Oecologia Australis
23(3):606-619, 2019
https://doi.org/10.4257/oeco.2019.2303.17

STREAM FISH IN THE ARIPUANÃ RIVER UPSTREAM AND DOWNSTREAM OF THE DARDANELOS-ANDORINHAS WATERFALL COMPLEX, STATE OF MATO GROSSO, BRAZIL

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Abstract: The Aripuanã River basin is part of one of the most biodiverse hydrographic basins on the planet; however, the lack of information on fish diversity in the basin is notable, particularly upstream to the Dardanelos and Andorinhas waterfalls complex. For this study, we sampled 50 m stretches of 71 streams in the Aripuanã River basin, upstream and downstream of the Dardanelos and Andorinhas waterfalls complex. Sampling occurred in the drought period in 2013 and 2014. A total of 11,334 specimens were capture, belonging to five orders, 21 families and 80 species. Among the 80 species, 71 were caught in the downstream and 45 in the upstream region. Overall, there were 36 species in both upstream and downstream samples, 35 exclusive to the downstream segment, and nine were restricted to the upstream region. Despite the low levels of current knowledge, at least 15 endemic fish species could be present in the Aripuanã River basin, and four from these 15 species were sampled in this study. Dardanelos and Andorinhas waterfalls complex are important barriers and we found significant differences in fish assemblage between upstream and downstream regions.

Keywords: Amazon basin; Aripuanã River basin; ichthyofauna; stream; waterfall barrier.

INTRODUCTION

The Amazon basin extends across 8 million km² (Sioli 1984, Dagosta & Pinna 2017) and drains lowlands in Brazil, Colombia, Ecuador, Peru and Bolivia (Goulding *et al.* 2003), and exhibits a rich aquatic biodiversity. The number of fish species inhabiting the Amazon basin is outstanding, with 57 families, 525 genera and 2,411 fish species, of which 111 genera (21%) and 1,089 species (45%) are endemic to the basin (Reis *et al.* 2016). However, this region is highly threatened by deforestation, habitat degradation and hydropower (Lees *et al.* 2016). In addition to immediate local effects, a wide variety of impacts on the terrestrial and aquatic biodiversity resulting from dam construction have been documented (see Lees *et al.* 2016 for review).

The Aripuanã River is a tributary from the Madeira River, which, with 820 fish species recorded, is one of the most species-rich rivers in the Amazon basin (Queiroz *et al.* 2013). However, the Madeira River basin could harbor well more than 1,000 fish species (Queiroz *et al.* 2013). The ichthyofauna of the Aripuanã River basin is little known, mainly upstream of the Dardanelos-Andorinhas complex with only two studies done so far. The first, made in the middle Madeira and lower portion of Aripuanã River (Rapp Py-Daniel *et al.* 2007) recorded 447 fish species, and the second study, made by Fernandes *et al.* (2013), in downstream and near the Dardanelos-Andorinhas complex falls captured 55 fish species. Accordingly, the present study aimed to describe the ichthyofauna from streams of first, second and third order localized downstream and upstream the Dardanelos-Andorinhas waterfalls complex in the Aripuanã River.

The waterfalls act as natural ecological barriers limiting fish dispersal processes which causes significant differences in species composition between rivers stretches located upstream and downstream of the waterfall (Jönck & Aranha 2010, Torrente-Vilara *et al.* 2011). Besides that, waterfall may affect genetic structure and increase genetic distance between local populations (Kano *et al.* 2012).

Surveys were performed between July and September (drought season) in 2013 and 2014, at 71 streams, of which 45 were first, 24 were second and 2 were of third order. In order to standardize the stream order (1st to 3rd orders sensu Strahler 1957), we used the hydrological model S.W.A.T. (Soil and Water Assessment Tools, available at www.usgs.gov). Sampling streams were located both upstream (40 sites) and downstream (31 sites) from the Dardanelos-Andorinhas waterfalls complex, in order to evaluate the effect of waterfalls as natural barriers.

