & Batista 2012, Hoogmoed 2013), nine caecilians and one caudate (Hoogmoed 2013). Although it represents the third highest richness of anurans among the Brazilian states (Toledo & Batista 2012), this biodiversity can be considered underestimated in number and complexity when considering the political limits, given the existence of a large number of cryptic species (Funk et al. 2011), several sampling gaps due to the concentration of researches in a few areas (Azevedo-Ramos & Galatti 2002) and the scarcity of studies that use appropriate methods for the record of amphibians belonging to different niches (Lynch, 2005). However , the number of recorded species has increased rapidly, with frequent descriptions of new species of anurans (e.g., Nunes et al. 2012, Simões et al. 2013, Peloso et al. 2014, Rojas et al. 2014) and amphibians of the orders Gymnophiona (Maciel & Hoogmoed 2011) and Caudata (Brcko et al. 2013) for the biome.

There are large, virtually unknown areas in the Amazon that possibly have never been sampled. Localities in the west of the biome, for example, seem to have higher amphibian diversity than other localities (Duellman 1999, Azevedo-Ramos & Galatti 2002). This information has been confirmed by the high number of species recorded in several studies conducted in recent years in the western region of the biome (França & Venâncio 2010, Ilha & Dixo 2010, Bernarde et al. 2011, Pantoja & Fraga 2012, Bernarde et al. 2013, Prudente et al. 2013, Waldez et al. 2013). However, few studies focus on the importance of varzea environments (Pantoja & Fraga 2012, Bernarde et al. 2013, Waldez et al. 2013), and no studies have systematically sampled amphibian assemblages in abandoned oxbow lakes and in floating meadows. The available studies on amphibians in floating meadows were conducted in the region of Manaus, in the lower Solimões River varzea and Janauari Lake (Hödl 1977, Schiesari et al. 2003), in the Pará (Suriname), Negro (Bolivia) and Curuá (Brazil) rivers (Hoogmoed 1993) and, recently, in the Samiria River basin, Peruvian Amazon (Upton et al. 2014).

Heyer (1976) conducted the first studies on the amphibian fauna of the Purus River region during two expeditions in the western Amazon. Since then, a number of inventories have been conducted in this river basin, from its highest portion in the Peruvian Amazon (Rodríguez 2003), to the middle portion (França & Venâncio 2010), down to its confluence with the Solimões River (Heyer 1977, Gordo 2003, Waldez et al. 2013), demonstrating a surprisingly high amphibian richness compared to other areas of the Brazilian (Gordo 2003) and Peruvian Amazon (Rodríguez 2003). Such studies indicate the need for priority conservation efforts (Azevedo-Ramos & Galatti 2002, França & Venâncio 2010). Despite the existing knowledge on amphibians of the Purus River basin, basic information on the composition and richness and abundance patterns of the assemblages is fragmented, with gaps remaining in the knowledge on amphibians at various scales, thereby limiting conservation efforts. In this study, we present the composition, richness and abundance of the amphibian fauna in varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil.

Materials and Methods

1. Study area

The study area is located in six oxbow lakes situated along the middle Purus River varzea between the municipalities of Boca do Acre and Pauní, Amazonas State (08°51'18"S and 67°44'34"W; 08°19'33"S and 67°20'51"W) (Figure 1). The Purus River basin is located in the southwestern Amazon, and the Purus River is one of the major tributaries of the Solimões-Amazon system, with its headwaters in the hills of the Fitzcarrald Arch, located in lowland forests in the states of Ucayali and Madre de Dios, Peru. The Purus River is one of the longest rivers in South America, running approximately 3,380 km, entering Brazil in the state of Acre, with its mouth in the Solimões River (Amazonas State) (Ríos-Villamizar et al. 2011). The Purus is classified as a white water river *sensu* Sioli (1991), meanders, and has water rich in Andean sediments (Ríos-Villamizar et al. 2011). The region has a monsoon-type tropical rainy climate (Am following Köppen; Brazil 1976). Rainfall in the Purus River basin has an annual cycle marked by a rainy season (between November and March) and a dry season (between May and September). April and October are considered transition months (Silva et al. 2008).

2. Data collection

Data collection took place between April 2013 and January 2014 for a total of 45 sampling days; the sampling period consisted of the transition between the rainy and dry seasons (6 to 20 April), beginning of the dry season (1 to 17 October) and the rainy season (4 to 20 January). We selected six oxbow lakes along approximately 200 km of river. Three lakes are located on the right bank of the Purus (Santana, Bom Lugar and Flor do Ouro) and three are located on the left bank (Cametá, Verde and Guamá). We sampled forty-seven 200-meter long transects in the lakes in each campaign, consisting of the "floating meadows" environments on the inside of the lakes and in the varzeas. The varzea environments were classified according to Junk et al. (1989) as follows: (1) high varzea – highest land segment of the plain, free from annual floods but occasionally flooded in larger floods (further from the riverbed); and (2) low flooplain – located in the inner portions of the lakes, between the lakes and the river, flooded during intermediate floods (Table 1). However, comparing vegetation types was not the objective of this study. We established a minimum distance of 1,000 meters between transects in the same environment type in each lake. We standardized samplings into nine transects, three in floating meadows, three in high varzea and three in low varzea in the Bom Lugar, Cametá, Flor do Ouro, Guamá and Santana lakes. Standardization was not possible at Lake Verde because the high sediment accumulation prevented movement inside of the lake; therefore, only one transect in the high varzea and one in the low varzea were sampled at Lake Verde (Table 1).

We sampled each transect during the day (1:00-5:00 p.m.) and night (7:00-11:00 p.m.), recording the animals through visual and acoustic searches limited by distance and time (200 meters in

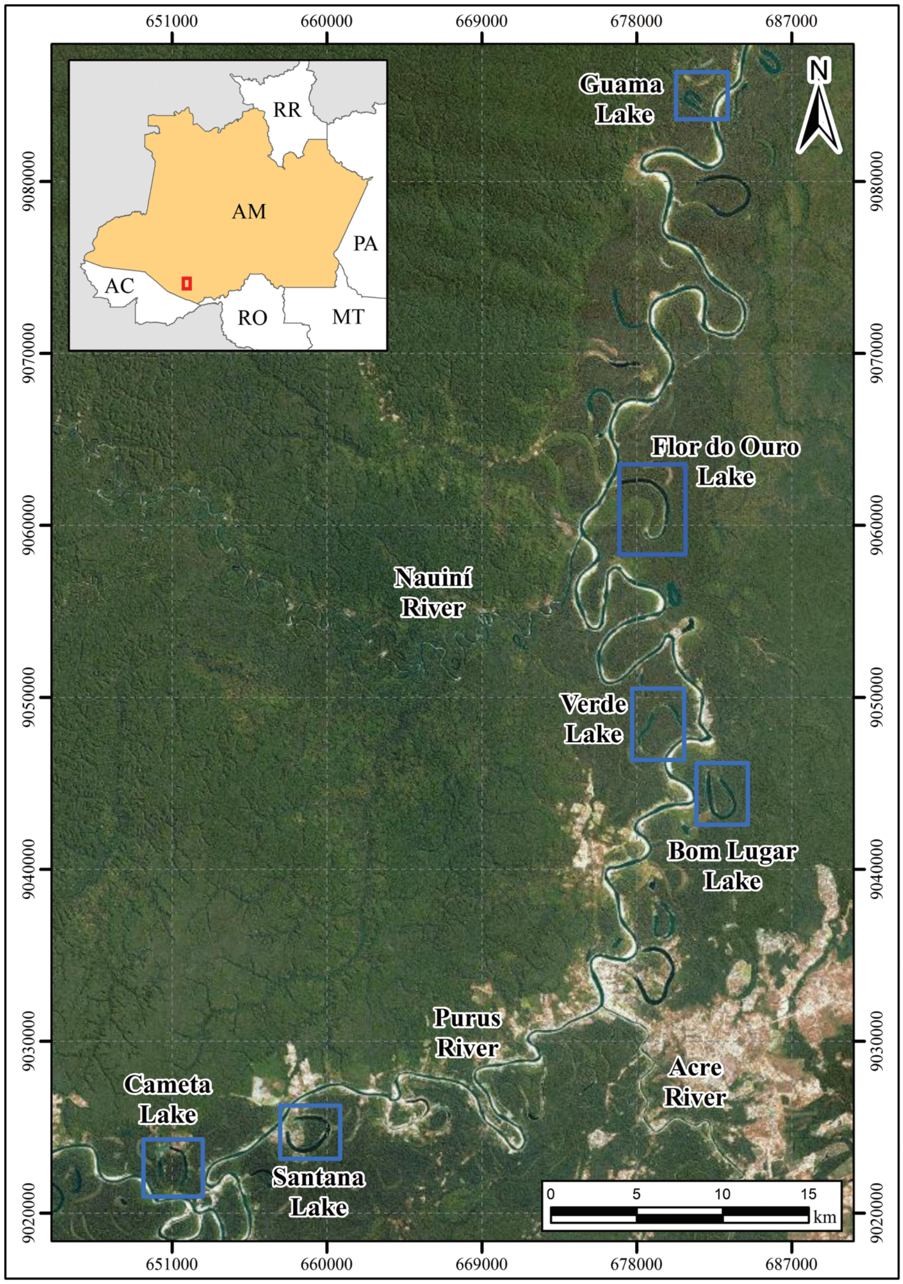

Figure 1. Location of the six oxbow lakes studied in the Middle Purus River, Amazonas, Brazil.

one hour), using a modified form of a visual time-constrained search (Crump & Scott Jr 1994, von May et al. 2010). Each transect in the varzea environments was sampled by two people, walking side-by-side, at an approximately constant speed, recording the amphibians on both sides of the trail (Seber 1986, Rödel & Ernst 2004). Whenever necessary, such as during samplings conducted along the lakeshore, special attention was given to the presence of aquatic macrophytes, and the transect was stratified (stratified random sampling) (Seber 1986).

