

Fishes of Cuniã Lake, Madeira River Basin, Brazil

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ABSTRACT: This study presents an inventory of the ichthyofauna of Cuniã Lake, situated in the floodplain of the Madeira River in Rondônia State, Brazil. A total of 11,949 specimens representing eight orders, 34 families, and 189 species were sampled with gill, seine, and hand nets during the dry and wet seasons between 2008 and 2012. Most of the species recorded in Cuniã Lake are commonly found in other locations in the central Amazonian floodplains, although some are rare in collections (e.g. *Acestrorhynchus minimus*, *Triportheus culter*, *Oxybrycon parvulus*, *Tyttocharax madeirae*, *Trachycorystes trachycorystes* and *Scorpiodoras lyophilus*) or represent new distributional records.

INTRODUCTION

The Madeira River is the main tributary of the Amazon River basin, especially considering its huge drainage area and discharge (Goulding *et al.* 2003). The floodplains of the Madeira River Basin in Brazilian territory are divided into two distinct regions that are disrupted by a 300 km river stretch of rapids and waterfalls (Torrente-Vilara *et al.* 2011): i) the floodplain of the Guaporé–Mamoré rivers, located upstream from the confluence of the Beni and Mamoré rivers, and ii) the sedimentary floodplains downstream of the rapids and waterfall stretch, which is directly connected to the main Amazon River's lowlands (Hubert and Renno 2006; Torrente-Vilara *et al.* 2011)

Situated in the lower portion of the Madeira River, Cuniã Lake is a complex of approximately 60 ponds and channels, which are interconnected during the high water season and harbor large stands of aquatic macrophytes, submerged leaf litter banks, and wooden shores. It stands out as one of the few large “várzea” lakes (floodplains seasonally inundated by turbid-water rivers) present between the downstream limit of the rapids stretch (the Teotônio and Santo Antônio waterfalls, currently submerged by the reservoir of the Santo Antônio hydroelectric dam), and the floodplains of the Jamari and Machado rivers, located nearly 200 km downstream (Goulding 1980).

Cuniã Lake is an important protected area, located in the *Reserva Extrativista do Lago do Cuniã* (RESEX Cuniã), where local fisheries are subjected to a management plan, and other sustainable uses of natural resources are ordinarily practiced. Cuniã Lake has a surface area of 18,000 ha and is connected to the Madeira River by a 42-km-long channel. During normal seasonal flooding periods there is a small but direct contribution from the Madeira River waters to Cuniã Lake. This contribution becomes negligible in the dry season, even though the channel does not completely disconnect from the main river. Some small forest streams empty at the northern

portion of the lake throughout most of the year. The most important streams are Igarapé Cuniã Grande and Igarapé Cuniãzinho, whose headwaters are located inside another important protected area, the *Estação Ecológica do Cuniã* (ESEC Cuniã). These two protected areas provide a high degree of environmental integrity to the hydrographic system of Cuniã Lake.

Recent studies have shown a high fish species richness in tributaries of the Madeira River (Rapp Py-Daniel *et al.* 2007; Torrente-Vilara *et al.* 2011; Pedroza *et al.* 2012), and results from several years of ichthyofaunal inventories, addressed by the authors of this study along the Madeira River Basin, indicate that the actual number of species surpasses 900. Moreover, the accumulated knowledge about the Madeira River ichthyofauna in the Brazilian territory is still very recent (Carmago and Giarizzo 2007; Rapp Py-Daniel *et al.* 2007; Araújo *et al.* 2009; Pedroza *et al.* 2012) if compared to the published studies developed in Bolivian areas (e.g. Lauzanne and Loubens 1985; Lauzanne *et al.* 1991; Chernoff *et al.* 2000). Therefore, in this study we describe the fish fauna of Cuniã Lake, providing basic information that may allow for the development of management strategies for the conservation of aquatic resources in the region. The RESEX Cuniã is one of the few protected areas in the middle-lower course of Madeira River, and may constitute an important representation of its typical fish fauna, now modified by the environmental disturbances resulting from the construction of the Santo Antônio and Jirau hydroelectric dams.

MATERIALS AND METHODS

STUDY SITE

The samplings were conducted in the Cuniã Lake and small direct tributaries (8°19'13.7" S, 63°28'18.5" W; Figures 1 and 2). The flood season occurs between October and March, while the dry season is from April to September. The mean values of local limnological

characteristics, measured only during a part of the work trips (November 2008–March 2010), were: depth 3.38 m (± 2.57), water transparency measured with a Secchi disk 1.52 m (± 1.17), electrical conductivity 6.74 $\mu\text{S}/\text{cm}$ (± 4.44), pH 5.7 (± 1.18), dissolved oxygen 3.99 mg/l (± 1.81), and water temperature 29.2°C (± 2.07).