MATERIAL AND METHODS

Study area

Sampling streams are in the Northwest region of the State of Mato Grosso, and are tributaries of the Aripuanã River (Madeira River basin), Meridional Amazon (Table 1). The Dardanelos-Andorinhas complex, in the Aripuanã River is one of the highest waterfalls in the Brazilian Amazon (Soares 1979). It has a 3 km-long stretch that is nearly 120 m high and represents a natural barrier to the movement of many aquatic organisms (Flausino-Junior *et al.* 2016). The Aripuanã river basin itself is in a transition region between the Amazonian forest and Cerrado domains that occur in the Central Plateau and the waterfall complex represents the contact between the Chapada de Dardanelos and the Amazonian Depression (Porsani *et al.* 2017).

According to the Köppen classification, the regional climate is Am - monsoon. The rainy season

Table 1. Sampling sites in the Aripuanã River basin, State of Mato Grosso, Brazil, geographic position, coordinates (Datum: SAD69) and elevation (meters).

Sites	Position	Latitude	Longitude	Order	Elevation (m)
P01	Upstream	10° 10’ 38.98” S	59° 21’ 47.27” W	First	308
P02	Upstream	10° 8’41.37” S	59° 18’ 36.25” W	First	291
P03	Upstream	10° 8’ 34.11” S	59° 17’ 32.26” W	First	286
P04	Upstream	10° 7’ 37.66” S	59° 25’ 28.19” W	First	293
P05	Upstream	10° 8’ 14.67” S	59° 24’ 53.66” W	First	303
P06	Upstream	10°10’ 38.54” S	59° 20’ 19.58” W	Second	287
P07	Upstream	10°10’ 27.44” S	59° 21’ 38.02”W	First	293
P08	Upstream	10° 9’ 18.57” S	59° 26’ 4.41”W	Second	299
P09	Upstream	10° 9’ 45.99” S	59° 26’ 25.73”W	First	302
P10	Upstream	10° 10’ 31.81” S	59° 25’ 49.73”W	Second	277
P11	Upstream	10° 16’ 36.89” S	59° 26’ 54.26” W	Second	282

Table 1. Continued on next page…

Table 1. ...Continued

Sites	Position	Latitude	Longitude	Order	Elevation (m)
P12	Downstream	10° 13’ 49.54” S	59° 24’ 9.15” W	First	275
P13	Downstream	10° 9’ 55.20” S	59° 21’ 5.90” W	First	142
P14	Downstream	10° 9’ 10.84”S	59° 21’11.91” W	First	112
P15	Downstream	10° 8’ 11.10”S	59° 21’58.60” W	Second	114
P16	Downstream	10° 7’ 33.51” S	59° 22’ 5.44” W	Second	137
P17	Downstream	10° 8’ 40.64” S	59° 21’ 35.76” W	Second	247
P18	Downstream	10°20’49.23”S	59°27’ 25.06” W	Second	259
P19	Downstream	10°20’29.88”S	59°28’ 23.62” W	First	116
P20	Downstream	10° 19’ 58.84” S	59°29’ 57.86” W	Second	132
P21	Downstream	10° 21’ 1.26” S	59° 31’ 29.69” W	Second	228
P22	Upstream	10°21’18.71”S	59° 30’ 58.59” W	First	237
P23	Upstream	10°12’3.94”S	59°29’ 4.02” W	First	241
P24	Downstream	10° 12’ 15.59” S	59° 30’ 45.68” W	First	152
P25	Downstream	10° 11’ 35.69” S	59°32’ 16.17” W	First	111
P26	Downstream	10° 19’ 33.92” S	59° 33’ 8.14” W	First	134
P27	Downstream	10° 16’ 48.58” S	59° 33’ 7.63” W	First	108
P28	Downstream	10° 16’ 21.07” S	59° 33’ 1.82” W	First	135
P29	Upstream	10° 23’ 35.49” S	59°28’ 0.43” W	First	236
P30	Upstream	10° 22’ 16.68” S	59° 29’ 47.55” W	Second	225
P31	Upstream	10° 21’ 32.45” S	59° 33’ 5.45” W	Second	224
P32	Upstream	10° 21’ 51.74” S	59° 33’ 17.30” W	First	244
P33	Upstream	10° 7’ 43.40” S	59° 29’ 46.53” W	First	270
P34	Upstream	10° 7’ 46.26” S	59° 29’ 47.21” W	First	209
P35	Upstream	10° 8’ 9.10” S	59° 30’ 37.16” W	First	236
P36	Downstream	10° 2’ 49.22” S	59° 30’ 42.65” W	Second	241
P37	Upstream	10° 3’35.05” S	59° 30’ 55.68” W	Third	229
P38	Upstream	10° 4’47.99” S	59° 31’ 4.19” W	First	265
P39	Upstream	10° 2’ 42.72” S	59° 27’ 22.15” W	First	270
P40	Upstream	10° 2’ 45.53” S	59° 29’ 17.91” W	Second	220
P41	Upstream	10° 2’ 11.20”S	59° 25’ 44.26” W	First	296
P42	Upstream	10° 2’ 30.25” S	59° 25’ 19.59” W	First	286
P43	Upstream	10° 2’ 43.93” S	59° 24’ 6.13” W	First	286
P44	Downstream	10° 2’ 21.39” S	59° 23’ 29.10” W	First	160
P45	Downstream	10° 20’ 18.39”S	59° 33’ 11.95” W	First	161
P46	Downstream	10° 9’ 38.96” S	59° 29’ 45. 88” W	First	132
P47	Downstream	10° 6’ 52.93” S	59° 31’ 30.67” W	First	236
P48	Downstream	10°18’26.70” S	59° 23’ 1.99” W	First	161
P49	Downstream	10° 32’ 22.00” S	59° 24’ 29.62” W	Second	136
P50	Downstream	10° 33’ 15.27” S	59° 23’ 11.06” W	First	161
P51	Downstream	10° 32’ 30.68” S	59° 23’ 21.50” W	First	206
P52	Downstream	10° 29’ 59.08” S	59 °21’ 41.59” W	First	134