All individuals observed and/or calling (observed and/or not observed) were identified and counted. We account all individuals in calls activity in approximately 20 meters along the transect. The collected individuals were recorded, placed in plastic bags and transported to the laboratory to be photographed and measured. The nomenclature used followed Frost (2015). Voucher specimens were anesthetized and euthanized with 5% xylocaine, fixed in 10% formalin (one part 37% formalin and nine parts water) and preserved in 70% alcohol. Then, specimens were deposited in the herpetological collections of the Federal University of Acre (Universidade Federal do Acre - UFAC), Rio Branco, Acre State, Brazil, and Federal University of Goiás (Universidade Federal de Goiás - ZUFG), Goiânia, Goiás State, Brazil (sampling permit ICMBio #37322-5) (Appendix 1).

3. Data analysis

Because species richness depends not only on the characteristics of the area but also on the sampling effort, we built a species rarefaction curve (Santos 2006) to analyze amphibian richness according to increased sampling effort. Species richness

Table 1. Transects sampled in six oxbow lakes of the Middle Purus River, Amazonas, Brazil.

Transect	Lake	Environment	Geographic coordinates
1	Bom Lugar	Floating meadows	08°38'09.92", 67°20'14.00"
2	Bom Lugar	Floating meadows	08°39'11.43", 67°20'10.85"
3	Bom Lugar	Floating meadows	08°37'53.37", 67°20'45.24"
4	Bom Lugar	High varzea	08°38'10.20", 67°20'54.90"
5	Bom Lugar	High varzea	08°39'18.30", 67°20'14.80"
6	Bom Lugar	High varzea	08°37'59.80", 67°20'07.50"
7	Bom Lugar	Low varzea	08°37'57.70", 67°20'35.10"
8	Bom Lugar	Low varzea	08°39'03.70", 67°20'09.50"
9	Bom Lugar	Low varzea	08°38'18.60", 67°20'15.20"
10	Cametá	Floating meadows	08°50'53.20", 67°37'26.50"
11	Cametá	Floating meadows	08°49'49.40", 67°37'30.80"
12	Cametá	Floating meadows	08°50'34.41", 67°38'03.33"
13	Cametá	High varzea	08°50'31.40", 67°37'05.40"
14	Cametá	High varzea	08°50'29.30", 67°37'03.50"
15	Cametá	High varzea	08°50'04.60", 67°38'11.00"
16	Cametá	Low varzea	08°50'44.31", 67°37'31.09"
17	Cametá	Low varzea	08°50'00.02", 67°37'22.40"
18	Cametá	Low varzea	08°50'05.80", 67°38'00.00"
19	Flor do Ouro	Floating meadows	08°30'12.12", 67°22'44.74"
20	Flor do Ouro	Floating meadows	08°29'21.43", 67°22'07.35"
21	Flor do Ouro	Floating meadows	08°28'39.35", 67°23'33.14"
22	Flor do Ouro	High varzea	08°30'24.60", 67°22'14.50"
23	Flor do Ouro	High varzea	08°29'09.00", 67°22'01.60"
24	Flor do Ouro	High varzea	08°28'29.60", 67°23'24.50"
25	Flor do Ouro	Low varzea	08°30'16.40", 67°22'33.50"
26	Flor do Ouro	Low varzea	08°29'17.50", 67°22'10.80"
27	Flor do Ouro	Low varzea	08°28'42.70", 67°23'20.60"
28	Guamá	Floating meadows	08°16'43.74", 67°21'02.74"
29	Guamá	Floating meadows	08°16'28.09", 67°21'30.17"
30	Guamá	Floating meadows	08°16'57.96", 67°21'03.96"
31	Guamá	High varzea	08°16'36.50", 67°21'00.30"
32	Guamá	High varzea	08°16'14.60", 67°21'37.90"
33	Guamá	High varzea	08°16'53.50", 67°21'23.10"
34	Guamá	Low varzea	08°16'46.80", 67°21'08.10"
35	Guamá	Low varzea	08°16'33.20", 67°21'19.59"
36	Guamá	Low varzea	08°16'46.40", 67°21'10.80"
37	Santana	Floating meadows	08°49'17.53", 67°34'01.56"
38	Santana	Floating meadows	08°49'22.20", 67°32'48.60"
39	Santana	Floating meadows	08°48'45.42", 67°33'45.03"
40	Santana	High varzea	08°49'26.89", 67°34'09.81"
41	Santana	High varzea	08°49'10.60", 67°32'31.45"
42	Santana	High varzea	08°48'30.55", 67°33'13.93"
43	Santana	Low varzea	08°49'23.90", 67°33'47.80"
44	Santana	Low varzea	08°48'59.33", 67°32'53.33"
45	Santana	Low varzea	08°48'54.16", 67°33'27.03"
46	Verde	High varzea	08°35'41.50", 67°21'49.30"
47	Verde	Low varzea	08°35'48.60", 67°21'58.00"

was estimated by extrapolating the species rarefaction curve, using the mean of the four values generated by the abundance-based richness estimators (ACE, Chao 1, Jack-knife 1 and Bootstrap) (Colwell et al. 2012). In this case, using mean values minimizes variations in the performance of certain estimators, usually related to differences in the sampling, diversity and equitability of assemblages (O'Hara 2005, Waldez et al. 2013). The species accumulation and total estimated richness curves were obtained from 1,000 randomizations using the software EstimateS 9.1.0 (Colwell 2013).

The dominances were represented by a Dominance Component curve or Whittaker Diagram, obtained by ranking species, starting with the most abundant, along the x-axis and the logarithm abundances on the y-axis. Rare species were those represented by a single individual (singletons), and the same number of species in the upper end of the abundance

http://dx.doi.org/10.1590/1676-0611-BN-2015-0093

distribution were used to define species as common. The other species were classified as having intermediate abundance. The pattern of the species abundance distribution was fitted to the logarithmic, geometric, lognormal and broken-stick models. Model fit was assessed by the chi square adherence test (Magurran 2011) using the software PAST version 2.17c (Hammer et al. 2001).

The conservation status of each species was based on the Red List of Threatened Species of the International Union for Conservation of Nature (IUCN 2015). The endemism and association of species with other biomes was based on Toledo & Batista (2012). Species not listed in those sources were evaluated based on their respective descriptions and taxonomic revisions, such as *Dendropsophus joannae* (Köhler & Lötters 2001), *Typhlonectes compressicauda* (Maciel & Hoogmoed 2011), *Elachistocleis muiraquitan* (Nunes-de-Almeida & Toledo 2012) and *Chiasmocleis royi* (Peloso et al. 2014).

Results

We recorded 8,732 amphibian specimens, distributed across three orders, 10 families, 22 genera and 59 species in the oxbow lakes of the varzea of the Middle Purus River. The order Anura was the most rich (57 species), and the families Hylidae (31 species), Leptodactylidae (nine species) and Microhylidae (five species) were the most speciose. Ceratophrydae and Dendrobatidae had only one species each. The orders Caudata and Gymnophiona were represented by only one species, the salamander *Bolitoglossa caldwellae* and the aquatic caecilian *Typhlonectes compressicauda,* respectively (Table 2; Figures 4 to 7).

The species rarefaction curve, considering all samples, indicated a rapid increase in species richness with the increase in the number of transects sampled and a trend toward stabilization in the last samplings, with the observed richness representing 89.82% of the expected richness for the region considering the mean of the estimators (62.34 ± 3.03 species). The clear trend toward stabilization of the curves, as shown by the considerable overlap of the confidence intervals of the observed and estimated richness, indicates that the sampling method used was appropriate for determining the local richness (Figure 2).

The highest richness was found in Lake Flor do Ouro (44 species), followed by Lake Bom Lugar (41 species), Cametá (38 species), Santana (35 species), Verde (30 species) and Guamá (26 species). Twelve species (*Dendropsophus brevifrons, Dendropsophus triangulum, Hypsiboas fasciatus, Hypsiboas punctatus, Osteocephalus taurinus, Scarthyla goinorum, Sphaenorhynchus dorisae, Sphaenorhynchus lacteus, Adenomera hylaedactyla, Leptodactylus leptodactyloides, Leptodactylus petersii* and *Hamptophryne boliviana*) occurred in all lakes and were considered constant throughout the Middle Purus River. Six species were recorded only at Lake Guamá (*Pristimantis lacrimosus, Ameerega hahneli, Dendropsophus* gr. *minutus, Hypsiboas boans, Leptodactylus knudseni* and *Bolitoglossa caldwellae*), three at Bom Lugar (*Rhaebo guttatus, Chiasmocleis bassleri* and *Typhlonectes compressicauda)*, three at Cametá (*Allobates gasconi, Hypsiboas microderma* and *Leptodactylus mystaceus*) and two at Flor do Ouro (*Ceratophrys cornuta* and *Leptodactylus pentadactylus*). Lakes Santana and Verde had no exclusive species when compared to the other lakes (Table 2).

Eight species (*Ceratophrys cornuta, Chiasmocleis bassleri, Dendropsophus* gr. *minutus, Hypsiboas microderma, Leptodactylus mystaceus, Leptodactylus pentadactylus, Rhaebo guttatus* and *Typhlonectes compressicauda)* were represented by only one individual and were considered rare in the studied environments. Applying the number of singletons to the other end of the abundance distribution, eight species were defined as common, including *Dendropsophus triangulum* (890 individuals), *Sphaenorhynchus lacteus* (838 individuals), *Scarthyla goinorum* (731 individuals), *Hypsiboas punctatus* (715 individuals), *Leptodactylus leptodactyloides* (660 individuals), *Hypsiboas fasciatus* (565 individuals), *Adenomera hylaedactyla* (509 individuals) and *Sphaenorhynchus dorisae* (480 individuals). The 43 remaining species were classified as having intermediary abundance (Table 2). The distribution of abundances fit a lognormal model ($\chi^2 = 13.40$, $p = 0.06$, Figure 3).

Twenty-nine species found in this study are endemic to the Amazon, 17 occur in the Amazon and Cerrado (Brazilian savanna) biomes, and 10 have a generalized distribution, occurring in more than two biomes. The distribution or status of three species (*Dendropsophus* gr. *minutus*, *Elachistocleis* sp. and *Scinax* gr. *ruber*) were not evaluated due to uncertainties in identification. According to the IUCN Red List of Threatened Species (IUCN 2015), none of the species found are listed in any threat category, two (*Allobates gasconi* and *Dendropsophus joannae*) are considered data deficient, and the conservation status of three (*Bolitoglossa caldwellae, Chiasmocleis royi* and *Elachistocleis muiraquitan)* has not been evaluated yet (Table 2).