Fish collection

The fish fauna was sampled on 25 occasions along three nearly complete hydrological cycles, from November 2008 to January 2012 during the implementation of the research program *Monitoramento e Conservação da Ictiofauna do Rio Madeira*, supported by *Santo Antônio Energia*, a consortium formed by several companies responsible for constructing, operating, maintaining, and monitoring the Santo Antônio Hydroelectric power plant. Sampling devices included passive collecting techniques and equipment (gill nets) intended to sample the fishes that occupy the water column, and active collecting (seine nets and hand nets) to sample shallow marginal habitats (aquatic macrophyte banks, leaf litter banks, and small streams). A set of thirteen gill nets (mesh sizes of 30, 40, 50, 60, 70, 80, 90, 100, 120, 140, 160, 180 and 200 mm between opposite knots) with a total catching area of 431 m² was exposed during a 24-hour cycle at each sampling occasion, and reviewed for fishes every four hours.

The fish samples were labeled and preserved in 10% formalin solution, transported to the laboratory, and identified to species level. A thorough revision of the taxonomic identity of the fishes was carried out

by specialists afterwards (see Acknowledgements). The taxonomic classification of species follows Reis *et al.* (2003) and Eschemeyer and Fong (2013) for supraspecific categories. The specimens were transferred to 70% ethanol, and voucher specimens were deposited in the fish collection of the *Departamento de Biologia da Universidade Federal de Rondônia* (UFRO-I), Porto Velho, State of Rondônia, Brazil (Table 1).

The fish sampling was authorized by the *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* (IBAMA, collecting permits: 51/2009, April 2009–March 2011; and 109/2011, May 2011–April 2012).

RESULTS AND DISCUSSION

A total of 11,949 specimens representing 189 species, eight orders and 34 families were collected (Table 1). Similar studies conducted in the Madeira River Basin have recorded 133 species from the Maderinha, Roosevelt and Jatuarana rivers (Camargo and Giarrizzo 2007), 447 species in the Aripuanã and middle Madeira Rivers (Rapp Py-Daniel *et al.* 2007), 74 in Belmont Stream (Araújo *et al.* 2009), and 160 in the Guariba River (Pedroza *et al.* 2012). Fish inventories conducted in lakes in the Brazilian Central Amazon (Mérona and Bittencourt 1993; Saint-Paul *et al.* 2000; Siqueira-Souza and Freitas 2004; Soares *et al.* 2006) have found fish richness ranging between 41 (Maracá Lake; Siqueira-Souza and Freitas 2004) and 172 species (Prato Lake; Saint-Paul *et al.* 2000). High differences in the sampling efforts employed in those studies hinder an accurate comparison of the fish species richness in each