Table 1. Continued on next page…

Table 1. ...Continued

Sites	Position	Latitude	Longitude	Order	Elevation (m)
P53	Downstream	10° 26' 1.89" S	59° 21' 39.63" W	First	121
P54	Downstream	10° 21' 52.32"S	59° 21' 35.81" W	Third	134
P55	Downstream	10° 27' 52.99"S	59° 22' 2.13" W	Second	148
P56	Upstream	10° 26' 18.42"S	59° 22' 5.95" W	Second	242
P57	Downstream	10° 25' 41.05"S	59° 21' 16.53" W	Third	225
P58	Downstream	10° 21' 0.29" S	59° 21' 42.39" W	Second	160
P59	Upstream	10° 20' 1.96" S	59° 21' 58.87" W	First	241
P60	Upstream	10° 27' 34.78" S	59° 22' 5.67" W	First	247
P61	Upstream	10° 10' 38.98" S	59° 21' 47.27" W	First	277
P62	Upstream	10° 8'41.37" S	59° 18' 36.25" W	First	296
P63	Upstream	10° 8' 34.11" S	59° 17' 32.26" W	First	299
P64	Upstream	10° 7' 37.66" S	59° 25' 28.19" W	Second	271
P65	Upstream	10° 8' 14.67" S	59° 24' 53.66" W	Second	253
P67	Upstream	10°10' 38.54" S	59° 20' 19.58" W	First	250
P68	Upstream	10°10' 27.44" S	59° 21' 38.02"W	First	242
P69	Upstream	10° 9' 18.57" S	59° 26' 4.41"W	Second	234
P70	Upstream	10° 9' 45.99" S	59° 26' 25.73"W	Second	245
P71	Upstream	10° 10' 31.81" S	59° 25' 49.73"W	Second	262
P72	Upstream	10° 16' 36.89" S	59° 26' 54.26" W	Second	270

is usually from November to April (mean monthly precipitation: 233 mm). The drought season is from May to October (mean monthly precipitation: 37 mm). Mean annual rainfall is about 3000 mm (Alvares *et al.* 2013). The soil is predominantly red-yellow podzolic and litholic, and the vegetation consists of ombrophilous forest remnants mostly replaced by pasture used for cattle-raising, or gold extraction in the last three decades (Fernandes *et al.* 2013). For sample selection, we considered the order (first, second and third) in the Horton scale modified by Strahler (1957), and the accessibility of each stream based on those with mouths downstream and upstream of the Dardanelos-Andorinhas complex waterfalls (Figure 1). Thus, all the streams sampled are inserted in a modified landscape for activities of cattle raising, mining and construction of roads.