Discussion

The amphibian richness recorded for the oxbow lakes of the varzea of the Middle Purus River corresponds to approximately 19% of the species known for the Amazon biome (Ávila-Pires et al. 2007, Toledo & Batista 2012, Hoogmoed 2013, Neckel-Oliveira et al. 2013), 28% for the Amazonas State (Toledo & Batista 2012) and 45% of the species known for the Purus River basin, from the upper portions in the Peruvian Amazon to its mouth in the Solimões River (Heyer 1977, Gordo 2003, Rodríguez 2003, França & Venâncio 2010, Waldez et al. 2013). In addition, nine species of anurans (*Allobates gasconi, Chiasmocleis royi, Dendropsophus joannae, Dendropsophus schubarti, Elachistocleis muiraquitan, Pristimantis lacrimosus, Pristimantis skydmainos, Pristimantis zimmermanae* and *Rhaebo guttatus*) and one caudate (*Bolitoglossa caldwellae*) are new records for the river basin, increasing the amphibian richness of the Purus River to 132 species. Six of these new species records (*Bolitoglossa caldwellae, Chiasmocleis royi, Dendropsophus joannae, Elachistocleis muiraquitan, Pristimantis lacrimosus* and *Pristimantis skydmainos*) represent expansion of the distribution to Amazonas State.

A recent review of the taxonomy and distribution of the salamanders of the genus *Bolitoglossa* in Brazil enabled the recognition of five species within the genus for the Brazilian Amazon (Brcko et al. 2013). Of these, *Bolitoglossa caldwellae* was described for the municipalities of Cruzeiro do Sul, Marechal Thaumaturgo and Porto Walter, Acre State. The capture of *B. caldwellae* individuals in the varzea environments of the Middle Purus River is the first record for Amazonas State and extends its distribution approximately 600 km from the nearest locality (Porto Walter).

The microhylid *Chiasmocleis royi*, historically mistaken for *Chiasmocleis ventrimaculata*, was recently described for the state of Acre (Peloso et al. 2014). The previously known distribution for *C. royi* encompasses the eastern and southern regions of Peru, northern Bolivia and western Brazil in the

Table 2. Amphibian species recorded in the varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil. N = Abundance; Bl = Bom Lugar; Ca = Cametá; Fo = Flor do Ouro; Gu = Guamá; St = Santana; Ve = Verde; Fm = Floating Meadows; Vz = Varzea; Gen = occurrence in more than two biomes; Am, Ce = Occurs in the Amazon and Cerrado; End = Endemic to the Amazon; Status = IUCN conservation status; LC = Least Concern; DD = Data deficient; NA = Not available.

Order/Family/Specie	Abundance	Oxbow lake	Environment	Distribution	Status
ANURA					
Aromobatidae					
Allobates femoralis (Boulenger, 1884)	78	Bl, Ca, Fo, Ve	Vz	Gen	LC
Allobates gasconi (Morales, 2002)	29	Ca	Vz	End	DD
Allobates trilineatus (Boulenger, 1884)	154	Bl, Ca, Fo, Gu, St	Vz	End	LC
Bufonidae					
Rhaebo guttatus (Schneider, 1799)	1	Bl	Vz	Am, Ce	LC
Rhinella gr. *margaritifera* (Laurenti, 1768)	63	Bl, Fo	Vz	Gen	LC
Rhinella marina (Linnaeus, 1758)	11	Bl, Ca, St, Ve	Fm, Vz	Gen	LC
Ceratophryidae					
Ceratophrys cornuta (Linnaeus, 1758)	1	Fo	Vz	End	LC
Craugastoridae					
Pristimantis fenestratus (Steindachner, 1864)	15	Bl, Fo, Gu	Vz	Am, Ce	LC
Pristimantis lacrimosus (Jiménez de la Espada, 1875)	21	Gu	Vz	End	LC
Pristimantis skydmainos (Flores and Rodriguez, 1997)	47	Fo, Gu	Vz	End	LC
Pristimantis zimmermanae (Heyer and Hardy, 1991)	24	Bl, Ca, Fo, St, Ve	Vz	End	LC
Dendrobatidae					
Ameerega hahneli (Boulenger, 1884)	20	Gu	Vz	End	LC
Hylidae					
Dendropsophus acreanus (Bokermann, 1964)	35	Bl, Fo, St, Ve	Fm, Vz	End	LC
Dendropsophus brevifrons (Duellman and Crump, 1974)	324	Bl, Ca, Fo, Gu, St, Ve	Vz	End	LC
Dendropsophus joannae (Köhler and Lötters, 2001)	70	Bl, Fo, St, Ve	Vz	End	DD
Dendropsophus koechlini (Duellman and Trueb, 1989)	52	Ca, Fo, St	Vz	End	LC
Dendropsophus leucophyllatus (Beireis, 1783)	64	Ca, Fo, St	Vz	Am, Ce	LC
Dendropsophus gr. *minutus* (Peters, 1872)	1	Gu	Vz	NC	LC
Dendropsophus parviceps (Boulenger, 1882)	89	Bl, Ca, Fo, St, Ve	Fm, Vz	Am, Ce	LC
Dendropsophus rossalleni (Goin, 1959)	54	Bl, Ca, Fo, Gu, St,	Fm, Vz	End	LC
Dendropsophus schubarti (Bokermann, 1963)	28	Ca, St, Ve	Vz	Am, Ce	LC
Dendropsophus timbeba (Martins and Cardoso, 1987)	29	St, Ve	Vz	End	LC
Dendropsophus triangulum (Günther, 1869)	890	Bl, Ca, Fo, Gu, St, Ve	Fm, Vz	End	LC
Hypsiboas boans (Linnaeus, 1758)	7	Gu	Fm	Am, Ce	LC
Hypsiboas calcaratus (Troschel, 1848)	13	Fo, Gu	Fm, Vz	End	LC
Hypsiboas fasciatus (Günther, 1858)	565	Bl, Ca, Fo, Gu, St, Ve	Fm, Vz	Am, Ce	LC
Hypsiboas lanciformis Cope, 1871	26	Bl, Ca, Fo, Gu, Ve	Fm, Vz	Am, Ce	LC
Hypsiboas microderma (Pyburn, 1977)	1	Ca	Vz	End	LC
Hypsiboas punctatus (Schneider, 1799)	715	Bl, Ca, Fo, Gu, St, Ve	Fm, Vz	Gen	LC
Hypsiboas raniceps Cope, 1862	152	Bl, Ca, Fo, St, Ve	Fm, Vz	Gen	LC
Osteocephalus taurinus Steindachner, 1862	62	Bl, Ca, Fo, Gu, St, Ve	Vz	Am, Ce	LC
Phyllomedusa bicolor (Boddaert, 1772)	26	Bl, Ca, Fo, Gu, Ve	Vz	Gen	LC
Phyllomedusa palliata Peters, 1873	134	Bl, Ca, Fo, St, Ve	Vz	End	LC
Phyllomedusa tomopterna (Cope, 1868)	4	Bl, Fo, Ve	Vz	Am, Ce	LC
Scarthyla goinorum (Bokermann, 1962)	731	Bl, Ca, Fo, Gu, St, Ve	Vz	End	LC
Scinax cruentommus (Duellman, 1972)	38	Bl, Ca, Fo, Gu, St	Vz	End	LC
Scinax funereus (Cope, 1874)	25	Bl, Ca, Fo, St	Vz	End	LC
Scinax garbei (Miranda-Ribeiro, 1926)	57	Bl, Ca, Fo, St, Ve	Fm, Vz	End	LC
Scinax gr. *ruber*	105	Bl, Ca, Fo, St, Ve	Fm, Vz	Gen	LC
Sphaenorhynchus carneus (Cope, 1868)	337	Bl, Ca, Fo, St, Ve	Fm, Vz	End	LC
Sphaenorhynchus dorisae (Goin, 1957)	480	Bl, Ca, Fo, Gu, St, Ve	Fm, Vz	End	LC
Sphaenorhynchus lacteus (Daudin, 1800)	838	Bl, Ca, Fo, Gu, St, Ve	Fm, Vz	Am, Ce	LC
Trachycephalus typhonius (Linnaeus, 1758)	30	Bl, Ca, Fo, St, Ve	Fm, Vz	Gen	LC
Leptodactylidae					
Adenomera andreae (Müller, 1923)	411	Bl, Ca, Fo, Gu, St	Vz	Am, Ce	LC
Adenomera hylaedactyla (Cope, 1868)	509	Bl, Ca, Fo, Gu, St, Ve	Vz	Gen	LC

Continued on next page

Table 2. Continued.

Order/Family/Specie	Abundance	Oxbow lake	Environment	Distribution	Status
Leptodactylus bolivianus Boulenger, 1898	51	Bl, Ca, Fo, St	Vz	Am, Ce	LC
Leptodactylus knudseni Heyer, 1972	3	Gu	Fm, Vz	Am, Ce	LC
Leptodactylus leptodactyloides (Andersson, 1945)	660	Bl, Ca, Fo, Gu, St, Ve	Fm, Vz	End	LC
Leptodactylus mystaceus (Spix, 1824)	1	Ca	Vz	Gen	LC
Leptodactylus pentadactylus (Laurenti, 1768)	1	Fo	Vz	Am, Ce	LC
Leptodactylus petersii (Steindachner, 1864)	212	Bl, Ca, Fo, Gu, St, Ve	Vz	Gen	LC
Leptodactylus rhodomystax Boulenger, 1884	18	Bl, Fo	Vz	Am, Ce	LC
Microhylidae					
Chiasmocleis bassleri Dunn, 1949	1	Bl	Vz	End	LC
Chiasmocleis royi Peloso, Sturaro, Forlani, Gaucher, Motta, and Wheeler, 2014	17	Bl, Ca, Fo, St	Vz	End	NA
Elachistocleis muiraquita (Nunes-de-Almeida & Toledo, 2012)	60	Bl, Ca, Fo, St	Vz	End	NA
Elachistocleis sp.	40	Bl, Ca, Fo, Ve	Vz	NC	NA
Hamptophryne boliviana (Parker, 1927)	300	Bl, Ca, Fo, Gu, St, Ve	Vz	Am, Ce	LC
CAUDATA					
Plethodontidae					
Bolitoglossa caldwellae Brcko, Hoogmoed, and Neckel-Oliveira, 2013	7	Gu	Vz	End	NA
GYMNOPHIONA					
Typhlonectidae					
Typhlonectes compressicauda (Duméril and Bibron, 1841)	1	Bl	Fm	End	LC

states of Acre (Rio Branco) and Rondônia (Guajará-Mirim). We were the first to record this species for the state of Amazonas, where it was recorded in four of the six lakes studied, expanding the distribution of the species by approximately 200 km. Another microhylid, *Elachistocleis muiraquitan*, previously known only from southeastern Peru, northwestern Bolivia and Brazil only in the municipalities of Rio Branco and Xapurí, Acre State (Nunes-de-Almeida et al. 2012, Allen et al. 2014), was also recorded in four of the lakes studied, thus being the first recorded for the state of Amazonas, extending its distribution by approximately 250 km.