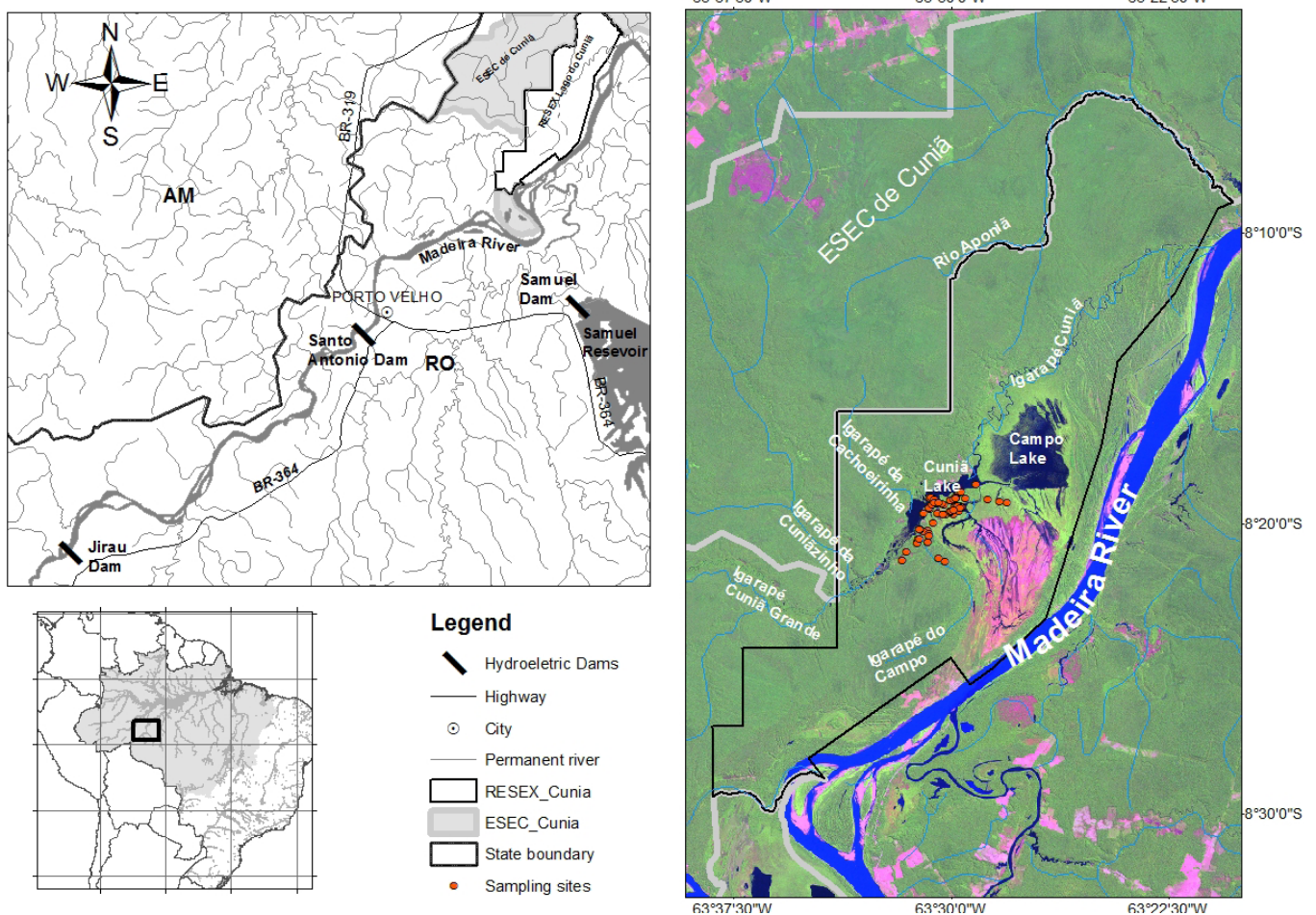


FIGURE 1. Location of the sampling sites in Cuniã Lake, Rondônia State, Brazil.

site. Nevertheless, finding nearly two hundred fish species in a single lake system represents an outstanding diversity even for Amazonian standards.

The high number of species registered in this study probably reflects the large collecting effort applied, the diversity of environments sampled, and the combined use of different types of fishing gear. In fact, environmental heterogeneity is known as one of the main factors that contribute to increasing species richness for different taxonomic groups (*e.g.* Kerr and Parker 1997; Tews *et al.* 2004; Báldi 2008), including fishes (*e.g.* Guégan *et al.* 1998). Nonetheless, we expect that the actual fish species richness present in the RESEX Cuniã is still higher than the figure presented in this paper, especially because: i) some typical floodplains species, which are widespread in the Amazon Basin, have not been sampled yet, for example, *Prochilodus nigricans* Spix and Agassiz, 1829, *Abramites hypselonotus* (Günther, 1868), *Laemolyta proxima* (Garman, 1890), *Leporinus fasciatus* (Bloch 1794), *L. trifasciatus* Steindachner, 1876, *Pseudanos trimaculatus* (Kner, 1858), *Psectrogaster amazonica* Eigenmann and Eigenmann, 1889, *Cynodon gibbus* (Agassiz, 1829), *Hydrolycus scomberoides* (Cuvier, 1819), *Pellona flavipinnis* (Valenciennes, 1837), *Ageneiosus ucayalensis* Castelnau, 1855, and *Hypophthalmus* spp.; and ii) many small forest streams in the study area, comprising an important aquatic environment that harbors a large portion of the Amazonian fish diversity, remain to be adequately sampled.

Characiformes and Siluriformes were the most diverse orders, making up 76.2% of the recorded species, followed by Perciformes (11.6%) and Gymnotiformes (7.4%), which corresponds to the known pattern for the Neotropical freshwater fish fauna (*cf.* Lowe-McConnell 1999; Albert *et al.* 2011).

The family with the highest species richness was Characidae (42 species), which is nominally the fourth richest freshwater fish family of the world, with more than 1000 described species (Lima *et al.* 2003; Mirande, 2009; Albert *et al.* 2011). Recent works have argued by the monophyly of Characidae (Mirande 2009, 2010; Oliveira *et al.* 2011), but there is no consensus about the phylogenetic relationships among subfamilies within the family. Once the relationships inside Characidae are resolved, there is expected to be a significant reduction in the relative importance of this family in the taxonomic composition



FIGURE 2. Aerial photo of the Cuniã Lake taken in December 2011, during flood season (Laboratório de Ictiologia e Pesca/UNIR and Santo Antônio Energia – SAE).

of the regional ichthyofauna. Cichlidae (20 species), the second largest family regarding species richness in the present study, and Serrasalminidae, the third, with 16 species, are composed of species that typically inhabit lakes and other lentic environments, and contributed strongly to the high species richness observed in Cuniã Lake.

Approximately 9% of the species could not be assigned to any described species, including nine Characiformes (*Charax* sp. “Madeira”; *Hemigrammus* sp. “falso marginatus”; *Moenkhausia* sp. “collettii alta”; *Moenkhausia* sp. “lepidura alta”; *Moenkhausia* sp. “falsa dichroura”; *Thayeria* sp. “falsa ifati”; *Pristobrycon* sp.; *Serrasalmus* sp. n. “anal borda escura”; *Serrasalmus* sp. n. “2n58”); three Siluriformes (*Ageneiosus* sp. n. “vittatus”; *Ancistrus* sp. “Sotério”; *Astrodoras* sp. “fulcro”); three Gymnotiformes (*Brachyhyopomus* sp. 3; *Brachyhyopomus* sp. 4; *Eigenmannia* sp.); and two Synbranchiformes (*Synbranchus* sp. “curto”; *Synbranchus* sp. “karipunus”). All of these species belong to poorly known taxonomic groups and/or represent still undescribed species, meaning that further taxonomic studies will be necessary.

