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Inventory

Checklist of the fishes from Jamari River basin, in areas under influence of dams, Rondônia, Brazil

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Abstract: The Madeira River is the most extensive tributary of the Amazon River and has the largest diversity of fishes in the world. On its right bank, the Madeira River receives the Jamari River, in which the first hydroelectric power plant (HPP) in State of Rondônia, Samuel HPP, was built. Besides this, other dams were built in the Jamari River and its tributaries, however, the available information in the scientific literature about the ichthyofaunistic diversity of this basin is rare. This work aims to provide an ichthyofaunistic inventory in a region of the Jamari river basin, in the State of Rondônia, where three small hydropower plants (SHPs) were implemented. The ichthyofauna was sampled in 16 expeditions between August 2015 and December 2018. Gill nets and seine nets were used with different meshes, as well as longlines and cast nets at different times of the day. Additionally, 81 INPA lots of species from the Samuel HPP area of influence were reanalyzed. Fish were identified according to the specialized literature, as well as in consultations with experts of various taxonomic groups. Voucher specimens of the species were cataloged and deposited in the ichthyological collection of the Núcleo de Pesquisas em Limnologia, Ictiologia e Aquicultura (Nupélia) of the Universidade Estadual de Maringá. A total of 230 species were recorded, of which 22 were putative new species, 117 were added to the Jamari River basin and 28 to the Madeira River basin. The continuation of the studies in this section of the Jamari river basin is fundamental for analysis of local impact due to the presence of dams. Moreover, the addition of putative new species to the Madeira River basin indicates gaps in the knowledge of Neotropical ichthyofauna.
Keywords: *Diversity, species list, Madeira River, Amazon basin, freshwater fish.*

Lista das espécies de peixes da bacia do rio Jamari, em áreas sob influência de reservatórios, Rondônia, Brasil

Resumo: O rio Madeira é o mais extenso afluente do rio Amazonas e possui a maior biodiversidade de peixes do mundo. Em sua margem direita, o rio Madeira recebe o rio Jamari, no qual foi construída a primeira usina hidrelétrica (UHE) do estado de Rondônia, a UHE Samuel. Além desta, outros barramentos foram construídos no rio Jamari e em seus afluentes, contudo são raras as informações disponíveis na literatura científica sobre a diversidade ictiofaunística desta bacia. O objetivo deste trabalho foi providenciar um inventário ictiofaunístico na região da bacia do rio Jamari, no estado de Rondônia, onde foram implantadas três pequenas centrais hidrelétricas (PCHs). A ictiofauna foi amostrada em 16 expedições entre os meses de agosto de 2015 e dezembro de 2018. Foram utilizadas redes de espera e arrasto com malhas de diversos tamanhos, além de espinhéis e tarrafas em diferentes períodos do dia. Adicionalmente, 81 lotes de espécies do INPA da área de influência da UHE Samuel foram reanalisados. Os peixes foram identificados de acordo com a literatura especializada, bem como em consultas com especialistas de diversos grupos taxonômicos. Exemplares testemunho das espécies foram catalogados e depositados na coleção ictiológica do Núcleo de Pesquisas em Limnologia, Ictiologia e Aquicultura da Universidade Estadual de Maringá. Foram registradas 230 espécies, destas, 22 são possíveis espécies novas, 117 são acrescentadas à bacia do rio Jamari e 28 à bacia do rio Madeira. A continuação dos estudos neste trecho da bacia do rio Jamari é fundamental para análises de impacto local devido à presença de barramentos. Além disso, a adição de possíveis novas espécies à bacia do rio Madeira aponta lacunas no conhecimento da ictiofauna Neotropical.
Palavras-chave: *Diversidade, lista de espécies, rio Madeira, bacia Amazônica, peixe de água doce.*

Introduction

The Amazon basin is recognized for its high number of fish species, and the rate of endemism reaches large values, representing almost half of the recorded species (Reis *et al*. 2016). This ecosystem is mainly affected by the pollution from the use of mercury by mining, construction of dams, deforestation and overexploitation of several natural resources (Castello *et al*. 2013). Amazonian rivers have a lowly exploited hydroelectric potential in comparison to other Neotropical basins (Lima *et al*. 2017). Meanwhile, in this region, some 175 large hydroelectric plants are already in operation or under construction and 277 are planned for the coming years (Castello & Macedo 2016).

Among the tributaries of the Amazon River, the Madeira River is the most extensive and one of the main rivers in South America, draining an area of approximately 984,000 km^2 (Fearnside 2014). Its biodiversity is one of the largest in the world and recent studies have reported the existence of approximately 1,000 fish species (Ohara *et al*. 2015), of a total of 3,000 species estimated for the entire Amazon basin (Queiroz *et al*. 2013a).

The Jamari River is one of the main tributaries of the Madeira River, draining approximately 29,067 km^2 (IBGE 2018). It is economically important for the State of Rondônia, especially since it was dammed to install the Samuel Hydroelectric Power Plant (HPP) in 1989, the first of the state (IBGE 2018). The single available inventory of the Jamari river ichthyofauna, reporting 122 species, focused the area around the Samuel dam, and was included in a study of the impacts caused by the power plant (Santos 1996).

Species richness estimates in Brazilian freshwater ecosystems are scarce and imprecise. Few basins have been inventoried, due to the lack of funding and poor gathering infrastructure (Agostinho *et al*. 2005). Inventories are important for recording species distributions, discovering new species, and comparing changes in richness and abundance over time due to environmental changes (Baird 2010).

Because (1) there is only data from an environmental impact study of Samuel HPP (Santos 1996); (2) the knowledge of ichthyofauna is limited to the studies carried out for the three other small hydropower plants (SHPs), so it is gray literature and it is not easily accessible; we do not know the approximate data of richness of fish species in the area. Thus, this study aimed to provide an ichthyofaunistic inventory of Jamari River basin, Rondônia, Brazil. In order to do this, we used collection data from fishes sampled around Samuel HPP and other three SHPs currently installed.

Material and Methods

1. Study area

The Jamari River is 563 km long and drains an area of 29,067 km². It is one of the eight sub-basins of the Madeira River. Its headwaters are near of Campo Novo de Rondônia town, northwest of Serra dos Pacaás Novos, and flows into the right bank of the Madeira River in the State of Rondônia (IBGE 2018). Its main right-bank tributaries are Branco, Preto do Crespo, Canaã and Quatro Cachoeiras Rivers, and the left-bank ones are Maçangana and Candeias Rivers. The ichthyofauna was sampled in the Jamari River basin, in the area occupied by the Canaã, Santa Cruz de Monte Negro and Jamari SHPs, all in the State of Rondônia (Figure 1, Table 1).

The Canaã SHP is located in the Canaã River, near the municipality of Ariquemes. The Canaã River presents upstream preserved riparian vegetation, with low flow velocity and shallow depth. The other SHPs were installed in the main course of Jamari River. The Santa Cruz de Monte Negro SHP is located near the municipality of Monte Negro. Its upstream section presents preserved riparian vegetation, low hydrometric level (average 1 meter) and, in narrower areas, waterfalls with formation of waterholes are observed. The Jamari SHP is located downstream of the Santa Cruz de Monte Negro SHP. Its upstream section presents low water level (average 1 m), moderate flow, numerous rock outcrops and punctual rapids. Downstream, the Jamari River is wider (mean of 35 m), it has a strong flow, but with backwater areas.

2. Sampling

The specimens were collected with authorizations 01/2015, 02/2015 and 03/2015 sent by the Secretaria de Estado do Desenvolvimento Ambiental (SEDAM) provided to JCBS. A total of 16 expeditions were carried out between August 2015 and December 2018 with the use of four different capture devices. Gillnets (2.4; 3; 4; 5; 6; 7; 8; 10; 12; 14 and 16 cm between opposite knots) were operated in the marginal region and remained exposed from 16h to 8h on the following day, with a search at 22h. At the reservoir areas, gill nets were installed simultaneously in the marginal region, in the sub-surface of the open areas (pelagic region; surface) and deep areas (bathypelagic region; modified from Smith & Petrere Junior, 2008).