The record of *Pristimantis lacrimosus* and *Pristimantis skydmainos* in the area studied is relatively important. *Pristimantis lacrimosus* is a small anuran that occurs in the upper Amazon River, distributed from southern Colombia, through Ecuador, northern Peru to the far west of Brazil in the Serra do Divisor National Park and Alto Jurua Extractive Reserve, Acre State (Duellman & Lehr 2009). It inhabits lowlands of tropical forests and low and humid montane forests, being commonly found in arboreal bromeliads (Duellman & Lehr 2009). *Pristimantis lacrimosus* was recorded at lake Guamá, in a varzea environment,

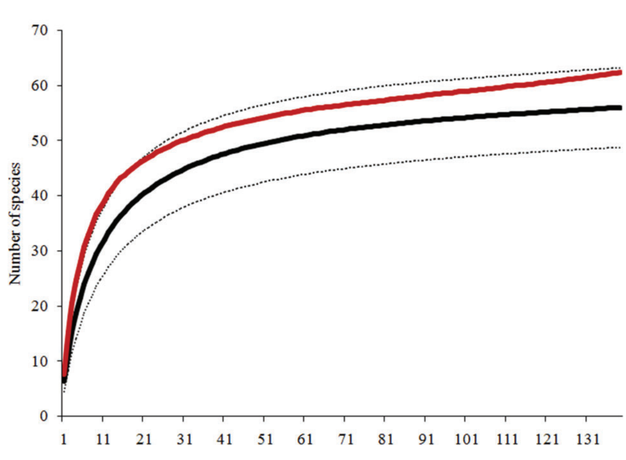

Figure 2. Rarefaction curve based on sampling effort (number of transects sampled, red line) and mean of the richness estimates (black line) of four different richness estimators (ACE, Chao 1, Jack-knife 1 and Bootstrap) for the amphibian assemblages recorded in the varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil. Dashed lines represent the 95% confidence intervals.

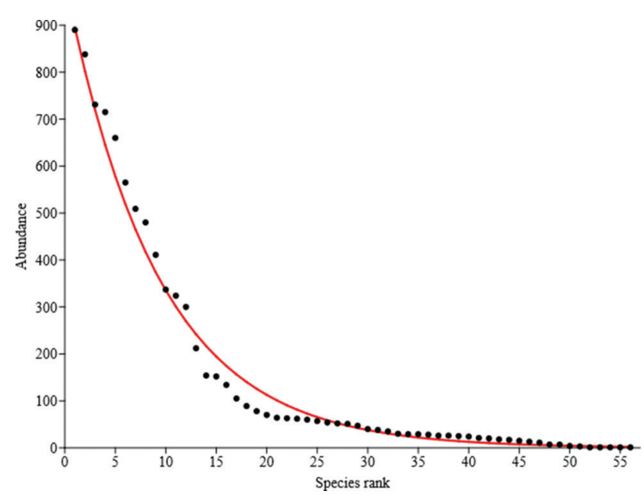

Figure 3. Whittaker diagram for the abundance distribution of amphibians recorded in the varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil.

Figure 4. Amphibian species recorded in the varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil: 1 – *Allobates femoralis,* 2 – *Allobates gasconi*, 3 – *Allobates trilineatus,* 4 – *Rhaebo guttatus,* 5 – *Rhinella* gr. *margaritifera*, 6 – *Rhinella marina,* 7 – *Ceratophrys cornuta,* 8 – *Pristimantis fenestratus,* 9 – *Pristimantis lacrimosus*, 10 – *Pristimantis skydmainos*, 11 – *Pristimantis zimmermanae*, 12 – *Ameerega hahneli*, 13 – *Dendropsophus acreanus*, 14 – *Dendropsophus brevifrons*, and 15 – *Dendropsophus joannae.*

where 21 individuals were recorded calling in the vegetation, at a height above 5 meters. This is the first record of *P. lacrimosus* for the state of Amazonas, extending its distribution by approximately 580 km from its occurrence in the state of Acre at the Alto Jurua Extractive Reserve, Marechal Thaumaturgo municipality. A member of the same genus but belonging to the same group as *Pristimantis conspicillatus* (Hedges et al. 2008), *Pristimantis skydmainos,* recorded in two lakes below the mouth of the Nauiní River (Flor do Ouro and Guamá), is another new record for the state of Amazonas. Until now, *P. skydmainos* was known to occur in the lowlands of the Amazon in southern Peru, the lower slopes of the Western Cordillera in Peru and Ecuador and the west end of Brazil in the Serra do Divisor National Park and Alto Jurua Extractive Reserve (Cisneros-Heredia 2006, Cisneros-Heredia et al. 2009, Duellman & Lehr 2009). The records obtained expand its occurrence in Brazil by 570 km from the Alto Jurua Extractive Reserve.

The occurrence of *Dendropsophus joannae* in Brazil has been suggested since it was first described (Köhler & Lötters 2001). However, the species had been misidentified in studies conducted in the state of Acre due to its morphological similarity to *Dendropsophus leali*, causing it to remain known only for its type locality (Cobija, Bolivia) for more than a decade (Frost 2015). The occurrence of this species in Brazil was recently confirmed by Melo-Sampaio & Souza (2015), which extended its distribution to different places across the state of Acre. In the Middle Purus River, *Dendropsophus joannae* occurred in four of the six sampled lakes, in varzea environments and always while calling in bushes near the creeks or flooded forests (igapós). These records are the first to Amazonas state and expand the geographical distribution of *Dendropsophus joannae* by approximately 160 km.

Although this study was conducted strictly in varzea environments and floating meadows, i.e., lowlands, the species richness

Figure 5. Amphibian species recorded in the varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil: 16 – *Dendropsophus koechlini* (female), 17 – *Dendropsophus koechlini* (male), 18 – *Dendropsophus leucophyllatus,* 19 – *Dendropsophus parviceps,* 20 – *Dendropsophus rossalleni*, 21 – *Dendropsophus schubarti,* 22 – *Dendropsophus timbeba* (amplexus), 23 – *Dendropsophus triangulum,* 24 – *Hypsiboas boans*, 25 – *Hypsiboas calcaratus*, 26 – *Hypsiboas fasciatus*, 27 – *Hypsiboas lanciformis*, 28 – *Hypsiboas punctatus*, 29 – *Hypsiboas raniceps*, and 30 – *Osteocephalus taurinus.*

reported is high compared to most of the studies conducted in the western Amazon (Azevedo-Ramos & Galatti 2002, Souza et al. 2008, França & Venâncio 2010, Ilha & Dixo 2010, Pantoja & Fraga 2012, Bernarde et al. 2013, Prudente et al. 2013), corroborating the existence of a diversity gradient where the western plains of the Amazon biome have greater amphibian diversity as a possible effect of the proximity of the highlands of western Amazon and its high patterns of endemism and richness (Heyer 1976, Duellman 1978, 1982, 1988, Azevedo-Ramos & Galatti 2002). This high diversity has also been associated with the occurrence areas of endemism (Silva et al. 2005, Waldez et al. 2013). The Middle Purus River is located in the Inambari endemism area, the second largest in terms of area (1.326.684 km^2), also considered to be species rich and to have a large number of endemic species with restricted distribution (Silva et al. 2005).

The prevalence of the families Hylidae and Leptodactylidae is a pattern known for Neotropical environments (Duellman 1999, Segalla et al. 2012), including the Brazilian Amazon (Azevedo-Ramos & Galatti 2002, Neckel-Oliveira 2013, Toledo & Batista 2012). Hylids predominate in the studied environments, becoming more dominant in floating meadows (81% of the species), where species of other families were only found occasionally. Apparently, there is no fauna adapted to this floating vegetation, which is mainly invaded by species of the family Hylidae, also present in other open herbaceous vegetation of humid environments, or by aquatic amphibians (Hoogmoed 1993). Although the objective of this study was not to test hypotheses that support the proposal of Hoogmoed (1993), the phylogenetic and ecomorphological similarities of the species associated with the floating meadows indicate a possible influence

Figure 6. Amphibian species recorded in the varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil: 31 – *Phyllomedusa bicolor,* 32 – *Phyllomedusa palliata*, 33 – *Phyllomedusa tomopterna,* 34 – *Scarthyla goinorum,* 35 – *Scinax cruentommus*, 36 – *Scinax funereus,* 37 – *Scinax garbei,* 38 – *Scinax* gr. *ruber,* 39 – *Sphaenorhynchus carneus*, 40 – *Sphaenorhynchus dorisae*, 41 – *Sphaenorhynchus lacteus*, 42 – *Trachycephalus typhonius*, 43 – *Adenomera andreae*, 44 – *Adenomera hylaedactyla*, and 45 – *Leptodactylus bolivianus.*

of the flood pulse, which selects species with ecomorphological characteristics adapted to seasonal flooding (Junk et al. 1989). Hylid species common in other areas, such as *Dendropsophus triangulum* and *Hypsiboas punctatus*, have been found in high densities in floating meadows environments, being rare in adjoining terrestrial habitats, which highlights the importance of floating meadows for many species of the family Hylidae (Upton et al. 2014). Furthermore, the occasional record of *Dendropsophus triangulum, Hypsiboas punctatus, Leptodactylus leptodactyloides* and *Rhinella marina* individuals on floating meadows moving between the lake and river during the drawdown period supports the suggestion that several species use floating meadows banks as dispersal vectors over long distances in Amazon rivers (Schiesari et al. 2003).