Stream characteristics

In each stream (Figure 2), we selected a 50-m stretch for sampling. Stream width (cm) and water velocity (m/s) were measured at four equidistant points in each station and the mean of the four measures were used to represent width and velocity. Nine measured of water depth (cm) was done along a four transect across the stream and the mean of the 36 measures was used to represent water depth. Dissolved oxygen and temperature were measured in a single point with a portable dissolved oxygen instrument (YSI Model 58). To assess difference among stream characteristics localized upstream and downstream a Two Sample t-test was used (Sokal & Rohlf 1981).

Fish Sampling

Each 50-m section of the stream was blocked with fine-mesh on the upstream and downstream with 2.5 mm seine nets to prevent fish escaping. After blocking each stretch, specimens were collected using hand gathering techniques with a sieve (0.8 × 0.7 m, 2.5 mm mesh) and a hand net (2.0 × 1.0 m, 5 mm mesh) for 4-person hours per stretch (Figure 3) (to more information about the method see Mendonça *et al.* 2005). Captured fish were euthanized by anesthetic overdose (0.2 ml oil clove/500 ml water, Fernandes *et al.* 2017). Immediately after euthanasia, fish were fixed in

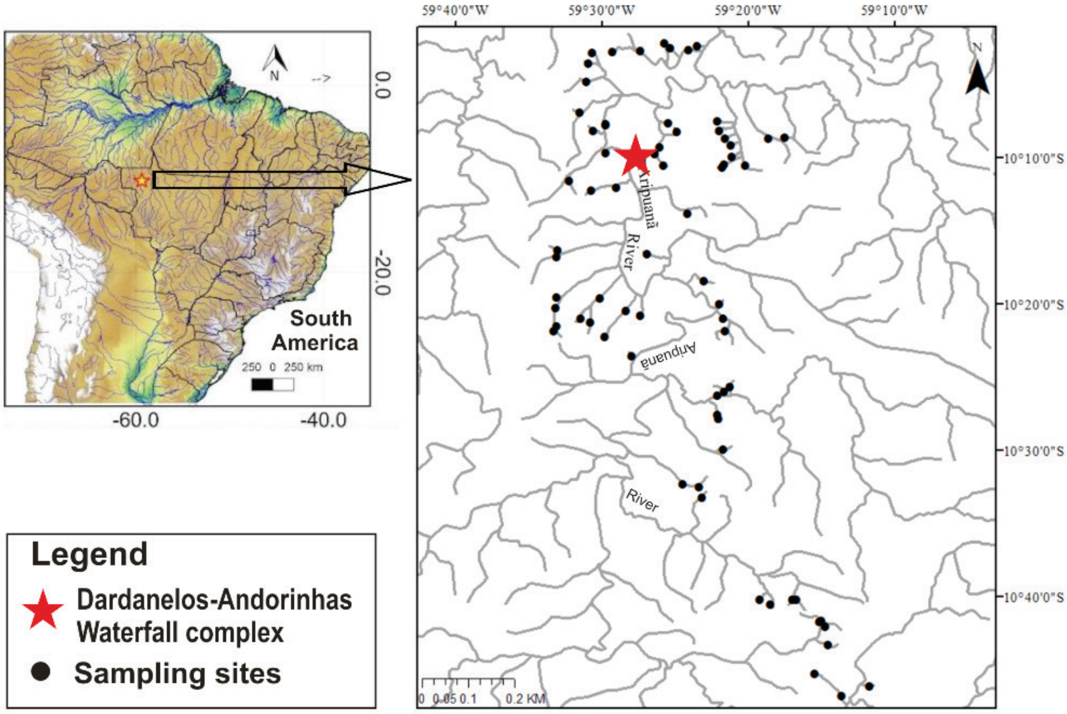

Figure 1. Distribution of the sites in the Aripuanã River basin, state of Mato Grosso, Brazil.