Seine nets (10 m in length and 0.5 cm mesh) were operated once per turn at the littoral zone, during the nocturnal and diurnal period. Longlines (20 hooks, 10 units of 4/0 interposed by 10 units of 7/0) were operated in all environments. Hooks were baited at sunset and searched at night and in the morning of the following day. Cast nets (2.4, 4 and 6 cm between opposite knots) were operated in the lotic environments, each sample including five throws, with sampling at nocturnal and diurnal periods.

3. Fish identification

The captured fish were anesthetized in clove oil, fixed in formalin and sent to the Biologic Consultoria Ambiental laboratory. Subsequently, they were kept in 70% alcohol solution and sent for identification in the laboratory of the ichthyology collection of the Núcleo de Pesquisas em Limnologia, Ictiologia e Aquicultura (Nupélia) of the Universidade Estadual de Maringá. The classification by family and higher taxonomic levels followed Betancur-R *et al*. (2017) for bony fishes and McEachran & Aschliman (2004) for Myliobatiformes. The classification of Characiformes followed Betancur-R *et al*. (2019). The classification of Loricariidae followed Lujan *et al*. (2015). The identification of the species was based on specialized papers (species descriptions, taxonomic revisions, etc.), on the keys present in Queiroz *et al*. (2013a), as well as on consultation with specialists in each taxonomic group. Individuals of the putative new species were photographed (Figure 3). Vouchers were deposited in the ichthyology collection of the Nupélia and they are available at http://splink.cria.org.br/. Uncatalogued specimens were in poor condition.

Because there are several differences between the list of the species sampled by us and that of Santos (1996), we decided to reanalyze lots collected by him and deposited at the Instituto Nacional de Pesquisas da Amazônia (INPA) collection. This reanalysis had two goals: (1) find

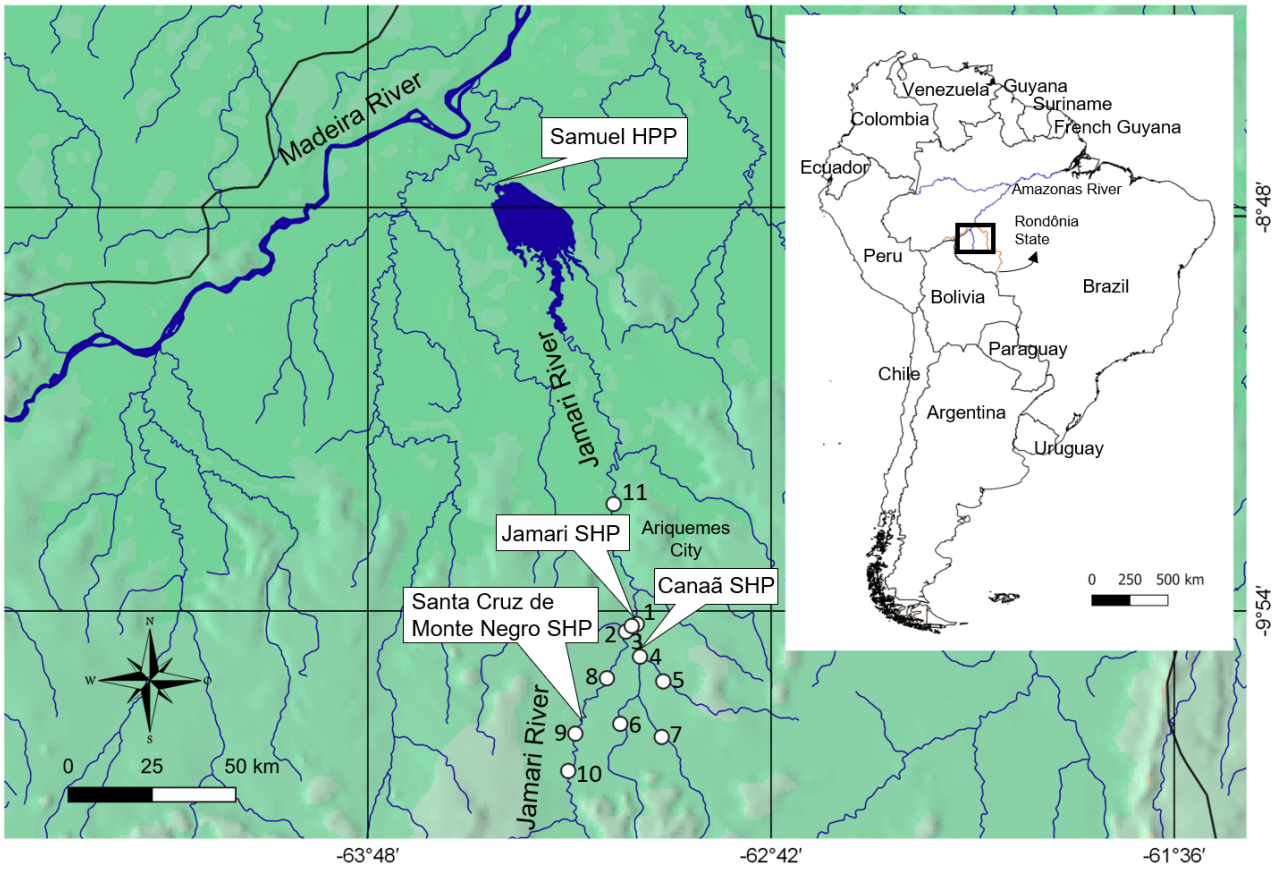

Figure 1. Sampling stations in the Jamari River: Canaã, Jamari and Santa Cruz de Monte Negro SHPs, with their approximate geographical coordinates: 1 - Downstream of Jamari and Canaã SHPs; 2 - Itapoana River; 3 - Jamari SHP reservoir; 4 - Canaã SHP reservoir; 5 - Quatro Cachoeiras River; 6 - Upstream of the Canaã SHP; 7 - Pardo River; 8 - Downstream of Santa Cruz de Monte Negro SHP and Upstream of Jamari SHP; 9 - Santa Cruz de Monte Negro SHP reservoir; 10 - Upstream of Santa Cruz de Monte Negro SHP; 11 - Downstream of Jamari SHP.

species from the Jamari River which were not collected by us, in order to increase the number of species included in our list; (2) verify the taxonomic identity of the specimens collected by Geraldo Santos and included in Santos (1996), given that many species have been described or revised since 1996. Whenever we felt certain that a given species in our list could not have been presented in the list by Santos (1996) under a misidentified name, we considered it to be a new record for the Jamari River basin, unless the species has been recorded in a revisionary study or species description.

Queiroz *et al*. (2013a) did not record for the Madeira River basin some of the species recorded herein in the Jamari River basin. This is partially explained by the presence of putatively new species so far known only from the Jamari River basin, although some of the possible new species listed herein are probably more widespread in the Madeira River basin. Other species, which are already described, have been reported from the Madeira River basin in other papers, dealing with taxonomic revisions or species descriptions: *Leporinus bleheri* Géry (1999), *Petulanos intermedius* (Winterbottom 1980) (see Sidlauskas & Santos 2005), *Myloplus zorroi* Andrade, Jégu & Giarrizzo (2016), *Mylossoma albiscopum* (Cope 1872) (see Mateussi *et al*. 2018), *Charax pauciradiatus* (Günther 1864) (see Menezes & Lucena 2014), *Leporacanthicus galaxias* Isbrücker & Nijssen (1989), *Pimelodus albofasciatus* Mees 1974 (see Santos 1996), *Satanoperca curupira* Ota, Kullander, Deprá, da Graça & Pavanelli (2018). All of the species above have been reported in Brazilian territory, except *L. bleheri*, which was sampled in the Verde River, on the border between Brazil and Bolivia.