Problems related to the use of morphotypes possibly represent the most important difficulty in the accurate comparison of the results of faunal inventories among different studies conducted in the Amazon region. It is important to note, however, that a fraction of those species, which were not fully identified taxonomically, are well-known morphotypes with a large distribution in the Madeira Basin, and perhaps even in the Amazon Basin. These findings suggest that the true beta diversity among typical “várzea” lakes sampled in different locations of the Amazon lowlands may be lower than the numerical differences resulting from nominal comparisons of published species lists containing a high proportion of morphotypes.

Some rare species (considered as such in function of their scarcity in fish collections) were recorded for Cuniã Lake, including the Characiformes *Acestrorhynchus minimus* Menezes, 1969, *Triportheus culter* (Cope, 1872), *Oxybrycon parvulus* Géry, 1964, *Tytocharax madeira* Fowler, 1913 and *Xenobrycon polyancistrus* Weitzman, 1987, and the Siluriformes *Trachycorystes trachycorystes* (Valenciennes, 1840). One species well-known taxonomically, but rare in collections, is the lungfish *Lepidosiren paradoxa* Fitzinger, 1837. According to local residents, this species occurs in Cuniã Lake, but we have not registered its presence in the area yet. *Scorpiodoras liophysus* Sousa and Birindelli, 2011 (Doradidae) is a thorny catfish apparently endemic to the Madeira River that was only recently described, including paratypes from Cuniã Lake. This emphasizes the importance of conducting ichthyofaunal inventories along the “várzea” floodplains, even in places close to the main urban centers of the Brazilian Amazon, which are still poorly known.

The Pirarucu *Arapaima gigas* (Schinz, 1822) is one of the largest freshwater fishes of the Neotropical region, and a typical inhabitant of floodplain lakes of the Amazon. Cuniã Lake was the natural upstream limit of its distribution in the Madeira River Basin, until it was accidentally introduced in the Madre de Dios River, Bolivia (Jégu *et al.* 2012). Thus, the pirarucu is now able to disperse along the

rapids stretch of the Madeira River, although apparently in low numbers. Despite being poorly represented in our standardized samplings, this species has a high natural abundance in Cuniã Lake and constitutes one of the most important species in the local commercial and subsistence fisheries (3.5–4.0 per year tons in 2009 and 2010; CRCO, personal observation). The protection provided by the status of an extractive reserve and the existence of a management plan for this species may help to guarantee its biological conservation in the lower course of Madeira River.

Among the species sampled from Cuniã Lake, almost 40% (72 species) are included on the list of species which are allowed to be exploited as ornamental fishes (Instrução Normativa 1, January 3rd 2012). Some of those species were well represented in our samples, suggesting a relatively high local abundance: for instance, *Acestrorhynchus* species, *Anodus elongatus* Agassiz, 1829, *Brachyhypopomus* species, *Hemigrammus* species, *Hyphessobrycon diancistrus* Weitzman, 1977, *Iguanodectes cf. spilurus* (Günther, 1864), *Mesonauta festivus* (Heckel, 1840), *Moenkhausia* species, *Nannostomus eques* Steindachner, 1876, *Pygocentrus nattereri* Kner, 1858, *Pyrrhulina cf. brevis* Steindachner, 1876, *Satanoperca jurupari* (Heckel, 1840), *Triporthus albus* Cope, 1872 and *Triporthus angulatus* (Spix and

Agassiz, 1829). These results indicate their potential to be exploited locally for the ornamental fish trade, although this activity is currently not being practiced in the Brazilian portion of the Madeira River Basin.

In conclusion, it is essential to emphasize once more the importance of the RESEX Cuniã as one of the few protected areas in the middle-lower Madeira River Basin, and its strategic position just downstream from an approximately 300-km-long stretch of rapids and waterfalls. These floodplains are important to the maintenance of the fish stocks that are exploited by local subsistence and commercial fishermen, and that also sustain a diversified trophic chain, as well as for the spawning and growth of many species of fishes (our personal observations). Furthermore, the presence of protected areas (including the RESEX Cuniã) may help to mitigate environmental impacts on and to maintain the biological integrity of an area with a long history of anthropogenic disturbances (deforestation, gold mining, and, more recently, the construction of large hydroelectric dams). In this sense, it is imperative to control deforestation and erosion, two of the main disturbance sources affecting rivers and other aquatic habitats in Rondônia State, and other “várzea” floodplains in the Brazilian Amazon (Albernaz *et al.* 2008).

TABLE 1. Taxonomic list of the species captured in the Cuniã Lake, Madeira River basin, indicating its potential for the ornamental fish trade (Orn. Fish) (cf. Instrução Normativa 001, January 3rd 2012), and catalogue numbers (UFRO-I). Because some species from the Cuniã Lake did not have specimens in good conditions to be stored at Collection of Fishes, numbers highlighted with only one asterisk (*) represent lots from Belmont Stream (08°38'33.7"S, 63°50'58.5"W), a tributary located 90 km upstream of the Cuniã Lake, and two asterisks (**), from Puruzinho Lake (07°22'21.3"S, 63°3'10.1"W), another lake 130 km downstream of the Cuniã Lake.