Richness, abundance and, consequently, species composition in assemblages are limited by environmental conditions (e.g., the humidity, temperature, rainfall, nutrient availability, and physical structure of the habitat) and by biotic processes (e.g., the predation, competition, dispersal, disturbances, and diseases) (Ricklefs 1987, Parris 2004). In this study, we did not evaluate changes in species composition among the lakes, but the data show possible influence of these biotic and abiotic factors on amphibian communities. However, differences in richness and the presence of species exclusive to some lakes indicate the influence of diversity structuring mechanisms on the amphibian assemblages along the area studied in the Purus River. For amphibians associated with floating meadows, these variations may be associated with the high beta diversity of macrophytes known among the lakes (Mormul et al. 2013), since there are specific association between plant species and amphibian species (Rödl 1977, Upton et al. 2014).

With the exception of the aquatic caecilian *Typhlonectes compressicauda*, all species considered rare were recorded exclusively in varzea environments. This rarity may be attributed to the

Figure 7. Amphibian species recorded in the varzea environments and floating meadows of the oxbow lakes of the Middle Purus River, Amazonas, Brazil: 46 – *Leptodactylus knudseni,* 47 – *Leptodactylus leptodactyloides*, 48 – *Leptodactylus mystaceus,* 49 – *Leptodactylus pentadactylus,* 50 – *Leptodactylus petersii*, 51 – *Leptodactylus rhodomystax,* 52 – *Chiasmocleis bassleri,* 53 – *Chiasmocleis royi,* 54 – *Elachistocleis muiraquitan*, 55 – *Hamptophryne boliviana*, and 56 – *Bolitoglossa caldwellae.*

association of these species to terra firme forests that are not influenced by seasonal flood pulses (Junk et al. 1989, von May et al. 2010, Bernarde et al. 2013, Waldez et al. 2013). The absence of these species in floating meadows can be attributed to their morphological and behavioral characteristics adapted to the vertical stratum, which limit or prevent the use of floating meadows as a resource. Furthermore, the characteristics of the floating meadows systems, since it is a horizontal design environment, directly exposed (no vegetation cover), and unstable (movement dependent of wind direction), can act as environment filters to prevent the occurrence of the species dependent on the terrestrial ecosystem. In contrast, all species considered abundant in the lakes studied have a wide distribution in the Amazon (AmphibiaWeb 2015, Frost 2015), four (*Adenomera hylaedactyla, Hypsiboas fasciatus, Leptodactylus leptodactyloides* and *Scarthyla goinorum*) are more abundant in varzea environments, and four (*Dendropsophus triangulum, Hypsiboas punctatus, Sphaenorhynchus dorisae* and *Sphaenorhynchus lacteus*) are associated with floating meadows. These associations of the amphibians with floating meadows and varzea environments were also found in other studies (Hödl 1977, Hoogmoed 1993, Upton et al. 2011, Bernarde et al. 2013, Catenazze et al. 2013, Waldez et al. 2013).

Species abundance distributions may reflect the processes that determine the biological diversity of an assemblage (Magurran 2011), due to the assumption that the abundance of a species reflects its success in competing for limited resources. The little sloped curve produced for the assemblages sampled in the lakes of the Middle Purus River indicates that few species have extreme abundances and that most have intermediate abundances, generating a lognormal distribution model. Lognormal curves result from different population growth rates of many coexisting species (MacArthur 1960). This type of distribution is found in assemblages controlled by ecological factors, with equitable sharing of available resources, as occurs for most assemblages of tropical forests (Ugland & Gray 1982, Ferreira & Petrere-Jr 2008, Magurran 2011).

Because species with small geographic ranges tend to be more threatened than species with wide geographic ranges (Toledo & Batista 2012), the high number of species endemic to the Amazon biome recorded in this study (49.15%) reinforces the need for conservation efforts for the amphibian fauna in the region of the Middle Purus River (França & Venâncio 2010). Many species are data deficient due to gaps in knowledge on their ranges and populations sizes and population trends (Morais et al. 2013). The data deficiency can be partially explained, for example, by factors such as data uncertainty during the evaluation process, reduced body size, cryptic behavior, fossorial habits, nocturnal activity and lack of studies on the natural history of species (Butchart & Bird 2010). Two species (*Allobates gasconi* and *Dendropsophus joannae*) from the oxbow lakes of the Middle

Purus River, described over a decade ago (Köhler & Lötters 2001, Morales 2002), are classified as data deficient by the IUCN due to their areas of occurrence, status and little known ecological requirements (IUCN 2015). Another three species (*Bolitoglossa caldwellae, Chiasmocleis royi* and *Elachistocleis muiraquitan)*, all described recently, are still not included in the IUCN database. Such situations can become a problem for conservation because the extinction risk of these species becomes unknown (Morais et al. 2013).

The high amphibian richness recorded in this study for the oxbow lakes of the Middle Purus River contributes to the knowledge on species inhabiting lowlands in the biome, including the expansion of spatial distributions, habitat use and population sizes. Although the sampling effort was enough to represent the regional amphibian assemblages, future studies should assess the importance of varzea environments and floating meadows for amphibian conservation as well as the association of the several species directly or indirectly associated to floating meadows and their ecological interactions.

Acknowledgements

We would like to thank doctors Fausto Nomura, Diogo B. Provete, Iberê F. Machado, Marinus Hoogmoed, Natan Maciel, Reuber Brandão, and Vinícius Guerra Batista for having provided important considerations along the development of this paper; Danilo Vieira do Nascimento, Murilo S. Andrade, and Lucicléia Matos for the assistance during field activities; Edinelson for the excellent job as boatman and local guide; the residents for offering their properties for our accomodation; Nathane Queiroz for the help in laboratory; the National Council for Scientific and Technological Development (CNPq) for granting the mastering scholarship to the WPR. This study was developed in the scope of the SISBIOTA project – Top Predators Net, with financial support by CNPq (563299/2010) and the Foundation for Research Support of the state of São Paulo (FAPESP, 10/52315-7). Research conducted under license by ICMBio 37322-5.

Appendix 1. Voucher specimens of amphibians collected in the oxbow lakes of the Middle Purus River, Amazonas, Brazil