Figure 2. Streams of first, second and third order in the Aripuanã River basin, state of Mato Grosso, Brazil. A - First order stream, B - Second order stream and C - Third order stream.

Figure 3. Fishing equipment used in the streams. A - Sieve and B - hand net.

10% formalin solution and then preserved in 70% ethanol. Fish were then identified and deposited in the Coleção Ictiológica do Núcleo de Pesquisas em Limnologia, Ictiologia e Aquicultura (NUP) of the Universidade Estadual de Maringá (UEM) (available at http://peixe.nupelia.uem.br) and Coleção de Peixes da Universidade Federal de Mato Grosso – CPUFMT. Fish nomenclature followed Reis *et al.* (2003), Fricke *et al.* (2017) and Nelson *et al.* (2016).

RESULTS

Stream characteristics

Of the 71 stream sampled, 44 were first order (26 upstream and 18 downstream), 24 were second order (14 upstream and 10 downstream), and two were third order (both localized downstream). The width, dissolved oxygen and temperature not differed among downstream and upstream while water depth was higher downstream and velocity was higher in upstream of the Dardanelos-Andorinhas complex waterfalls (Table 2).

The fish assemblage

In total, 11,334 specimens belonging to five orders, 21 families and 80 species were captured. Characiformes was the species-rich order (42 species), followed by Siluriformes (25), Cichliformes (seven), Gymnotiformes (five) and Synbranchiformes (one) (Figure 4). We captured 4,044 specimens (71 species) in downstream of the Dardanelos-Andorinhas waterfalls complex, while 7,290 specimens (45 species) were captured in the upstream of the falls (Table 3). The five most abundant upstream species, (56.6% of the total), were *Inpaichthys kerri* (30.1 %), *Knodus* sp. (8.5%), *Hyphessobrycon* sp. 1 (7.7%), *Ancistrus* spp. (7.1%) and *Hyphessobrycon vilmae* (6.8%) (60.1% of total specimen capture). On downstream, *Knodus* sp. (17.2%), *Hemigrammus* cf. *bellottii* (14%), *I. kerri* (11.1%), *Jupiaba citrina* (8.2%) and *Moenkhausia oligolepis* (6.1%).

The distribution of most species was shaped by the presence of the Dardanelos-Andorinhas waterfalls complex. Of the 80 collected species, 36 were both in the upstream as downstream, 35 were collected only downstream, and nine only in the upstream region (Table 3).

DISCUSSION

Characiformes and Silurifomes were the dominant orders in our study, as it is common in many Neotropical streams (Lowe-McConnell 1999, Mendonça *et al.* 2005, Fernandes *et al.* 2013). The dominance of both orders in the Neotropical region can explain this pattern (Reis *et al.* 2003).

Most of the recent articles on fish from the Aripuanã River Basin deal principally with the description of new species (*e.g.*, Zanata & Ohara 2009, Deprá *et al.* 2014, Zawadzki & Carvalho 2014, Pastana & Ohara 2016). Fewer articles addressing the regional composition of fish community in the region were published, namely Soares (1979), Rapp Py-Daniel *et al.* (2007), Pedroza *et al.* (2012), Fernandes *et al.* (2013) and Flausino-Júnior *et al.* (2016). Thus, although the Aripuanã basin is rich in fish species, the knowledge about its diversity is low and estimates of the species number in the basin is not available. Despite the low levels of current knowledge regarding its upstream region, Deprá *et al.* (2014) stated that at least 15 endemic fish species could be present in the Aripuanã River basin. Of these, this study recorded *Crenicichla hemera*, *Geophagus mirabilis*, and *Hypostomus dardanelos.*

Herein 80 species were recorded in 71 first, second and third order streams (average of 13

Table 2 . Mean ± standard deviation of the environmental characteristics of the stream located both upstream and downstream from the Dardanelos-Andorinhas waterfalls complex, Aripuanã River basin, Amazonian Brazil.