TAXA	ORN. FISH	UFRO-I LOT #
Osteoglossiformes		
Arapaimatidae		
<i>Arapaima gigas</i> (Schinz, 1822)		600*
Osteoglossidae		
<i>Osteoglossum bicirrhosum</i> (Cuvier, 1829)		10159
Clupeiformes		
Pristigasteridae		
<i>Pellona castelnaeana</i> Valenciennes, 1847		4657
Characiformes		
Acestrorhynchidae		
<i>Acestrorhynchus falcistrostris</i> (Cuvier, 1819)	X	3219; 3259
<i>Acestrorhynchus microlepis</i> (Schomburgk, 1841)	X	8817; 10189
<i>Acestrorhynchus minimus</i> Menezes, 1969	X	8388
<i>Roestes molossus</i> (Kner, 1858)		28; 27
Anostomidae		
<i>Laemolyta taeniata</i> (Kner, 1859)	X	9211
<i>Leporinus cylindriciformis</i> Borodin, 1929		7706**
<i>Leporinus friderici</i> (Bloch, 1794)		10090
<i>Rhytiodus argenteofuscus</i> Kner, 1858		9599
<i>Rhytiodus microlepis</i> Kner, 1858		8544
<i>Schizodon fasciatus</i> Spix and Agassiz, 1829		392
Bryconidae		
<i>Brycon amazonicus</i> (Spix and Agassiz, 1829)		6291; 9603
<i>Brycon melanopterus</i> (Cope, 1872)		9980
Chalceidae		
<i>Chalceus epakros</i> Zanata and Toledo-Piza, 2004		8593**
<i>Chalceus guaporensis</i> Zanata and Toledo-Piza, 2004		12397
Characidae		
<i>Aphyocharax avary</i> Fowler, 1913		4647
<i>Aphyodite grammica</i> Eigenmann, 1912		4667

TABLE 1. CONTINUED.

TAXA	ORN. FISH	UFRO-I LOT #
<i>Astyanax</i> aff. <i>bimaculatus</i> (Linnaeus, 1758)	X	4677; 3489; 1765
<i>Astyanax</i> cf. <i>anterior</i> Eigenmann, 1908		4668
<i>Charax</i> sp. "Madeira"		8552
<i>Ctenobrycon spilurus</i> (Valenciennes, 1850)		4680
<i>Hemigrammus analis</i> Durbin, 1909	X	8543
<i>Hemigrammus belottii</i> (Steindachner, 1882)	X	4685
<i>Hemigrammus</i> cf. <i>geisleri</i> Zarske and Géry, 2007		2323; 4644; 4652; 4659
<i>Hemigrammus hyanuary</i> Durbin, 1918	X	10897
<i>Hemigrammus levis</i> Durbin, 1908	X	4646; 4645
<i>Hemigrammus melanochrous</i> Fowler, 1913		11125
<i>Hemigrammus ocellifer</i> (Steindachner, 1882)	X	3816; 4674
<i>Hemigrammus</i> sp. "falso marginatus"		10619; 10620; 10818; 10822
<i>Hemigrammus vorderwinkleri</i> Géry, 1963	X	3863
<i>Hyphessobrycon copelandi</i> Durbin, 1908	X	10534
<i>Hyphessobrycon diancistrus</i> Weitzman, 1977	X	9027; 10618; 10630; 10820; 11535; 11539
<i>Microchemobrycon casiquiare</i> Böhlke, 1953	X	4666; 4653
<i>Microchemobrycon melanotus</i> (Eigenmann, 1912)		10565; 11432
<i>Moenkhausia bonita</i> Benine, Castro and Sabino, 2004		1861; 9210
<i>Moenkhausia ceros</i> Eigenmann, 1908		14352
<i>Moenkhausia</i> cf. <i>gracilima</i> Eigenmann, 1908	X	8979; 9009
<i>Moenkhausia colletti</i> (Steindachner, 1882)	X	2778; 3797; 3801; 4108
<i>Moenkhausia cotinho</i> Eigenmann, 1908	X	4642; 4643
<i>Moenkhausia</i> sp. "falsa dichroura"		4272
<i>Moenkhausia intermedia</i> Eigenmann, 1908	X	9228; 9229
<i>Moenkhausia lepidura</i> (Kner, 1858)	X	9195; 9199
<i>Moenkhausia oligolepis</i> (Günther, 1864)	X	1656
<i>Moenkhausia</i> sp. "colletti alta"		1658
<i>Moenkhausia</i> sp. "lepidura alta"		2332
<i>Odontostilbe fugitiva</i> Cope, 1870		9039
<i>Oxybrycon parvulus</i> Géry, 1964		508
<i>Petitella georgiae</i> Géry and Boutière, 1964	X	4660; 4651
<i>Poptella compressa</i> (Günther, 1864)		1456; 2935
<i>Prionobrama filigera</i> (Cope, 1870)	X	4648
<i>Roeboides biserialis</i> (Garman, 1890)		8624; 8763
<i>Roeboides myersii</i> Gill, 1870		8233; 8234; 8259; 8268
<i>Tetragonopterus argenteus</i> Cuvier, 1816	X	4264
<i>Tetragonopterus chalceus</i> Spix and Agassiz, 1829	X	4264; 4266**
<i>Thayeria</i> sp. "falsa ifati"		12753**
<i>Tyttocharax madeirae</i> Fowler, 1913		8587**
<i>Xenobrycon polyancistrus</i> Weitzman, 1987		4672
Ctenoluciidae		
<i>Boulengerella maculata</i> (Valenciennes, 1850)	X	3789
Curimatidae		
<i>Curimata knerii</i> Steindachner, 1876		9610, 10498**
<i>Curimatella alburna</i> (Müller and Troschel, 1844)	X	4273
<i>Curimatella meyeri</i> (Steindachner, 1882)		9601**
<i>Cyphocharax notatus</i> (Steindachner, 1908)		1502**
<i>Cyphocharax plumbeus</i> (Eigenmann and Eigenmann, 1889)		8342
<i>Cyphocharax spiluroopsis</i> (Eigenmann and Eigenmann, 1889)		7914; 8340
<i>Potamorhina altamazonica</i> (Cope, 1878)		3450**
<i>Potamorhina latior</i> (Spix and Agassiz, 1829)		4679; 4682
<i>Potamorhina pristigaster</i> (Steindachner, 1876)		9596; 9600
<i>Psectrogaster rutiloides</i> (Kner, 1858)		3451**
Cynodontidae		
<i>Rhaphiodon vulpinus</i> Agassiz, 1829		3616
Erythrinidae		
<i>Hoplerythrinus unitaeniatus</i> (Spix and Agassiz, 1829)		1134
<i>Hoplias malabaricus</i> (Spix and Agassiz, 1829)	X	2536; 7904
Gasteropelecidae		
<i>Thoracocharax stellatus</i> (Kner, 1858)	X	4717

