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Fishes of Cuniã Lake, Madeira River Basin, Brazil

Luiz J. de Queiroz [1*], Gislene Torrente-Vilara [2], Fabíola G. Vieira [3], Willian M. Ohara [1], Jansen Zuanon [4], Carolina R. C. Doria [1]

1 Universidade Federal de Rondônia, Laboratório de Ictiologia e Pesca. Campus José Ribeiro Filho, BR 364, km 9.5. CEP 76801-059. Porto Velho, RO, Brazil.
2 Universidade Federal do Amazonas. Departamento de Biologia. Av. Rodrigo Otávio Jordão Ramos, 3000. CEP 69077-000. Manaus, AM, Brazil.
3 Universidade Federal de Rondônia, Programa de Pós-Graduação em Desenvolvimento Regional e Meio Ambiente. CEP 76801-059. Porto Velho, RO, Brazil.
4 Instituto Nacional de Pesquisas da Amazônia, Coordenação de Biodiversidade — CBIO/INPA. Av. André Araújo, 2936, Aleixo. CEP 69080-971. Manaus, AM, Brazil.
* Corresponding author. E-mail: *luizjq@yahoo.com.br*

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 lyophisus*) 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 µS/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 m^2 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

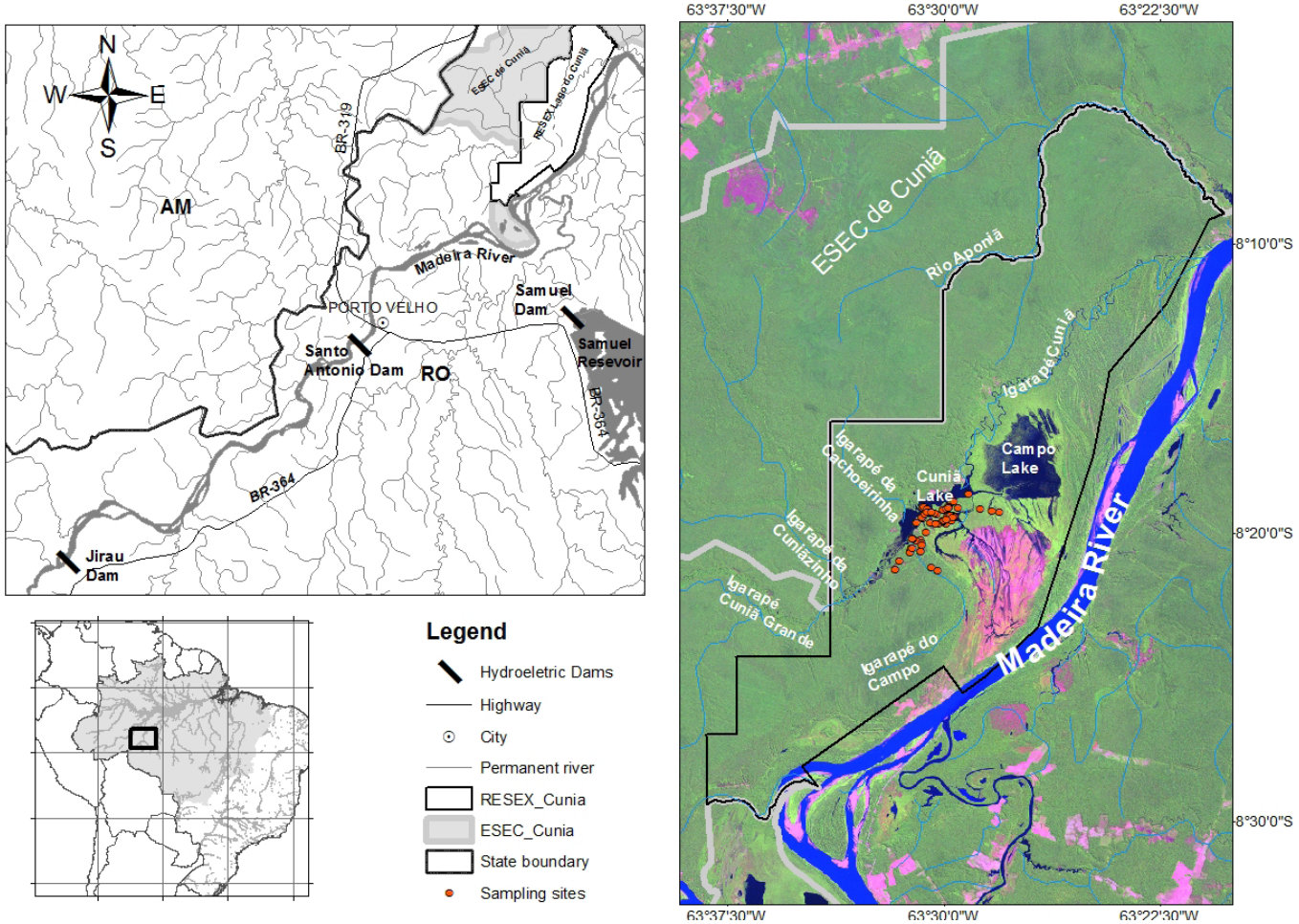

Figure 1. Location of the sampling sites in Cuniã Lake, Rondônia State, Brazil.

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 of the regional ichthyofauna. Cichlidae (20 species), the second largest family regarding species richness in the present study, and Serrasalmidae, 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.

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).

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 (*Brachyhypopomus* sp. 3; *Brachyhypopomus* sp. 4; *Eigenmannia* sp.); and two Synbranchiformes (*Synbranchus* sp. "curto"; *Synbranchus* sp. "karipunas"). 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, *Tyttocharax madeira* Fowler, 1913 and *Xenurobrycon 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; CRCD, 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), *Triportheus albus* Cope, 1872 and *Triportheus 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 potencial 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		
Arapaima gigas (Schinz, 1822)		600*
Osteoglossidae		
Osteoglossum bicirrhosum (Cuvier, 1829)		10159
Clupeiformes		
Pristigasteridae		
Pellona castelnaeana Valenciennes, 1847		4657
Characiformes		
Acestrorhynchidae		
Acestrorhynchus falcirostris (Cuvier, 1819)	X	3219; 3259
Acestrorhynchus microlepis (Schomburgk, 1841)	X	8817; 10189
Acestrorhynchus minimus Menezes, 1969	X	8388
Roestes molossus (Kner, 1858)		28; 27
Anostomidae		
Laemolyta taeniata (Kner, 1859)	X	9211
Leporinus cylindriformis Borodin, 1929		7706**
Leporinus friderici (Bloch, 1794)		10090
Rhytiodus argenteofuscus Kner, 1858		9599
Rhytiodus microlepis Kner, 1858		8544
Schizodon fasciatus Spix and Agassiz, 1829		392
Bryconidae		
Brycon amazonicus (Spix and Agassiz, 1829)		6291; 9603
Brycon melanopterus (Cope, 1872)		9980
Chalceidae		
Chalceus epakros Zanata and Toledo-Piza, 2004		8593**
Chalceus guaporensis Zanata and Toledo-Piza, 2004		12397
Characidae		
Aphyocharax avary Fowler, 1913		4647
Aphyodite grammica Eigenmann, 1912		4667

Table 1. ***Continued.***

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

Table 1. ***Continued.***

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

Table 1. ***Continued.***

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

Table 1. ***Continued.***

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

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