Ordem Anura: Família Aromobatidae: Allobates gasconi: ZUFG-8184; ZUFG-8345; Allobates trilineatus: ZUFG-7654; ZUFG-7655; ZUFG-7656; ZUFG-7657; ZUFG-7658; ZUFG-8092; ZUFG-8174; ZUFG-8320; ZUFG-8393;. Família Bufonidae: Rhaebo guttatus: ZUFG-8185. Rhinella gr. margaritifera: ZUFG-7870; ZUFG-7871; ZUFG-7872; ZUFG-7873; ZUFG-7874; ZUFG-7875; ZUFG-7876; ZUFG-7877; ZUFG-7878; ZUFG-7879; ZUFG-7880; ZUFG-7881; ZUFG-7882; ZUFG-7883; ZUFG-7884; ZUFG-7885; ZUFG-7886; ZUFG-7887; ZUFG-7888; ZUFG-8171; ZUFG-7889; ZUFG-8301; ZUFG-8348; ZUFG-8366; ZUFG-8367; ZUFG-8397; ZUFG-8398. Rhinella marina: ZUFG-7890; ZUFG-8132; ZUFG-8186. Família Ceratophryidae: Ceratophrys cornuta: ZUFG-8061. Família Craugastoridae: Pristimantis fenestratus: ZUFG-8325. Pristimantis lacrimosus: ZUFG-8266. Pristimantis skydmainos: ZUFG-8107; ZUFG-8108; ZUFG-8109; ZUFG-8110; ZUFG-8238; ZUFG-8267. Pristimantis zimmermanae: ZUFG-8423. Família Dendrobatidae: Ameerega hahneli: ZUFG-7659; ZUFG-8113. Família Hylidae: Dendropsophus acreanus: ZUFG-8154; ZUFG-8351; ZUFG-8352. Dendropsophus brevifrons: ZUFG-7662; ZUFG-7663; ZUFG-7664; ZUFG-8164; ZUFG-8237; ZUFG-8250; ZUFG-8330; ZUFG-8385. Dendropsophus joannae: ZUFG-7666; ZUFG-8233; ZUFG-8243; ZUFG-8276; ZUFG-8308; ZUFG-8309; ZUFG-8310; ZUFG-8340. Dendropsophus koechlini: ZUFG-7665; ZUFG-8063; ZUFG-8064; ZUFG-8065; ZUFG-8066; ZUFG-8067; ZUFG-8068; ZUFG-8069; ZUFG-8086; ZUFG-8172; ZUFG-8212; ZUFG-8313. Dendropsophus leucophyllatus: ZUFG-8271; ZUFG-8272; ZUFG-8296. Dendropsophus gr. minutus: UFAC-6255; UFAC-6259.Dendropsophus parviceps: ZUFG-7667; ZUFG-7668; ZUFG-8095; ZUFG-8226; ZUFG-8227; ZUFG-8228; ZUFG-8229; ZUFG-8230; ZUFG-8231; ZUFG-8244; ZUFG-8339; ZUFG-8349. Dendropsophus rossalleni: ZUFG-7669; ZUFG-7670; ZUFG-7671; ZUFG-7672; ZUFG-7673; ZUFG-8080. Dendropsophus schubarti: ZUFG-7674; ZUFG-7661; ZUFG-8155; ZUFG-8288; ZUFG-8289; ZUFG-8290; ZUFG-8291; Dendropsophus timbeba: ZUFG-8278; ZUFG-8279; ZUFG-8292; ZUFG-8293; ZUFG-8294; ZUFG-8331; ZUFG-8332. Dendropsophus triangulum: UFAC-6237; ZUFG-7638; UFAC-6250; UFAC-6251; ZUFG-7675; ZUFG-7676; ZUFG-7677; ZUFG-7678; ZUFG-7679; ZUFG-7680; ZUFG-7681; ZUFG-7682; ZUFG-7683; ZUFG-7684; ZUFG-7685; ZUFG-7686; ZUFG-7687; ZUFG-7688; ZUFG-7689; ZUFG-7690; ZUFG-7691; ZUFG-7692; ZUFG-7693; ZUFG-7694; ZUFG-7695; ZUFG-7696; ZUFG-7697; ZUFG-7698; ZUFG-8084; ZUFG-8096; ZUFG-8097; ZUFG-8098; ZUFG-8099; ZUFG-8100; ZUFG-8145; ZUFG-8146; ZUFG-8179; ZUFG-8180; ZUFG-8160; ZUFG-8161; ZUFG-8187; ZUFG-8188; ZUFG-8240; ZUFG-8241; ZUFG-8261; ZUFG-8262; ZUFG-8376; ZUFG-8392; ZUFG-8297; ZUFG-8408. Hypsiboas calcaratus: ZUFG-7730; ZUFG-8072. Hypsiboas fasciatus: ZUFG-8081; ZUFG-8087; ZUFG-8119; ZUFG-8120; ZUFG-8131; ZUFG-8150; ZUFG-8151; ZUFG-8167; ZUFG-8168; ZUFG-8169; ZUFG-8170; ZUFG-8181; ZUFG-8193; ZUFG-8194; ZUFG-8235; ZUFG-8236; ZUFG-8256; ZUFG-8242; ZUFG-8286; ZUFG-8287; ZUFG-8342; ZUFG-8343; ZUFG-8388; ZUFG-8404. Hypsiboas lanciformis: ZUFG-7762. Hypsiboas punctatus: ZUFG-8075; ZUFG-8085; ZUFG-8101; ZUFG-8102; ZUFG-8126; ZUFG-8141; ZUFG-8143; ZUFG-8166; ZUFG-8263; ZUFG-8264; ZUFG-8295; ZUFG-8381. Hypsiboas raniceps: UFAC-6263; UFAC-6264; ZUFG-7763; ZUFG-7764; ZUFG-7765; ZUFG-7766; ZUFG-7767; ZUFG-7768; ZUFG-7769; ZUFG-7770; ZUFG-7771; ZUFG-8105; ZUFG-8300; ZUFG-8411; ZUFG-8412. Osteocephalus taurinus: ZUFG-7833; ZUFG-8106; ZUFG-8176; ZUFG-8225; ZUFG-8329; ZUFG-8416. Phyllomedusa palliata: UFAC-6244; UFAC-6245; UFAC-6246; ZUFG-8221; ZUFG-8222; ZUFG-8281; ZUFG-8282; ZUFG-8283. Phyllomedusa tomopterna: UFAC-6236; UFAC-6242; UFAC-6243; ZUFG-8153; ZUFG-8232. Scarthyla goinorum: ZUFG-8165; ZUFG-8214; ZUFG-8277; ZUFG-8299; ZUFG-8333; ZUFG-8334; ZUFG-8335; ZUFG-8386; ZUFG-8387. Scinax cruentommus: ZUFG-7907; ZUFG-7908; ZUFG-7909; ZUFG-7911; ZUFG-7912; ZUFG-7913; ZUFG-7914; ZUFG-7916; ZUFG-8140; ZUFG-8319; ZUFG-8356; ZUFG-8357; ZUFG-8358; ZUFG-8396. Scinax funereus: UFAC-6253; UFAC-6254; ZUFG-7861; ZUFG-7863; ZUFG-8183; ZUFG-8197; ZUFG-8265; ZUFG-8311; ZUFG-8318; ZUFG-8326; ZUFG-8327; ZUFG-8328; ZUFG-8344; ZUFG-8347; ZUFG-8361; ZUFG-8374; ZUFG-8391. Scinax garbei: UFAC-6238; UFAC-6252; ZUFG-7862; ZUFG-7918; ZUFG-7919; ZUFG-8071; ZUFG-8158; ZUFG-8177; ZUFG-8239; ZUFG-8275; ZUFG-8382; ZUFG-8399. Scinax gr. ruber: ZUFG-7917; ZUFG-7892; ZUFG-7893; ZUFG-7894; ZUFG-7895;

ZUFG-7896; ZUFG-7897; ZUFG-7898; ZUFG-7899; ZUFG-7900; ZUFG-7901; ZUFG-7902; ZUFG-7903; ZUFG-7904; ZUFG-7906; ZUFG-7915; ZUFG-7920; ZUFG-7921; ZUFG-8062; ZUFG-8070; ZUFG-8124; ZUFG-8147; ZUFG-8156; ZUFG-8157; ZUFG-8178; ZUFG-8251; ZUFG-8259; ZUFG-8260; ZUFG-8285; ZUFG-8298; ZUFG-8299; ZUFG-8322; ZUFG-8353; ZUFG-8424; ZUFG-8425; ZUFG-8426. Sphaenorhynchus carneus: ZUFG-8076; ZUFG-8077; ZUFG-8082; ZUFG-8104; ZUFG-8189; ZUFG-8190; ZUFG-8409. Sphaenorhynchus dorisae: UFAC-6230; UFAC-6231; UFAC-6232; UFAC-6233; UFAC-6234; UFAC-6265; ZUFG-8078; ZUFG-8083; ZUFG-8103; ZUFG-8133; ZUFG-8134; ZUFG-8127; ZUFG-8128; ZUFG-8144. Sphaenorhynchus lacteus: UFAC-6235; UFAC-6266; ZUFG-7642; ZUFG-7643; ZUFG-7644; ZUFG-7645; ZUFG-7646; ZUFG-7647; ZUFG-7648; ZUFG-7649; ZUFG-7650; ZUFG-7651; ZUFG-8074; ZUFG-8079; ZUFG-8159; ZUFG-8191; ZUFG-8192; ZUFG-8360. Trachycephalus typhonius: ZUFG-7837; ZUFG-7838; ZUFG-7839; ZUFG-7840; ZUFG-7841; ZUFG-7842; ZUFG-7843; ZUFG-8121; ZUFG-8149; ZUFG-7850; ZUFG-7851; ZUFG-8280. Família Leptodactylidae: Adenomera andreae: UFAC-6261; UFAC-6262; ZUFG –7636; ZUFG-7638; ZUFG-7639; ZUFG-7640; ZUFG-7642; ZUFG-7645; ZUFG-7646; ZUFG-7647; ZUFG-7650; ZUFG-7651; ZUFG-7652; ZUFG-7864; ZUFG-7865; ZUFG-7866; ZUFG-7867; ZUFG-7868; ZUFG-7869; ZUFG-7944; ZUFG– 7948; ZUFG-7649; ZUFG-8350; ZUFG-8073; ZUFG-8089; ZUFG-8115; ZUFG-8116; ZUFG-8117; ZUFG-8138; ZUFG-8139; ZUFG-8175; ZUFG-8368; ZUFG-8369; ZUFG-8370; ZUFG-8379; ZUFG-8405; ZUFG-8406; ZUFG-8413; ZUFG-8414. Adenomera hylaedactyla: ZUFG-7637; ZUFG-7641; ZUFG-7643; ZUFG-7644; ZUFG-7648; ZUFG-7653; ZUFG-8111; ZUFG-8112; ZUFG-8129; ZUFG-8130; ZUFG-8152; ZUFG-8219; ZUFG-8220; ZUFG-8306; ZUFG-8354; ZUFG-8364; ZUFG-8365; ZUFG-8375; ZUFG-8380; ZUFG-8384; ZUFG-8090; ZUFG-8091; ZUFG-8394; ZUFG-8395. Leptodactylus bolivianus: ZUFG-7773; ZUFG-7774; ZUFG-7775; ZUFG-7776; ZUFG-7777; ZUFG-7778; ZUFG-7779; ZUFG-7780; ZUFG-7781; ZUFG-7782; ZUFG-7783; ZUFG-7784; ZUFG-7785; ZUFG-8415; ZUFG-8252; ZUFG-8355; ZUFG-8427. Leptodactylus leptodactyloides: ZUFG-7787; ZUFG-7786; ZUFG-7795; ZUFG-7797; ZUFG-7796; ZUFG-7856; ZUFG-7640; ZUFG-7806; ZUFG-7801; ZUFG-7802; ZUFG-7805; ZUFG-7803; ZUFG-7804; ZUFG-7800; ZUFG-7799; ZUFG-7789; ZUFG-7788; ZUFG-7807; ZUFG-7943; ZUFG-7827; ZUFG-7828; ZUFG-7808; ZUFG-7810; ZUFG-7811; ZUFG-7809; ZUFG-7812; ZUFG-7813; ZUFG-7815; ZUFG-7814; ZUFG-7816; ZUFG-7791; ZUFG-7790; ZUFG-7792; ZUFG-7818; ZUFG-7817; ZUFG-7940; ZUFG-7820; ZUFG-7821; ZUFG-7822; ZUFG-7794; ZUFG-7793; ZUFG-8125; ZUFG-8257; ZUFG-8258; ZUFG-8253; ZUFG-8254; ZUFG-8142; ZUFG-8417; ZUFG-8418; ZUFG-8419; ZUFG-8420; ZUFG-8162; ZUFG-8163; ZUFG-8122; ZUFG-8123; ZUFG-8371; ZUFG-8372; ZUFG-8373; ZUFG-8247; ZUFG-8248; ZUFG-8249; ZUFG-8135; ZUFG-8212; ZUFG-8213; ZUFG-8182; ZUFG-8390; ZUFG-8088; ZUFG-8093; ZUFG-8094; ZUFG-8304; ZUFG-8305; ZUFG-8359; ZUFG-8234; ZUFG-8284; ZUFG-8114; ZUFG-8307. Leptodactylus pentadactylus: ZUFG - 8346. Leptodactylus petersii: UFAC-6239; ZUFG-7823; ZUFG-7824; ZUFG-7825; ZUFG-7819; ZUFG-7830; ZUFG-8336; ZUFG-8337; ZUFG-8338; ZUFG-8273; ZUFG-8274. Leptodactylus rhodomystax: ZUFG-7829; ZUFG-8136. Família Microhylidae: Chiasmocleis bassleri: ZUFG –8137. Chiasmocleis royi: ZUFG-7660; ZUFG-8401; ZUFG-8402; ZUFG-8403; ZUFG-8223; ZUFG-8224; ZUFG-8324; ZUFG-8321. Elachistocleis muiraquitan: UFAC-6240; UFAC-6241; UFAC-6249; ZUFG-7699; ZUFG-8148; ZUFG-8173; ZUFG-8389; ZUFG-8400; ZUFG-8362; ZUFG-8363; ZUFG-8323. Elachistocleis sp.: ZUFG-7834; ZUFG-7835; ZUFG-7836; ZUFG-7844; ZUFG-7845; ZUFG-7846; ZUFG-7847; ZUFG-7848; ZUFG-7849; ZUFG-7831; ZUFG-7832; ZUFG-8421; ZUFG-8215; ZUFG-8216; ZUFG-8321. Hamptophryne boliviana: UFAC-6247; UFAC-6248; ZUFG-7700; ZUFG-7701; ZUFG-7702; ZUFG-7703; ZUFG-7704; ZUFG-7705; ZUFG-7706; ZUFG-7707; ZUFG-7708; ZUFG-7709; ZUFG-7710; ZUFG-7711; ZUFG-7946; ZUFG-7712; ZUFG-7713; ZUFG-7714; ZUFG-7715; ZUFG-7716; ZUFG-7717; ZUFG-7718; ZUFG-7719; ZUFG-7720; ZUFG-7721; ZUFG-7722; ZUFG-7723; ZUFG-7724; ZUFG-7725; ZUFG-7726; ZUFG-7727; ZUFG-7728; ZUFG-7729; ZUFG-8422; ZUFG-8195; ZUFG-8196; ZUFG-8410; ZUFG-8118; ZUFG-8245; ZUFG-8246; ZUFG-8217; ZUFG-8218; ZUFG-8383; ZUFG-8407; ZUFG-8302; ZUFG-8303. Ordem Caudata: Família Plethodontidae: Bolitoglossa caldwellae: ZUFG-8377; ZUFG-8378; ZUFG-8255; ZUFG-8268; ZUFG-8269; ZUFG-8270. Ordem Gymnophiona: Família Typhlonectidae: Typhlonectes compressicauda: UFAC-6267.