TABLE 1. CONTINUED.

TAXA	ORN. FISH	UFRO-I LOT #
Hemiodontidae		
<i>Anodus elongatus</i> Agassiz, 1829	X	3523
<i>Anodus orinocensis</i> (Steindachner, 1887)	X	1780**
<i>Hemiodus atranalis</i> (Fowler, 1940)		4551; 8819
<i>Hemiodus immaculatus</i> Kner, 1858		4547
<i>Hemiodus microlepis</i> Kner, 1858		1142**
<i>Hemiodus semitaeniatus</i> Kner, 1858		1805
<i>Hemiodus unimaculatus</i> (Bloch 1794)	X	4661
Iguanodectidae		
<i>Bryconops giacopinii</i> (Fernández-Yépez, 1950)		2341; 4656
<i>Iguanodectes</i> cf. <i>spilurus</i> (Günther, 1864)	X	4663
Lebiasinidae		
<i>Copella nigrofasciata</i> (Meinken, 1952)	X	10187
<i>Nannostomus digrammus</i> (Fowler, 1913)	X	6584
<i>Nannostomus eques</i> Steindachner, 1876	X	6602
<i>Pyrrhulina</i> cf. <i>australis</i> Eigenmann and Kennedy, 1903	X	9958
<i>Pyrrhulina</i> cf. <i>brevis</i> Steindachner, 1876	X	2537
Prochilodontidae		
<i>Semaprochilodus insignis</i> (Jardine, 1841)		10029**
Serrasalminidae		
<i>Catoprion mento</i> (Cuvier, 1819)	X	4675
<i>Colossoma macropomum</i> (Cuvier, 1816)		1712; 7403; 11114
<i>Metynnis guaporensis</i> Eigenmann, 1915	X	4670
<i>Metynnis lippincottianus</i> (Cope, 1870)	X	8507
<i>Mylossoma aureum</i> (Spix and Agassiz, 1829)		4673
<i>Mylossoma duriventre</i> (Cuvier, 1818)		3522
<i>Piaractus brachypomus</i> (Cuvier, 1818)		6289
<i>Pristobrycon</i> sp.		8505
<i>Pygocentrus nattereri</i> Kner, 1858	X	8953
<i>Serrasalmus elongatus</i> Kner, 1858		1807
<i>Serrasalmus maculatus</i> Kner, 1858		1125; 8227; 8271; 8273; 8280; 8396; 8506
<i>Serrasalmus rhombeus</i> (Linnaeus, 1766)		8848; 9851
<i>Serrasalmus</i> sp. n. "anal borda escura"		1808
<i>Serrasalmus</i> sp. n. "2n58"		8274
<i>Serrasalmus spilopleura</i> Kner, 1858		8222; 9389; 9850; 10097
<i>Serrasalmus</i> gr. <i>rhombeus</i> (Linnaeus, 1766)		8848; 9851
Triporthidae		
<i>Triporthus albus</i> Cope, 1872	X	1493**
<i>Triporthus angulatus</i> (Spix and Agassiz, 1829)	X	523; 524
<i>Triporthus auritus</i> (Valenciennes, 1850)		1140**
<i>Triporthus culter</i> (Cope, 1872)		388; 9605
Siluriformes		
Auchenipteridae		
<i>Ageneiosus inermis</i> (Linnaeus, 1766)		389
<i>Ageneiosus</i> sp. n. "vittatus"		9595
<i>Auchenipterichthys coracoideus</i> (Eigenmann and Allen, 1942)		6298; 9990; 10068; 10506
<i>Auchenipterus ambyiacus</i> Fowler, 1915		4103
<i>Centromochlus heckelii</i> (De Filippi, 1853)		9594
<i>Parauchenipterus galeatus</i> (Linnaeus, 1766)		4107
<i>Parauchenipterus porosus</i> (Eigenmann and Eigenmann, 1888)		9938
<i>Tatia aulopygia</i> (Kner, 1858)	X	10107
<i>Trachelyopterichthys taeniatus</i> (Kner, 1858)		1711; 1811; 8373
<i>Trachycorystes trachycorystes</i> (Valenciennes, 1840)		1752; 1810; 6293; 6999
Callichthyidae		
<i>Corydoras latus</i> Pearson, 1924		6079; 10729
<i>Corydoras splendens</i> (Castelnau, 1855)		10726; 10727; 10728; 10742; 10963
<i>Megalechis picta</i> (Müller and Troschel, 1849)		8002
Doradidae		
<i>Amblydoras affinis</i> (Kner, 1855)		1708; 2322
<i>Anadoras weddellii</i> (Castelnau, 1855)		8417; 8522