Other species were identified in Queiroz *et al*. (2013a) with a different name: *Leporinus desmotes* = *L. jatuncochi* (see Burns *et al*. 2017), *L. cylindriformes* = *L. niceforoi* (this paper), *Moenkhausia* sp. "virgulata" = *Astyanax guaporensis* (see Marinho & Ohara 2013), *Moenkhausia* sp. "collettii alta" = *Astyanax guianensis* (see Marinho *et al*. 2015), *Moenkhausia* cf. *megalops* = *M. abyss* Oliveira & Marinho (2016), *Moenkhausia* sp. "lepidura longa" = *M. hasemani* (see Marinho & Langeani 2016), *Ancistrus* sp. 2 "Sotério" = *Ancistrus* cf. *dolichopterus* (this paper), *Acistrus* sp. 1 "Baixinho" = *Ancistrus* sp. (this paper), *Hemiancistrus* sp. "Bamburro" = *Peckoltia* cf. *ephippiata* Armbruster, Werneke & Tan (2015), *Pterygoplichthys pardalis* = *P. disjunctivus* Weber (1991), *Hemidoras morrisi* = *Opsodoras morrisi* (see DoNascimiento *et al*. 2017), *Opsodoras ternetzi* = *Tenellus ternetzi* (see Birindelli 2014), *Rhamdia quelen* = *Rhamdia* sp. (this paper), *Hypophthalmus edentatus* = *Hypophthalmus oremaculatus* (see Littmann *et al*. 2015), "*Pseudopimelodus*" *pulcher* = *Rhyacoglanis* sp. (see Shibatta & Vari 2017).

Table 1. Location of sampling stations in the Jamari River during the expeditions between August 2015 and December 2018.

Number	Sampling stations	Geographic coordinates
1	Downstream of Jamari and Canaã SHPs	9°56'20.73" S, 63°4'8.10" W
2	Itapoana River	9°57'22.83" S, 63°5'45.79" W
3	Jamari SHP reservoir	9°56'27.63" S, 63°4'47.87" W
4	Canaã SHP reservoir	10°1'28.93" S, 63°3'26.96" W
5	Quatro Cachoeiras River	10°14'37.06" S, 62°59'53.70" W
6	Upstream of the Canaã SHP	10°12'27.50" S, 63°6'40.57" W
7	Pardo River	10°5'31.45" S, 62°59'38.49" W
8	Downstream of Santa Cruz de Monte Negro SHP and Upstream of Jamari SHP	10°5'0.56" S, 63°8'52.10" W
9	Santa Cruz de Monte Negro SHP reservoir	10°14'3.79" S, 63°14'1.34" W
10	Upstream of Santa Cruz de Monte Negro SHP	10°20'10.13" S, 63°15'11.71" W
11	Downstream of Jamari SHP	9°36'30.61" S, 63°7'45.49" W

Results

The 49,947 specimens captured and those belonging to the 81 INPA lots are distributed in 230 species belonging to 42 families and ten orders (Table 2). Just the 81 INPA lots reanalyzed by us yielded an additional 55 species (Table 2). A total of 117 species were added to the Jamari River basin and 28 species to the Madeira River basin (Table 2).

The richest order was Characiformes, with 18 families and 121 species (52.6%), followed by Siluriformes with ten families and 63 species, (27.4%) and Cichliformes with one family and 21 species (9.1%) (Figure 2). Gymnotiformes presented five families with 14 species (6.1%), Clupeiformes presented two families and four species (1.7%) and Myliobatiformes presented one family and two species (0.9%) (Figure 2). Synbranchiformes, Pleuronectiformes, Beloniformes, Tetraodontiformes presented just one species, 0.4% each. Sciaenidae, which is *incertae sedis* in Eupercaria, was represented by a single species too (0.4%) (Figure 2).

The richest family was Characidae with 45 species (19.6%), followed by Cichlidae with 21 species (9.1%) and Anostomidae with 20 species (8.7%) (Figure 2). Loricariidae and Pimelodidae presented 14 species each (6.1% each); Serrasalmidae 13 (5.7%); Curimatidae and Doradidae 10 each (4.3% each) (Figure 2). The other families summed 83 species (total of 36.1%) (Figure 2). Among the latter, 13 families (Parodontidae, Prochilodontidae, Chalceidae, Lebiasinidae, Aspredinidae, Cetopsidae, Hypopomidae, Engraulidae, Synbranchidae, Achiridae, Belonidae, Tetraodontidae and Sciaenidae) presented only one species (total of 5.7%) (Figure 2).

Among captured and reexamined specimens, 22 putatively new species were found, representing approximately 9.6% of all species: *Leporinus* sp., *Apareiodon* sp., *Astyanax* sp., *Hyphessobrycon* sp., *Moenkhausia* sp., *Thayeria* sp. "hemiodus", *Creagrutus* sp., *Gymnotus* sp., *Corydoras* sp., *Ancistrus* sp., *Hypostomus* sp., *Typhlobelus* sp., *Ceptosidium* sp., *Phenacorhamdia* sp., *Rhamdia* sp., *Megalonema* sp., *Pimelodus* sp., *Batrochoglanis* sp. "aff. B. *villosus*", *Rhyacoglanis* sp., *Synbranchus* sp., *Geophagus* sp. 1 and *Geophagus* sp. 2 (Figure 3).

Discussion

Our study added 117 species to the 122 listed by Santos (1996) from the Jamari River basin, and 28 species to the 820 listed by Queiroz *et al*. (2013a) from the Madeira River basin in Brazilian territory. From those INPA lots reanalyzed, several species collected by Geraldo Santos were not included in Santos (1996), not even under a different name. However, we were not able to verify all the identifications by Santos (1996), once the author did not provide the catalog numbers of the lots analyzed by him, and we failed to find in the INPA collection several lots collected in the Jamari River basin. The record of 22 putatively new species and the scarce information on the threat status of most species recorded in the present study are examples of gaps still existing in the knowledge of Neotropical ichthyofauna.

The results followed the known patterns for Neotropical ichthyofauna (Lowe-McConnell 1999), showing the highest percentage of Characiformes species, followed by Siluriformes and Cichliformes. The same proportion at the order level was found for other sites in the Madeira River basin (Camargo & Giarrizzo 2007, Perin *et al*. 2007, Casatti *et al*. 2013). Regarding families with greater species richness, our work presented greater richness in Characidae, followed by Cichlidae and Anostomidae. However, other authors obtained different relative amounts: Characidae>Cichlidae>Loricariidae (Camargo & Giarrizzo 2007); Characidae>Loricariidae>Cichlidae (Casatti *et al*. 2013); Loricariidae>Characidae>Cichlidae (Perin *et al*. 2007); Curimatidae> Characidae>Loricariidae (Araújo *et al*. 2009). Although this difference suggests the high variability of species distribution in the different tributaries of the Madeira River basin, and probably a high percentage of species to be discovered (Casatti *et al*. 2013), those works were conducted in distinct environments (*e.g*. streams, Araújo *et al*. 2009, Casatti *et al*. 2013 and Perin *et al*. 2007; river, Camargo & Giarizzo). Also, those studies employed different fishing gears, which tend to capture different species, as shown by Oliveira *et al*. (2014).

Jamari River has Samuel HPP, which was installed in 1989, and three other SHPs which were installed after 2015. We did not analyze the effects from those dams installed in the Jamari River basin, but literature shows that tropical rivers are the main targets for dam construction due to their high hydroelectric potential (ANA 2019), which also affects aquatic ecosystems (Fearnside 2014). In Brazil, the Amazon basin is already considered the final energy frontier, since the other basins of the country have their hydroelectric potential almost exhausted (Doria *et al*. 2018, ANEEL 2019). If, on the one hand, hydroelectric plants generate more energy, on the other they cause both environmental and socio-economic impacts. The most evident issue of dam construction is the habitat fragmentation with blocking of access between the spawning and initial development sites of the migratory species (Agostinho *et al*. 2002), which makes the development of new populations unfeasible.