References

ALLEN, L., VON MAY, R., ORTEGA, J.V., BURDEKIN, O. & WHITWORTH, A. 2014. A preliminary geographic distribution map of *Elachistocleis muiraquitan* Nunes de Almeida & Toledo, 2012 (Amphibia: Anura: Microhylidae). Check List 10(2):388–391, http://dx.doi.org/10.15560/10.2.388.

AMPHIBIAWEB. 2015. Information on amphibian biology and conservation. http://www.amphibiaweb.org/index.html (último acesso em 03/jun/2015).

AVILA-PIRES, T.C.S, HOOGMOED, M.S. & VITT, L.J. 2007. Herpetofauna da Amazônia. In Herpetologia no Brasil II (L.B. Nascimento & M.R. Oliveira, eds). Sociedade Brasileira de Herpetologia, Belo Horizonte, p.13–143.

AZEVEDO-RAMOS, C. & GALATTI, U. 2002. Patterns of amphibian diversity in Brazilian Amazonia: conservation implications. Biol. Conserv. 103(1):103–111, http://dx.doi.org/10.1016/S0006-3207(01)00129-X.

BERNARDE, P.S., MACHADO, R.A. & TURCI, L.C.B. 2011. Herpetofauna da área do Igarapé Esperança na Reserva Extrativista Riozinho da Liberdade, Acre – Brasil. Biot. Neotrop. 11(3):117–144 http://www.biotaneotropica.org.br/v11n3/en/abstract?inventory+bn02111032011 (último acesso em 04/06/2015), http://dx.doi.org/10.1590/S1676-06032011000300010.

BERNARDE, P.S., ALBUQUERQUE, S., MIRANDA, D.B. & TURCI, L.C.B. 2013. Herpetofauna da floresta do baixo rio Moa em Cruzeiro do Sul, Acre – Brasil. Biot. Neotrop. 13(1):220–244 http://www.biotaneotropica.org.br/v13n1/pt/abstract?inventory+bn02113012013 (último acesso em 04/06/2015).

BRASIL. 1976. RADAMBRASIL: Folha SC.19 Rio Branco: geologia, geomorfologia, pedologia, vegetação e uso potencial da terra. Ministério das Minas e Energia, Departamento Nacional da Produção Mineral, Rio de Janeiro.

BRCKO, I.C., HOOGMOED, M.S. & NECKEL-OLIVEIRA, S. 2013. Taxonomy and distribution of the salamander genus *Bolitoglossa* Duméril, Bibron & Duméril, 1854 (Amphibia, Caudata, Plethodontidae) in Brazilian Amazonia. Zootaxa 3686(4):401–431, http://dx.doi.org/10.11646/zootaxa.3686.4.1.

BUTCHART, S.H.M. & BIRD, J.P. 2010. Data Deficient birds on the IUCN Red List: what do not we know and why does it matter? Biol. Conserv. 143:239–247, http://dx.doi.org/10.1016/j.biocon.2009.10.008.

CISNEROS-HEREDIA, D.F. 2006. Amphibia, Brachycephalidae, *Eleutherodactylus skydmainos*: first country record, Ecuador. Check List 2(2):47–49.

CISNEROS-HEREDIA, D.F., ARMIJOS-OJEDA, D. & VALAREZO, K. 2009. First country Record of *Pristimantis metabates* (Duellman and Pramuk) and distribution extension of *Pristimantis skydmainos* (Flores and Rodríguez) in eastern Ecuador (Amphibia, Anura, Strabomantidae). Herpetology Notes 2:185–188.

COLWELL, R.K. 2013. EstimateS: Statistical Estimation of Species Richness and Shared Species from Samples. Version 9.1.0. User's Guide and Application. Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs.

COLWELL, R.K., CHAO, A., GOTELLI, N.J., LIN, S.Y., MAO, C.X., CHAZDON, R.L. & LONGINO, J.T. 2012. Models and estimators linking individual-based and sample-based rarefaction, extrapolation, and comparison of assemblage. Journal of Plant Ecology 5:3–21, http://dx.doi.org/10.1093/jpe/rtr044.

CRUMP, M.L. & SCOTT, N.J. 1994. Standard Techniques for Inventory and Monitoring – Visual Enconters Surveys. In Measuring and Monitoring Biological Diversity – Standard Methods for Amphibians (W.R. Heyer, M.A. Donnelly, R.W. McDiarmid, L.C. Hayek and M.S. Foster, eds). Smithsonian Institution Press, Washington and London, p.84–91.

DUELLMAN, W.E. 1978. The biology of an equatorial herpetofauna in Amazonian Ecuador. Miscellaneous publication – University of Kansas, Museum of Natural History 65:1–352.

DUELLMAN, W.E. 1979. The South American Herpetofauna: Its Origin, Evolution, and Dispersal. Museum of Natural History, University of Kansas, Laurence.

DUELLMAN, W.E. 1982. Quaternary climatic-ecological fluctuations in the lowland tropics: frog and forests. In Biological Diversification in the Tropics (G.T. Prance, ed.). Columbia University Press, New York, p.389–402.

DUELLMAN, W.E. 1988. Patterns of species diversity in anuran amphibians in the American tropics. Ann. Mo. Bot. Gard. 75(1):79–104.

DUELLMAN, W.E. 1999. Distribution Patterns of Amphibians in South America. In Patterns of Distribution of Amphibians (W.E. Duellman, ed.). The Johns Hopkins University Press, Baltimore and London, p.255–327.

DUELLMAN, W.E. & LEHR, E. 2009. Terrestrial-Breeding Frogs (Strabomantidae) in Peru. Natur und Tier – Verlag, Münster.

FERREIRA, F.C. & PETRERE-JR, M. 2008. Comments about some species abundance patterns: classic, neutral, and niche partitioning models. Braz. J. Biol. 68(4):1003–1012, http://dx.doi.org/10.1590/S1519-69842008000500008.

FRANÇA, F.G.R. & VENÂNCIO, N.M. 2010. Reptiles and amphibians of a poorly known region in southwest Amazonia. Biotemas 23(3):71–84, http://dx.doi.org/10.5007/2175-7925.2010v23n3p71.

FROST, D.R. 2015. http://research.amnh.org/herpetology/amphibia/index.html (último acesso em 04/06/2015).

FUNK, W.C., CAMINER, M. & RON, S.R. 2011. High levels of cryptic species diversity uncovered in Amazonian frogs. P. R. Soc. B 279:1806–1814, http://dx.doi.org/10.1098/rspb.2011.1653.

GORDO, M. 2003. Os Anfíbios Anuros do Baixo Rio Purus/Solimões. In Piagaçu-Purus: Bases Científicas para Criação de uma Reserva de Desenvolvimento Sustentável (C.P. de Deus, R. da Silveira & L.H.R. Py-Daniel, eds.). IDSM, Manaus, p.65–71.

HAMMER, O., HARPER, D.A.T. & RYAN, P.D. 2001. Past: Paleontological statistics software package for education and data analysis. Paleontologia Electronica 4(1):1–9.

HEDGES, S.B., DUELLMAN, W.E. & HEINICKE, M.P. 2008. New world direct-developing frogs (Anura: Terrarana): molecular phylogeny, classification, biogeography and conservation. Zootaxa 1737:1–182.

HEYER, W.R. 1976. Notes on the frog fauna of the Amazon Basin. Acta Amaz. 6(3):369–378.

HEYER, W.R. 1977. Taxonomic notes on frogs from the Madeira and Purus Rivers, Brazil. Pap. Avulsos de Zool. 31:141–162.

HÖDL, W. 1977. Call differences and calling site segregation in anuran species from Central Amazonian floating meadows. Oecologia 28:351–363, http://dx.doi.org/10.1007/BF00345990.