TABLE 1. CONTINUED.

TAXA	ORN. FISH	UFRO-I LOT #
<i>Astrodoras</i> sp. "fulcro"		2320
<i>Nemadoras hemipeltis</i> (Eigenmann, 1925)		3826**
<i>Opsodoras stuebelii</i> (Steindachner, 1882)		10094
<i>Ossancora asterophysa</i> Birindelli and Sabaj Pérez, 2011		4681
<i>Ossancora fimbriata</i> (Kner, 1855)		4658
<i>Scorpiodoras liophysus</i> Sousa and Birindelli, 2011		3471; 7893
Loricariidae		
<i>Ancistrus</i> sp. "Sotério"		3385
<i>Dekeyseria amazonica</i> Rapp Py-Daniel, 1985		1136; 10927
<i>Hemiodontichthys acipenserinus</i> (Günther, 1864)		8377**
<i>Hypoptopoma incognitum</i> Aquino and Schaefer, 2010		8299; 8306; 8389; 8654
<i>Hypoptopoma thoracatum</i> Günther, 1868		8316
<i>Loricariichthys acutus</i> (Valenciennes, 1840)		3267; 7895; 7901; 11119
<i>Loricariichthys maculatus</i> (Bloch, 1794)		8828**
<i>Peckoltia</i> aff. <i>vittata</i> (Steindachner, 1881)	X	4650
<i>Pseudorinelepis genibarbis</i> (Valenciennes, 1840)	X	2234; 3496; 10158; 10926
<i>Pterygoplichthys lituratus</i> (Kner, 1854)		1201; 2231; 3495
<i>Pterygoplichthys pardalis</i> (Castelnau, 1855)	X	4911; 10925
<i>Rineloricaria formosa</i> Isbrücker and Nijssen, 1979	X	6242; 10761
<i>Rineloricaria lanceolata</i> (Günther, 1868)	X	12333**
Pimelodidae		
<i>Calophysus macropterus</i> (Lichtenstein, 1819)		391
<i>Pimelodus blochii</i> Valenciennes, 1840	X	4649
<i>Pseudoplatystoma tigrinum</i> (Valenciennes, 1840)		4654
<i>Sorubim maniradii</i> Littmann, Burr and Buitrago-Suarez, 2001		1144**
Gymnotiformes		
Apteronotidae		
<i>Adontosternarchus balaenops</i> (Cope, 1878)	X	8380
<i>Parapteronotus hasemani</i> (Ellis, 1913)		8336; 12058
Gymnotidae		
<i>Gymnotus carapo</i> Linnaeus, 1758	X	2535
Hypopomidae		
<i>Brachyhypopomus brevirostris</i> (Steindachner, 1868)	X	6476; 6490; 6503; 6505; 6516; 6532; 7925
<i>Brachyhypopomus pinnicaudatus</i> (Hopkins, 1991)	X	6484; 6486; 6489; 6491; 6500; 6502; 7927
<i>Brachyhypopomus</i> sp. 3		6397-6402; 6470-71; 6474-75; 6479; 6533
<i>Brachyhypopomus</i> sp. 4		6468; 6493
<i>Steatogenys elegans</i> (Steindachner, 1880)	X	2326; 7926; 8360; 11510
Rhamphichthyidae		
<i>Rhamphichthys marmoratus</i> Castelnau, 1855	X	1812; 12208; 12226
Sternopygidae		
<i>Distocyclus conirostris</i> (Eigenmann and Allen, 1942)		1328
<i>Eigenmannia limbata</i> (Schreiner and Miranda Ribeiro, 1903)	X	1854
<i>Eigenmannia macrops</i> (Boulenger, 1897)	X	4271
<i>Eigenmannia</i> sp.		12067; 12071; 12072
<i>Sternopygus macrurus</i> (Bloch and Schneider, 1801)		11940
Beloniformes		
Belonidae		
<i>Belonion apodion</i> Collette, 1966		555
<i>Potamorrhaphis eigenmanni</i> Miranda Ribeiro, 1915		1235
<i>Potamorrhaphis guianensis</i> (Jardine, 1843)	X	551
Synbranchiformes		
Synbranchidae		
<i>Synbranchus madeirae</i> Rosen and Rumney, 1972		537; 2314; 2545; 2667; 7715; 7718; 7722
<i>Synbranchus</i> sp. "curto"		533; 2331; 2546
<i>Synbranchus</i> sp. "karipunas"		538
Perciformes		
Cichlidae		
<i>Acaronia nassa</i> (Heckel, 1840)	X	4655
<i>Apistogramma agassizii</i> (Steindachner, 1875)	X	8663
<i>Apistogramma gephyra</i> Kullander, 1980	X	7848; 8012