Table 2. List of fish species from areas altered by the Canaã, Santa Cruz de Monte Negro and Jamari SHPs, and by the Samuel HPP, all in the Jamari River basin, Rondônia, Brazil. The presence in each sampling site is represented by an "x". Species which are new records for the Jamari and/or Madeira river basins are indicated by an "*". Species we were not capable to notify if they are new records are indicated by "?". The threat categories for species are in accordance with the IUCN (2019) Red List (Data Deficient = DD; Least Concern = LC). Species which do not have information in the IUCN (2019) are indicated by "-". In the Madeira River column, "a" represents species which were reported from the Madeira River basin in other papers, but not in Queiroz *et al*. (2013a); "b" represents those species which have been identified in Queiroz *et al*. with a different name (see Material and Methods to more information). The numbers in the header represent the sample stations (see Figure 1). *Characidium* aff. *zebra* was collected in our work, but it was not deposited at NUP. References for classification are in Material and Methods.

Classification	Sampling sites											New records		IUCN	Voucher
	1	2	3	4	5	6	7	8	9	10	11	Jamari River	Madeira River		
CHONDRICHTHYES															
MYLIOBATIFORMES															
Potamotrygonidae															
Potamotrygon falkneri Castex & Maciel 1963	x											*		DD	NUP 19827
Potamotrygon orbignyi (Castelnau 1855)		x						x				*		LC	NUP 19376
OSTEICHTHYES															
CLUPEIFORMES															
Engraulidae															
Lycengraulis batesii (Günther 1868)														LC	INPA 10401, INPA 12092
Pristigasteridae															
Ilisha amazonica (Miranda Ribeiro 1920)												*		LC	INPA 7451, INPA 16249
Pellona castelnaeana Valenciennes 1847														LC	INPA 15154
Pellona flavipinnis (Valenciennes 1837)														LC	INPA 7450
CHARACIFORMES															
Crenuchidae															
Characidiinae															
Characidium aff. *zebra* Eigenmann 1909					x		x			x		*		-	INPA 14143
Characidium etheostoma Cope 1872					x					x		*		-	NUP 19333
Erythrinidae															
Hoplerythrinus unitaeniatus (Spix & Agassiz 1829)		x										*		-	NUP 19389
Hoplias gr. *malabaricus* (Bloch 1794)	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19747
Anostomidae															
Anostomoides atrianalis Pellegrin 1909												*		-	INPA 10621, INPA 15182, INPA 15185, INPA 15193
Gnathodolus bidens Myers 1927												*		-	INPA 48820
Hypomasticus pachycheilus (Britski 1976)	x											*		-	NUP2 1266, INPA 1371
Laemolyta proxima (Garman 1890)	x	x	x	x		x		x		x	x			-	NUP 19352
Laemolyta taeniata (Kner 1858)	x	x		x				x			x			-	NUP 19526
Leporellus vittatus (Kner 1858)	x							x				*		-	NUP 19320
Leporinus bleheri Géry 1999								x				*	a	-	NUP 19446
Leporinus brunneus Myers 1950												*		-	INPA 15403, INPA 15411
Leporinus fasciatus (Bloch 1794)	x		x	x	x	x	x	x	x	x	x			-	NUP 19531
Leporinus friderici (Bloch 1794)	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19353
Leporinus jamesi Garman 1929												*		-	INPA 52170
Leporinus jatuncochi Ovchynnyk 1971	x				x	x	x	x			x	*	b	-	NUP 19381
Leporinus niceforoi Fowler 1943	x	x	x	x	x	x	x	x	x	x			b	LC	NUP 19375
Leporinus sp.		x		x	x	x	x	x	x	x		*	*	-	NUP 19345
Megaleporinus trifasciatus (Steindachner 1876)								x				*		-	NUP 19745
Petulanos intermedius (Winterbottom 1980)													a	-	INPA 15183

Continuation Table 2.

Classification	Sampling sites											New records		IUCN	Voucher
	1	2	3	4	5	6	7	8	9	10	11	Jamari River	Madeira River		
Pseudanos gracilis (Kner 1858)											x	*		-	NUP 20794
Pseudanos trimaculatus (Kner 1858)					x		x	x	x	x	x			-	NUP 19318
Rhytiodus argenteofuscus Kner 1858														-	INPA 10638
Schizodon fasciatus Spix & Agassiz 1829	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19332
Chilodontidae															
Caenotropus labyrinthicus (Kner 1858)	x		x					x	x	x	x			-	NUP 19439
Caenotropus schizodon Scharcansky & Lucena 2007	x		x	x			x	x	x	x	x	*		-	NUP 19361
Curimatidae															
Curimata cyprinoides (Linnaeus 1766)								x		x		*	*	-	NUP 19341
Curimatella meyeri (Steindachner 1882)								x		x	x			-	NUP 20754
Cyphocharax leucostictus (Eigenmann & Eigenmann 1889)	x	x				x		x	x	x	x	?		-	NUP 19553
Cyphocharax notatus (Steindachner 1908)	x	x		x	x	x	x	x	x	x	x	*		-	NUP 19480
Cyphocharax spiluropsis (Eigenmann & Eigenmann 1889)	x	x	x	x	x	x	x	x	x	x	x	?		-	NUP 19479
Potamorhina altamazonica (Cope 1878)	x			x		x	x	x			x			-	NUP 19542
Potamorhina latior (Spix & Agassiz 1829)	x						x				x			-	NUP 21267
Psectrogaster amazonica Eigenmann & Eigenmann 1889	x											*		-	NUP 19541
Psectrogaster essequibensis (Günther 1864)	x	x	x	x		x	x	x	x	x	x			-	NUP 19362
Steindachnerina guentheri (Eigenmann & Eigenmann 1889)	x	x			x	x	x	x	x	x		*		-	NUP 19400
Cynodontidae															
Cynodon gibbus (Spix & Agassiz 1829)														-	INPA 16341
Hydrolycus armatus (Jardine 1841)	x											*		-	Uncatalogued
Hydrolycus scomberoides (Cuvier 1819)														-	INPA 13291
Hydrolycus tatauaia Toledo-Piza, Menezes & Santos 1999														-	INPA 13281
Rhaphiodon vulpinus Spix & Agassiz 1829	x		x			x		x			x			-	NUP 19356
Hemiodontidae															
Hemiodus gracilis Günther 1864		x	x	x	x		x	x	x	x		?		-	NUP 19336
Hemiodus unimaculatus (Bloch 1794)	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19548
Parodontidae															
Apareiodon sp.	x	x		x	x	x		x	x	x		*		-	NUP 19455
Prochilodontidae															
Prochilodus nigricans Spix & Agassiz 1829	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19321
Serrasalmidae															
Colossoma macropomum (Cuvier 1816)			x	x	x			x				*		-	NUP 20797
Metynnis lippincottianus (Cope 1870)	x	x	x	x	x				x	x	x	*		-	NUP 19493
Metynnis maculatus (Kner 1858)		x			x							*		-	NUP 19383
Myleus setiger Müller & Troschel 1844		x				x	x		x			?		-	NUP 19576
Myloplus asterias (Müller & Troschel 1844)	x	x	x	x	x	x	x	x		x		?		-	NUP 19515
Myloplus rubripinnis (Müller & Troschel 1844)	x	x	x	x	x	x	x	x	x	x		?		-	NUP 19842
Myloplus zorroi Andrade, Jégu & Giarrizzo 2016	x	x	x		x	x	x	x	x	x	x	?	a	-	NUP 19843
Mylossoma albiscopum (Cope 1872)											x		a	-	NUP 21268
Serrasalmus compressus Jégu, Leão & Santos 1991	x	x	x	x	x	x	x	x	x	x	x	?		-	NUP 19834
Serrasalmus eigenmanni Norman 1929		x	x	x	x	x	x	x	x	x	x			-	NUP 19330
Serrasalmus maculatus Kner 1858	x						x		x	x		?		-	NUP 19837
Serrasalmus rhombeus (Linnaeus 1766)	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19818

 http://dx.doi.org/10.1590/1676-0611-BN-2019-0803

Continuation Table 2.