HOOGMOED, M.S. 1993. The herpetofauna of floating meadows. In The Freshwater Ecosystem of Suriname (P.E. Ouboter, org). Academic Publishers, Dordrecht, p.199–213, http://dx.doi.org/10.1007/978-94-011-2070-8_11.

HOOGMOED, M.S. 2013. http://www.museu-goeldi.br/censo/ (último acesso em 04/06/2015).

ILHA, P. & DIXO, M. 2010. Anurans and lizards, Rio Preto da Eva, Amazonas, Brazil. Check List 6(1):17–21.

IUCN. 2015. IUCN Red List of Threatened Species. Version 2015.1. Accessible at http://www.iucnredlist.org/. Captured on 02 June 2015.

JUNK, W.J., BAYLEY, P.B. & SPARKS, R.E. 1989. The flood pulse concept in river-floodplain systems. Canadian Special Publication of Fisheries and Aquatic Sciences 106(1):110–127.

KÖHLER, J. & LÖTTERS, S. 2001. A new species of minute *Hyla* from the Southwestern Amazon Basin (Amphibia, Anura, Hylidae). Stud. Neotrop. Fauna E. 36(2):105–112, http://dx.doi.org/10.1076/snfe.36.2.105.2135.

LYNCH, J.D. 2005. Discovery of the richest frog fauna in the world – an exploration of the forests to the North of Leticia. Rev. Acad. Colomb. Cienc. 29(113):581–588.

MACARTHUR, R.M. 1960. On the relative abundance of species. Am. Nat. 94(874):25–36.

MACIEL, A.O. & HOOGMOED, M.S. 2011. Taxonomy and distribution of caecilian amphibians (Gymnophiona) of Brazilian Amazonia, with a key to their identification. Zootaxa 2984:1–53.

MAGURRAN, A.E. 2011. Medindo a Diversidade Biológica. Editora Universidade Federal do Paraná, Curitiba.

MELO-SAMPAIO, P.R. & SOUZA, M.B. 2015. New and noteworthy distributional records of treefrogs (Anura) from southwestern Amazonia. Check List 11(4):1681, http://dx.doi.org/10.15560/11.4.1681.

MORAIS, A.R., SIQUEIRA, M.N., LEMES, P., MACIEL, N.M., MARCO JR, P. & BRITO, D. 2013. Unraveling the conservation status of Data Deficient species. Biol. Conserv 166:98–102, http://dx.doi.org/10.1016/j.biocon.2013.06.010.

MORALES, V.R. 2002. Sistematica y biogeografia del grupo *trilineatus* (Amphibia, Anura, Dendrobatidae, *Colostethus*), con descripción de once nuevas espécies. Publ. Asoc. Amigos Doñana 13:1–59.

MORMUL, R.P., THOMAZ, S.M. & VIEIRA, L.J.S. 2013. Richness and composition of macrophyte assemblages in four Amazonian lakes. Acta Scientiarum 35(3):343–350, http://dx.doi.org/10.4025/actascibiolsci.v35i3.11602.

NECKEL-OLIVEIRA, S., GALATTI, U. & FAVERI, S.B. 2013. Ecological correlates in Brazilian Amazonian anurans: implications for conservation. Amphibia-Reptilia 34(2013):217–232, http://dx.doi.org/10.1163/15685381-00002890.

NUNES-DE-ALMEIDA, C.H.L. & TOLEDO, L.F. 2012. A new species of *Elachistocleis* Parker (Anura, Microhylidae) from the State of Acre, Northern Brazil. Zootaxa 3424:43–50.

O'HARA, R.B. 2005. Species richness estimators: how many species can dance on the head of a pin? J. Anim. Ecol. 74:375–386, http://dx.doi.org/10.1111/j.1365-2656.2005.00940.x.

PANTOJA, D.L. & FRAGA, R. 2012. Herpetofauna of the Reserva Extrativista do Rio Gregório, Juruá Basin, southwest Amazonia, Brazil. Check List 8(3):360–374.

PARRIS, K.M. 2004. Environmental and spatial variables influence the composition of frog assemblages in sub-tropical eastern Australia. Ecography 27:392–400, http://dx.doi.org/10.1111/j.0906-7590.2004.03711.x.

PELOSO, P.L.V., STURARO, M.J., FORLANI, M.C., GAUCHER, P., MOTTA, A.P. & WHEELER, W.C. 2014. Phylogeny, taxonomic revision, and character evolution of the genera *Chiasmocleis* and *Syncope* (Anura, Microhylidae) in Amazonia, with descriptions of three new species. B. Am. Mus. Nat. Hist. 386:1–112, http://dx.doi.org/10.1206/834.1.

PRUDENTE, A.L.C., STURARO, M.J., TRAVASSOS, A.E.M., MASCHIO, G.F. & SANTOS-COSTA, M.C. 2013. Anurans of the Urucu Petrol Basin, municipality of Coari, State of Amazonas, northern Brazil. Check List 9(3):601–606.

RICKLEFS, R.E. 1987. Community diversity: relative roles of local and regional processes. Science 235(4785):167–171, http://dx.doi.org/10.1126/science.235.4785.167.

RÍOS-VILLAMIZAR, E.A., MARTINS JUNIOR, A.F. & WAICHMAN, A.V. 2011. Caracterização físico-química das águas e desmatamento na bacia do rio Purus, Amazonia brasileira Ocidental. Revista de Geografia Acadêmica 5(2):54–56.

RÖDEL, M.O. & ERNEST, R. 2004. Measuring and monitoring amphibian diversity in tropical Forest. I. Na evaluation of methods with recommendations for standardization. Ecotropica 10:1–14.

RODRÍGUEZ, L.O. 2003. Anfibios y Reptiles de la Región del Alto Purús. In Alto Purús. Biodiversidad, Conservación y Manejo (R.L. Pitman, N. Pitman & P. Álvarez, eds.). Nicholas School of the Environment, Duke University, Lima, p. 89–95.

ROJAS, R.R., CARVALHO, V.T., GORDO, M., ÁVILA, R.W., FARIAS, I.P. & HRBEK, T. 2014. A new species of *Amazophrynella* (Anura: Bufonidae) from the southwestern part of the Brazilian Guiana Shield. Zootaxa 3753(1):079–095.

SANTOS, A.J. 2006. Estimativas de Riqueza em Espécies. In Métodos de Estudos em Biologia da Conservação e Manejo da Vida Silvestre (L. Cullen Jr, C. Valladares-Padua & R. Rudran, eds.). Editora da Universidade Federal do Paraná, Curitiba, p. 19–41.

SCHIESARI, L., ZUANON, J., AZEVEDO-RAMOS, C., GARCIA, M., GORDO, M., MESSIAS, M. & VIEIRA, E.M. 2003. Macrophyte rafts as dispersal vectors for fishes and amphibians in the Lower Solimões River, Central Amazon. J. Trop. Ecol. 19:333–336, http://dx.doi.org/10.1017/S0266467403003365.

SEBER, G.A.F. 1986. A review of estimating animal abundance. Biometrics 42:267–292, http://dx.doi.org/10.2307/2531049.

SEGALLA, M.V., CARAMASCHI, U., CRUZ, C.A.G., GRANT, T., HADDAD, C.F.B., LANGONE, J. & GARCIA, P.C.A. 2014. Brazilian amphibians: List of species. Herpetologia Brasileira 3(2):37–48.

SILVA, A.E.P., ANGELIS, C.F., MACHADO, L.A.T. & WAICHAMAN, A.V. 2008. Influência da precipitação na qualidade da água do Rio Purus. Acta Amaz. 28(4):733–742.

SILVA, J.M.C., RYLANDS, A.B. & FONSECA, G.A.B. 2005. O destino das áreas de endemismo da Amazônia. Megadiversidade 1(1):124–131.

SIMÕES, P.I., STURARO, M.J., PELOSO, P.L.V. & LIMA, A.P. 2013. A new diminutive species of *Allobates* Zimmermann and Zimmermann, 1988 (Anura, Aromobatidae) from the northwestern Rio Madeira-Rio Tapajós interfluve, Amazonas, Brazil. Zootaxa 3609(3):251–273.

SIOLI, H. 1991. Amazônia: Fundamentos da Ecologia da Maior Região de Florestas Tropicais. 3 ed. Vozes, Rio de Janeiro.

SOUZA, V.M., SOUZA, M.B. & MORATO, E.F. 2008. Efeitos da sucessão florestal sobre a anurofauna (Amphibia: Anura) da Reserva Catuaba e seu entorno, Acre, Amazônia sul-ocidental. Rev. Bras. Zool. 25(1):49–57.

TOLEDO, L.F. & BATISTA, R.F. 2012. Integrative study of Brazilian anurans: geographic distribution, size, environment, taxonomy, and conservation. Biotropica 44(6):785–792, http://dx.doi.org/10.1111/j.1744-7429.2012.00866.x.

UGLAND, K.I. & GRAY, J.S. 1982. Lognormal distributions and the concept of community equilibrium. Oikos 39:171–178, http://dx.doi.org/10.2307/3544482.

UPTON, K., STEADMAN, J., POPPLEWELL, D., ROGERS, I. & WILLS, A. 2011. Amazonian frog diversity and microhabitat use. Herpetological Bulletin 118:10–17.

UPTON, K., WARREN-THOMAS, E. & ROGERS, I. 2014. Amphibian diversity on floating meadows in flooded forests of the Peruvian Amazon. Herpetological Review 45(2):209–212.

VON MAY, R., JACOBS, J.M., SANTA-CRUZ, R., VALDIVIA, J., HUAMÁN, J.M. & DONNELLY, M.A. 2010. Amphibian community structure as a function of Forest type in Amazonian Peru. J. Trop. Ecol. 26:509–519, http://dx.doi.org/10.1017/S0266467410000301.

WALDEZ, F., MENIN, M. & VOGT, R.C. 2013. Diversidade de anfíbios e répteis Squamata na região do baixo rio Purus, Amazônia Central, Brasil. Biot. Neotrop. 13(1):300–316.

Received 29/07/2015
Revised 21/01/2016
Accepted 22/01/2016