TABLE 1. CONTINUED.

TAXA	ORN. FISH	UFRO-I LOT #
<i>Apistogramma linkei</i> Kolowski, 1985		12354
<i>Apistogramma resticulosa</i> Kullander, 1980	X	2319; 8013
<i>Biotodoma cupido</i> (Heckel, 1840)	X	12369**
<i>Chaetobranchius flavescens</i> Heckel, 1840	X	1713; 1715
<i>Cichla pleiozona</i> Kullander and Ferreira, 2006		390; 1804; 6297
<i>Crenicichla adspersa</i> Heckel, 1840		9604**
<i>Crenicichla inpa</i> Ploeg, 1991		4269
<i>Crenicichla johanna</i> Heckel, 1840	X	9979
<i>Crenicichla marmorata</i> Pellegrin, 1904	X	1202; 1716; 9636; 9981
<i>Crenicichla regani</i> Ploeg, 1989	X	8943
<i>Crenicichla semicineta</i> Steindachner, 1892		8188
<i>Geophagus megasema</i> Heckel, 1840	X	7833
<i>Heros spurius</i> Heckel, 1840		7847; 8007; 8258
<i>Hypselecara temporalis</i> (Günther, 1862)	X	1714
<i>Laetacara thayeri</i> (Steindachner, 1875)	X	9406
<i>Mesonauta festivus</i> (Heckel, 1840)	X	2315; 8017; 8019-23
<i>Satanoperca jurupari</i> (Heckel, 1840)	X	12395
Eleotridae		
<i>Microphilypnus ternetzi</i> Myers, 1927		6394; 7745
Sciaenidae		
<i>Plagioscion squamosissimus</i> (Heckel, 1840)		3686

ACKNOWLEDGMENTS: Special acknowledgements are due to Cristhiana Röpke and Ariana Cella-Ribeiro for coordinating the subprogram "Ecologia e biologia da Ictiofauna do Rio Madeira" in the program "Monitoramento e Conservação da Ictiofauna do Rio Madeira" supported by Santo Antônio Energia consortium, which made this study possible together with Instituto de Estudos e Pesquisas Agroambientais e Organizações Sustentáveis (IEPAGRO). Thanks are also given to Santo Antônio Energia, the Instituto Chico Mendes/Porto Velho City, especially to Cristiano Andrey S. do Vale, IBAMA, and to Laboratório de Ictiologia e Pesca da Universidade Federal de Rondônia for offering logistical support for collecting and analyzing samples. Mathias Kundert and Claire Shea helped with English corrections. Fabíola G. Vieira benefited from a MSc scholarship from CNPq. JZ receives a productivity grant from CNPq (307464/2009-1). Further acknowledgement is due to, in alphabetical order, Alberto Akama, Cláudio Zawadzki, Flávio Bockmann, Flávio C. T. Lima, Francisco Langeani, Frank Raynner Ribeiro, Geraldo Mendes dos Santos, Henrique Varella, José L. Birindelli, Leandro Sousa, Lúcia H. Rapp Py-Daniel, Manoela Marinho, Marina Loeb, Marcelo Britto, Marcelo Rocha, Mônica Toledo-Piza, Michel Jégu, Osvaldo Oyakawa, Richard Vari, Rodrigo Caires, Vivianne Sant'Anna, W Jefferson da Graça, and William Crampton, for their efforts in helping to identify the fish species. The authors are also grateful to the referees and editor of Check List who contributed to the improvement of this article.

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RECEIVED: May 2012

ACCEPTED: April 2013

PUBLISHED ONLINE: June 2013

EDITORIAL RESPONSIBILITY: Javier A. Maldonado O.