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	1	2	3	4	5	6	7	8	9	10	11	Jamari River	Madeira River		
Serrasalmus spilopleura Kner 1858	x	x	x		x		x	x	x	x		?		-	NUP 19436
Acestrorhynchidae															
Acestrorhynchinae															
Acestrorhynchus falcatus (Bloch 1794)		x			x	x								-	NUP 19388
Acestrorhynchus falcirostris (Cuvier 1819)														-	INPA 15260
Acestrorhynchus heterolepis (Cope 1878)	x	x	x	x	x	x	x	x	x	x	x	*		-	NUP19354
Acestrorhynchus microlepis (Jardine 1841)	x	x	x	x	x	x	x	x	x	x	x			-	NUP19366
Bryconidae															
Brycon amazonicus (Agassiz 1829)														LC	INPA 16383
Brycon falcatus Müller & Troschel 1844	x	x	x			x		x		x				-	NUP 19386
Brycon melanopterus (Cope 1872)														-	INPA 16446
Brycon pesu Müller & Troschel 1845	x			x			x		x	x				-	NUP 19348
Chalceidae															
Chalceus epakros Zanata & Toledo-Piza 2004	x		x	x			x	x	x			?		-	NUP 19441
Characidae															
Stethaprioninae															
Astyanax anterior Eigenmann 1908		x			x							?		-	NUP 19549
Astyanax gr. *bimaculatus* (Linnaeus 1758)			x				x		x			?		-	NUP 19413
Astyanax guaporensis Eigenmann 1911	x							x				?	b	LC	NUP 20714
Astyanax guianensis Eigenmann 1909	x					x					x	?	b	-	NUP 20790
Astyanax cf. *maximus* (Steindachner 1876)		x			x	x						?		-	NUP 19442
Astyanax multidens Eigenmann 1908	x										x	?	*	-	NUP 19422
Astyanax sp.	x	x	x		x	x	x	x		x	x	?	*	-	NUP 19560
Ctenobrycon spilurus (Valenciennes 1850)	x	x	x	x	x	x	x	x	x		x	*		-	NUP 19404
Hemigrammus geisleri Zarske & Géry 2007	x	x		x	x	x	x	x	x	x	x	*		-	NUP 19406
Hemigrammus ocellifer (Steindachner 1882)												*		-	INPA 20838
Hemigrammus vorderwinkleri Géry 1963						x						*		-	NUP 19410
Hyphessobrycon diancistrus Weitzman 1977											x	*		-	NUP 20779
Hyphessobrycon sweglesi (Géry 1961)						x						*		-	NUP 19409
Hyphessobrycon sp.						x						?	*	-	NUP 21269
Jupiaba acanthogaster (Eigenmann 1911)		x			x	x	x	x	x	x		*		-	NUP 19419
Jupiaba anteroides (Géry 1965)												?		-	INPA 16535
Jupiaba cf. *scologaster* (Weitzman & Vari 1986)	x	x	x		x		x	x		x	x	?	*	-	NUP 19425
Jupiaba zonata (Eigenmann 1908)	x	x			x	x	x	x		x		?		-	NUP 19418
Microschemobrycon callops Böhlke 1953		x		x	x	x	x	x	x	x		*		-	NUP 19417
Microschemobrycon guaporensis Eigenmann 1915	x	x			x	x	x	x	x	x	x	*		-	NUP 19459
Microschemobrycon melanotus (Eigenmann 1912)		x			x	x		x			x	*		-	NUP 19496
Moenkhausia abyss Oliveira & Marinho 2016	x							x			x	?	b	-	NUP 19568
Moenkhausia ceros Eigenmann 1908												*		-	INPA 10767, INPA 11116, INPA 20891
Moenkhausia collettii (Steindachner 1882)	x	x	x		x	x	x	x		x	x	*		-	NUP 19719
Moenkhausia cotinho Eigenmann 1908												*		-	INPA 20921
Moenkhausia gr. *dichroura* (Kner 1858)					x							?	?	-	NUP 19506
Moenkhausia gracilima Eigenmann 1908	x	x		x	x	x	x	x	x	x	x	?		-	NUP 19570
Moenkhausia grandisquamis (Müller & Troschel 1845)	x				x						x	*		-	NUP 19347
Moenkhausia hasemani Eigenmann 1917	x	x		x	x	x	x	x		x	x	?	b	-	NUP 19469
Moenkhausia mikia Marinho & Langeani 2010	x	x			x	x	x	x		x	x	?	*	-	NUP 19449

Continuation Table 2.

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Moenkhausia oligolepis (Günther 1864)		x			x	x	x	x		x		*		-	NUP 19370
Moenkhausia pankilopteryx Bertaco & Lucinda 2006	x	x	x	x	x	x	x	x		x	x	*		-	NUP 19408
Moenkhausia sp.		x			x	x		x		x	x	*	*	-	NUP 19720
Poptella compressa (Günther 1864)	x	x	x	x	x	x	x	x	x	x	x			-	NUP 21270
Thayeria sp. "hemiodus"	x							x			x	*		-	NUP 19483
Stevardiinae															
Creagrutus cf. *beni* Eigenmann 1911		x										*		-	NUP 20733
Creagrutus sp.	x	x	x		x	x	x	x	x	x	x	*	*	-	NUP 19579
Knodus heteresthes (Eigenmann 1908)	x	x		x	x	x	x	x	x	x	x	*		-	NUP 19384
Xenurobrycon cf. *pteropus* Weitzman & Fink 1985		x				x						*	*	-	NUP 19520
Tetragonopterinae															
Tetragonopterus chalceus Spix & Agassiz 1829	x	x	x		x	x	x	x	x	x	x	?		-	NUP 19475
Characinae															
Charax pauciradiatus (Günther 1864)		x			x	x	x			x	x	*	a	-	NUP 19561
Phenacogaster retropinnus Lucena & Malabarba 2010	x	x	x		x	x	x	x	x	x	x	*		-	NUP 19416
Roeboides affinis (Günther 1868)	x	x	x	x	x	x	x	x	x	x	x			LC	NUP 19349
Cheirodontinae															
Serrapinnus microdon (Eigenmann 1915)						x	x					*		-	NUP 19528
Serrapinnus notomelas (Eigenmann 1915)		x					x	x	x	x		*		-	NUP 19405
Ctenoluciidae															
Boulengerella cuvieri (Spix & Agassiz 1829)	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19444
Boulengerella maculata (Valenciennes 1850)														-	INPA 7335, INPA 7336
Iguanodectidae															
Bryconops aff. *caudomaculatus* (Günther 1864)	x	x	x	x	x	x	x	x	x	x	x	?		-	NUP 19317
Bryconops gracilis (Eigenmann 1908)	x	x	x	x	x	x	x	x	x	x	x	*	*	LC	NUP 20708
Bryconops cf. *melanurus* (Bloch 1794)	x	x	x	x	x	x	x	x	x	x	x	*	*	-	NUP 21272
Iguanodectes variatus Géry 1993												*		-	INPA 16406
Lebiasinidae															
Pyrrhulininae															
Nannostomus digrammus (Fowler 1913)												*		-	INPA 44369
Triportheidae															
Agoniatinae															
Agoniates halecinus Müller & Troschel 1845	x	x	x	x				x	x	x	x	?		-	NUP 19492
Triportheinae															
Triportheus angulatus (Spix & Agassiz 1829)	x							x			x			-	NUP 19421
GYMNOTIFORMES															
Gymnotidae															
Electrophorus electricus (Linnaeus 1766)					x	x		x		x				LC	NUP 19828
Gymnotus carapo madeirensis Craig, Crampton & Albert 2017		x	x		x			x	x			*		-	NUP 19535
Gymnotus aff. *javari* Albert, Crampton & Hagedorn 2003												*	*	-	INPA 9841
Gymnotus gr. *pantherinus* (Steindachner 1908)												*	*	-	INPA 9838
Gymnotus sp.									x			*	?	-	NUP 21273
Apteronotidae															
Apteronotus albifrons (Linnaeus 1766)			x									*		-	NUP 19574
Apteronotus cf. *caudimaculosus* de Santana 2003									x			*	*	-	Uncatalogued

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Classification	Sampling sites											New records		IUCN	Voucher
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Hypopomidae															
Brachyhypopomus beebei (Schultz 1944)												*		-	INPA 19947
Rhamphichthyidae															
Gymnorhamphichthys rondoni (Miranda Ribeiro 1920)						x	x					*		-	NUP 20738
Rhamphichthys rostratus (Linnaeus 1766)		x			x	x		x	x	x	x	?		-	NUP 19836
Sternopygidae															
Eigenmannia limbata (Schreiner & Miranda Ribeiro 1903)			x									*		-	NUP 21274
Eigenmannia gr. *trilineata* López & Castello 1966	x	x	x	x	x	x	x	x	x	x	x	?	*	-	NUP 19575
Rhabdolichops caviceps (Fernández-Yépez 1968)												*	*	-	INPA 27966
Sternopygus macrurus (Bloch & Schneider 1801)		x			x	x	x	x		x		*		-	NUP 19371
SILURIFORMES															
Callichthyidae															
Callichthys callichthys (Linnaeus 1758)												*		-	INPA 48761
Corydoras similis Hieronimus 1991		x				x		x				*		-	NUP 20709
Corydoras sp.					x							*	?	-	NUP 21275
Hoplosternum littorale (Hancock 1828)												*		-	INPA 11169
Megalechis picta (Müller & Troschel 1849)												*		-	INPA 11176
Loricariidae															
Rhinelepinae															
Pseudorinelepis genibarbis (Valenciennes 1840)														-	INPA 7340
Loricariinae															
Farlowella smithi Fowler 1913							x					*		-	NUP 19556
Loricaria cataphracta Linnaeus 1758	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19585
Rineloricaria castroi Isbrücker & Nijssen 1984						x						?		-	NUP 19597
Hypoptopomatinae															
Otocinclus mangaba Lehmann A., Mayer & Reis 2010							x					*		-	NUP 20775
Hypostominae															
Ancistrus cf. *dolichopterus* Kner 1854	x	x			x	x	x	x				?	b	LC	NUP 19322
Ancistrus sp.					x	x	x	x	x	x		?	b	-	NUP 19337
Hypostomus cf. *hemicochliodon* Armbruster 2003	x	x	x	x	x	x	x	x	x	x	x	?	*	-	NUP 19603
Hypostomus sp.	x	x	x		x		x	x	x	x	x	?		-	NUP 19587
Lasiancistrus schomburgkii (Günther 1864)	x	x	x		x	x	x	x	x	x	x	*		LC	NUP 19338
Leporacanthicus galaxias Isbrücker & Nijssen 1989	x										x		a	-	NUP 19423
Peckoltia brevis (La Monte 1935)	x		x					x	x	x	x	?	*	-	NUP 19343
Peckoltia cf. *ephippiata* Armbruster, Werneke & Tan 2015	x	x	x		x	x	x	x	x	x	x	?	b	-	NUP 19346
Pterygoplichthys disjunctivus (Weber 1991)								x				?	b	-	NUP 19323
Trichomycteridae															
Henonemus punctatus (Boulenger 1887)	x											*		-	NUP 20704
Typhlobelus sp.										x		*	?	-	NUP 20722
Vandellia beccarii Di Caporiacco 1935	x											*	*	-	NUP 21276
Aspredinidae															
Pterobunocephalus depressus (Haseman 1911)						x	x					*		-	NUP 19378
Auchenipteridae															
Ageneiosus inermis (Linnaeus 1766)	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19753
Auchenipterichthys coracoideus (Eigenmann & Allen 1942)		x	x	x		x		x			x	?		LC	NUP 19364

Continuation Table 2.

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Auchenipterichthys cf. *punctatus* (Valenciennes 1840)												*	*	-	INPA 22669
Auchenipterus nuchalis (Spix & Agassiz 1829)	x		x	x	x	x		x	x	x	x			LC	NUP 19367
Centromochlus heckelii (De Filippi 1853)														-	INPA 10904, INPA 10944, INPA 10959
Duringlanis altae (Fowler 1945)								x				*		DD	NUP 20784
Parauchenipterus porosus (Eigenmann & Eigenmann 1888)		x	x	x	x	x	x	x	x	x	x	?		-	NUP 19365
Tatia orca (Sarmento-Soares, Lazzarotto, Rapp Py-Daniel & Leitão 2017)			x			x			x	x	x	*	*	-	NUP 19327
Tympanopleura brevis (Steindachner 1881)			x					x		x		*		-	Uncatalogued
Cetopsidae															
Cetopsidium sp.												*	*	-	INPA 6503
Doradidae															
Acanthodoras cf. *cataphractus* (Linnaeus 1758)						x						*		-	NUP 20746
Acanthodoras spinosissimus (Eigenmann & Eigenmann 1888)												*		-	INPA 12151
Leptodoras praelongus (Myers & Weitzman 1956)												*		-	INPA 26730
Nemadoras humeralis (Kner 1855)												*		-	INPA 21427
Opsodoras morrisi (Eigenmann 1925)												*	b	-	INPA 12178, INPA 22970
Ossancora fimbriata (Kner 1855)												*		LC	INPA 12155
Oxydoras niger (Valenciennes 1821)	x		x	x	x		x	x	x					-	NUP 19355
Platydoras armatulus (Valenciennes 1840)	x	x	x	x	x	x	x	x	x			*		-	NUP 19350
Tenellus leporhinus (Eigenmann 1912)												*	*	-	INPA 22005, INPA 49999
Tenellus ternetzi (Eigenmann 1925)	x					x	x	x		x	x	*	b	-	NUP 19569
Heptapteridae															
Phenacorhamdia sp.												*	?	-	INPA 8003
Pimelodella serrata Eigenmann 1917	x	x	x	x	x	x	x	x	x	x	x	?		-	NUP 19326
Rhamdia sp.		x				x						*	b	-	Uncatalogued
Pimelodidae															
Brachyplatystoma vaillantii (Valenciennes 1840)												*		-	INPA 14439
Calophysus macropterus (Lichtenstein 1819)														-	INPA 5981, INPA 22883
Hemisorubim platyrhynchos (Valenciennes 1840)	x	x	x	x	x	x	x	x	x	x				-	NUP 19750
Hypophthalmus oremaculatus Nani & Fuster 1947	x		x	x				x	x	x	x		b	-	NUP 19465
Leiarius pictus (Müller & Troschel 1849)						x					x	*		-	NUP 20806
Megalonema sp.	x	x			x	x	x	x		x		*	?	-	NUP 19372
Pimelodus albofasciatus Mees 1974	x	x	x	x	x	x	x	x	x	x	x		a	-	NUP 19358
Pimelodus blochii Valenciennes 1840	x		x	x			x	x	x	x	x			-	NUP 19357
Pimelodus ornatus Kner 1858	x	x			x	x	x	x	x	x	x	*		-	NUP 19756
Pimelodus sp.	x		x	x	x		x	x	x	x		*	*	-	NUP 19486
Pinirampus pirinampu (Spix & Agassiz 1829)	x		x					x	x		x			-	NUP 21277
Pseudoplatystoma punctifer (Castelnau 1855)	x	x	x	x	x	x	x	x	x	x	x			-	NUP 19373
Pseudoplatystoma tigrinum (Valenciennes 1840)	x			x										-	NUP 19360
Sorubim elongatus Littmann, Burr, Schmidt & Isern 2001	x		x					x		x	x	?		-	NUP 19527
Pseudopimelodidae															
Batrochoglanis sp. "aff. *B. villosus*"						x						*		-	NUP 20681, INPA 9518

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Rhyacoglanis sp.												*	b	-	INPA 9517
Pseudopimelodus bufonius (Valenciennes 1840)							x					*		-	NUP 19407
SYNBRANCHIFORMES															
Synbranchidae															
Synbranchus sp.												*	?	-	INPA 11065
PLEURONECTIFORMES															
Achiridae															
Hypoclinemus mentalis (Günther 1862)												*		-	INPA 11014
CICHLIFORMES															
Cichlidae															
Acaronia nassa (Heckel 1840)														-	INPA 7611, INPA 7612, INPA 12093
Aequidens tetramerus (Heckel, 1840)				x		x	x			x		*		-	NUP 19382
Apistogramma pulchra Kullander 1980												*		-	INPA 7663, INPA 11877
Apistogramma resticulosa Kullander 1980			x									*		-	NUP 19514
Biotodoma cupido (Heckel 1840)												*		-	INPA 11652
Chaetobranchus flavescens Heckel 1840		x										*		-	NUP 19387
Cichla pinima Kullander & Ferreira 2006	x	x	x	x	x			x	x	x		?		-	NUP 19315
Cichla pleiozona Kullander & Ferreira 2006	x	x	x	x	x	x	x	x	x	x	x	?		-	NUP 19313
Cichlasoma boliviense Kullander 1983					x	x	x					*		-	NUP 19334
Crenicichla johanna Heckel 1840	x		x	x	x		x	x	x	x				-	NUP 19335
Crenicichla marmorata Pellegrin 1904												?		-	INPA 1505, INPA 1506, INPA 1799, INPA 2101, INPA 2102, INPA 2950
Crenicichla semicincta Steindachner 1892			x									?		-	NUP 19512
Geophagus cf. *neambi* Lucinda, Lucena & Assis 2010	x											?	*	-	NUP 19463
Geophagus sp. 1	x	x	x	x	x	x	x	x	x	x	x	?	*	-	NUP 19504
Geophagus sp. 2			x					x	x	x		?	*	-	NUP 19507
Heros spurius Heckel 1840														-	INPA 7672
Hypselecara temporalis (Günther 1862)						x								-	NUP 19325, INPA 7568
Mesonauta festivus (Heckel 1840)														-	INPA 7774
Pterophyllum scalare (Schultze 1823)												*		-	INPA 10491
Satanoperca curupira Ota, Kullander, Deprá, da Graça & Pavanelli 2018		x	x	x		x	x	x	x	x			a	-	NUP 19328
Satanoperca jurupari (Heckel 1840)		x	x	x	x	x	x	x						-	NUP 19402
BELONIFORMES															
Belonidae															
Potamorrhaphis guianensis (Jardine 1843)											x	*		-	NUP 20773
TETRAODONTIFORMES															
Tetraodontidae															
Colomesus cf. *asellus* (Müller & Troschel 1849)												*		-	INPA 9255, INPA 9258
INCERTAE SEDIS															
Sciaenidae															
Pachypops fourcroi (Lacepède 1802)	x		x					x			x	*		-	NUP 19543

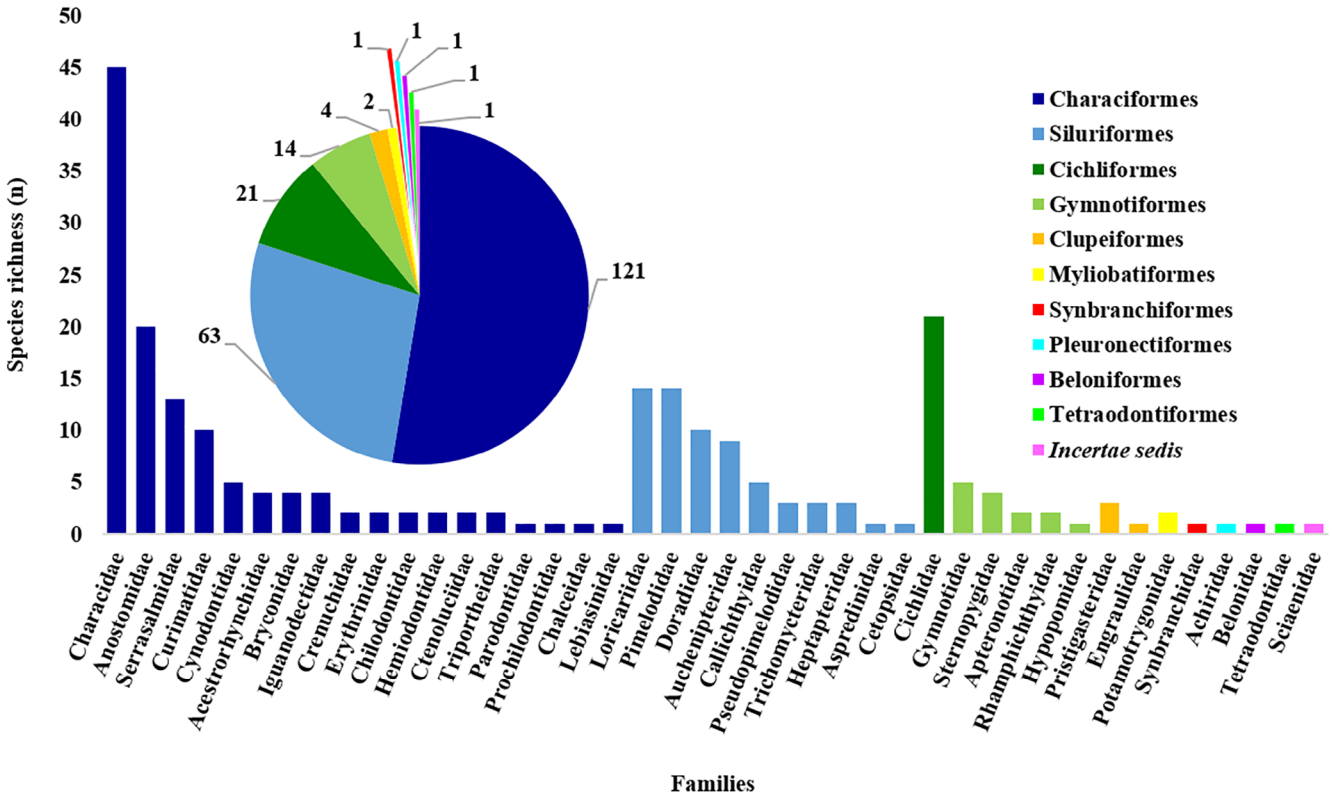

Figure 2. Distribution of number of species by families and orders.

Many migratory fish species have commercial importance for the State of Rondônia, for example, branquinha-cascuda (*Psectrogaster amazonica*), curimatã (*Prochilodus nigricans*), cuiu-cuiu (*Oxydoras niger*), barba-chata (*Pinirampus pirinampu*), among others (Doria *et al*. 2012). However, it is common for anglers to be excluded from plans for the construction of hydroelectric dams, mitigation and compensation of social and ecological impacts (Doria *et al*. 2018).

The Jamari River presented high species richness (230) compared to the other tributaries of Madeira River in which studies were carried out. Among them, 48 in streams of the urban region of Rondônia (Perin 2007), 133 in the preservation area of Marmelos River (Camargo & Giarrizzo 2007), 448 in Aripuanã River and in the middle Madeira River (Rapp Py-Daniel *et al*. 2007), 74 in Belmont Stream (Araújo *et al*. 2009), 174 in the middle Madeira River (Torrente-Vilara *et al*. 2011), 160 in Guariba and Roosevelt Rivers (Pedroza *et al*. 2012), 189 in Cuniã Lake (Queiroz *et al*. 2013b), 40 in streams of the Machado River basin (Casatti *et al*. 2013) and 74 species in Tarumã River, also belonging to the Machado River basin (Costa *et al*. 2017). Richness varies depending on the size and age of the reservoir and on the sampled basin, where the river basins of the Amazon region are richer when compared to others in the Neotropical region (Agostinho *et al*. 2016). Even though species richness increases in the initial years of the reservoir (heterotrophic phase) (Agostinho *et al*. 2007), it is only a reflection of the connection of different biotopes previously isolated (Agostinho *et al*. 2007, Agostinho *et al*. 2016), occurring the inverse later, whereas only tolerant species survive in the new environment (Agostinho *et al*. 2016). Due to the high species richness and the presence of migratory fish, it is essential to carry out continuous monitoring of the Jamari River ichthyofauna, in order to detect potential impacts generated by SHPs in the subsequent years. Also, the enhanced knowledge that would be obtained through continuous sampling would result in better decisions regarding environmental management of the basin, avoiding negative impacts on the diversity and distribution of the fish assemblage.

 http://dx.doi.org/10.1590/1676-0611-BN-2019-0803

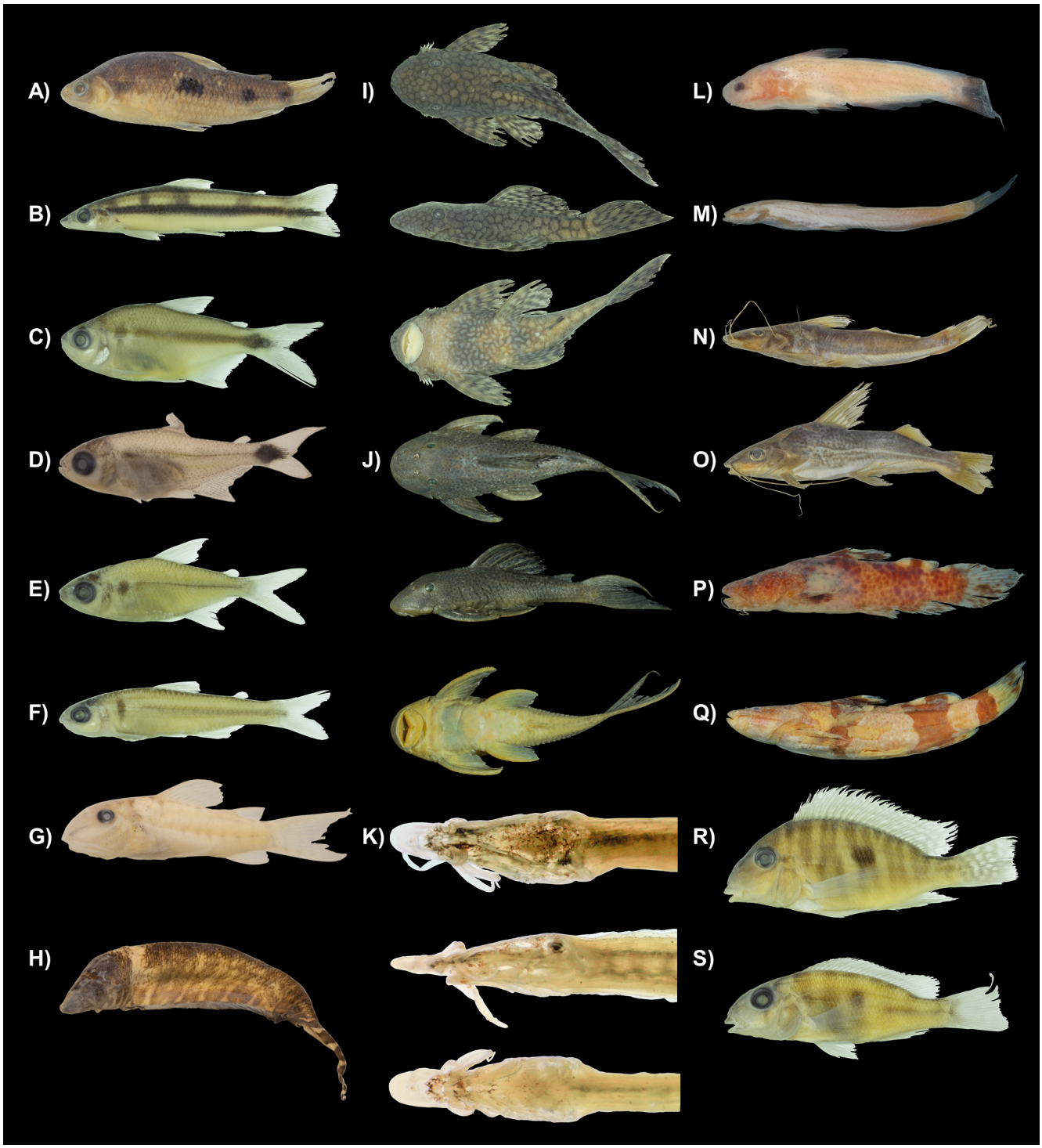

Figure 3. Putatively new species of Jamari River basin. A) *Leporinus* sp., NUP19345, 154.0 mm SL; B) *Apareiodon* sp., NUP9455, 65.4 mm SL; C) *Astyanax* sp., NUP19560, 50.0 mm SL; D) *Hyphessobrycon* sp., NUP21269, 14.0 mm SL; E) *Moenkhausia* sp., NUP19720, 24.0 mm SL; F) *Creagrutus* sp. 1, NUP19579, 33.0 mm SL; G) *Corydoras* sp., NUP21275, 19.0 mm SL; H) *Gymnotus* sp., NUP21273, 160.0 mm SL; I) *Ancistrus* sp. 1, NUP19337, 60.0 mm SL; J) *Hypostomus* sp., NUP19587, 107.0 mm SL; K) *Typhlobelus* sp., NUP20722, 28.0 mm SL; L) *Cetopsidium* sp., INPA6503, 22.3 mm SL; M) *Phenacorhamdia* sp., INPA8003 55.0 mm SL; N) *Megalonema* sp., NUP19372, 161.0 mm SL; O) sp., NUP19486, 152.0 mm SL; P) *Batrochoglanis* sp. "aff. B. villosus", INPA9518, 44.2 mm SL; Q) *Rhyachoglanis* sp., INPA9517, 58.5 mm SL; R) *Geophagus* sp. 1, NUP19504, 89.8 mm SL; S) *Geophagus* sp. 2, NUP19507, 29.6 mm SL.

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Author contributions

Rianne Caroline de Oliveira: Substantial contribution in the concept and design of the study; Contribution to data analysis and interpretation; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

Gabriel de Carvalho Deprá: Substantial contribution in the concept and design of the study; Contribution to data analysis and interpretation; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

Cláudio Henrique Zawadzki: Substantial contribution in the concept and design of the study; Contribution to data analysis and interpretation; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

João Carlos Barbosa da Silva: Substantial contribution in the concept and design of the study; Contribution to data collection; Contribution to data analysis and interpretation; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

Weferson Júnio da Graça: Substantial contribution in the concept and design of the study; Contribution to data analysis and interpretation; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

Conflicts of interest

The authors declare that they have no conflict of interest related to the publication of this manuscript.

Ethics

The specimens were collected with authorizations 01/2015, 02/2015 and 03/2015 sent by the Secretaria de Estado do Desenvolvimento Ambiental (SEDAM) provided to João Carlos Barbosa da Silva from Biologic Consultoria Ambiental.

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