Variables	Downstream	Upstream	t-value	p
Width (m)	2.03 ± 0.65	2.18 ± 0.80	-0.85	0.39
Velocity (m/s)	7.56 ± 6.2	3.83 ± 7.4	3.12	0.003
Water Dep.th (cm)	12.4 ± 6.2	17.0 ± 7.6	-2.75	0.007
Dissolved oxygen (mg/l)	1.18 ± 0.95	1.18 ± 0.99	0.10	0.99
Temperature (ºC)	24.6 ± 2.5	25.1 ± 2.0	-0.86	0.38

Table 3. List of fish species collected on the first, second and third order streams located both upstream and downstream from the Dardanelos-Andorinhas waterfalls complex, Aripuanã River basin, Amazonian Brazil.

Order/Family/Species	Downstream	Upstream	Total	Vouchers
CHARACIFORMES				
Acestrorhynchidae				
Acestrorhynchus falcatus (Bloch 1794)	1	2	3	CPUFMT 5131
Anostomidae				
Leporinus gomesi Garavello & Santos 1981	1	9	10	CPUFMT 4936
Characidae				
Aphyocharax cf. *pusillus* Günther 1868	1		1	CPUFMT 5043
Astyanax cf. *anterior* Eigenmann 1908	39		39	CPUFMT 4965
Astyanax cf. *bimaculatus* (Linnaeus 1758)	44		44	NUP 18415
Astyanax cf. *maximus* (Steindachner 1876)	33	96	129	CPUFMT 4880
Creagrutus cf. *anary* Fowler 1913	14		14	CPUFMT 5140
Hemigrammus cf. *bellottii* (Steindachner 1882)	567		567	NUP 18417, CPUFMT 5143
Hemigrammus lunatus Durbin 1918	1		1	
Hemigrammus silimoni Britski & Lima 2008		159	159	CPUFMT 5034
Hyphessobrycon sp. 1	16	559	575	CPUFMT 4857 NUP 18452
Hyphessobrycon eques (Steindachner 1882)	5		5	CPUFMT 5052
Hyphessobrycon sp. 2	3		3	CPUFMT 5053
Hyphessobrycon vilmae Géry 1966	1	495	496	CPUFMT 4879
Inpaichthys kerri Géry & Junk 1977	447	2192	2639	NUP 18562, CPUFMT 4869
Jupiaba apenima Zanata 1997	126		126	NUP 18420, CPUFMT 4969
Jupiaba zonata (Eigenmann 1908)	1		1	
Jupiaba citrina Zanata & Ohara 2009	332		332	CPUFMT 5003

Table 3. Continued on next page…

Table 3. ...Continued

Order/Family/Species	Downstream	Upstream	Total	Vouchers
Knodus sp.	695	617	1312	NUP 18564, 18421, CPUFMT 4946
Moenkhausia cf. *pankilopteryx* Bertaco & Lucinda 2006	124		124	NUP 18423, CPUFMT 5138
Moenkhausia cotinho Eigenmann 1908	45		45	CPUFMT 4983
Moenkhausia mikia Marinho & Langeani 2010	71		71	CPUFMT 5056
Moenkhausia levidorsa Benine 2002	1	242	243	CPUFMT 4899
Moenkhausia oligolepis (Günther 1864)	248	361	609	NUP 18422, CPUFMT 5137
Phenacogaster sp.	159		159	NUP 18566, CPUFMT 4913
Poptella compressa (Günther 1864)	78		78	NUP 18567, CPUFMT 5009
Serrapinnus cf. *notomelas* (Eigenmann 1915)	18		18	NUP 18426, CPUFMT 5136
Tetragonopterus aff. *argenteus* Cuvier 1816		2	2	
Thayeria sp.	2		2	CPUFMT 5065
Crenuchidae				
Characidium sp.	4	16	20	CPUFMT 4978
Characidium zebra Eigenmann 1909	159	103	262	NUP 18416
Curimatidae				
Cyphocharax gr. *spilurus* (Günther 1864)	14	68	82	CPUFMT 4901
Steindachnerina fasciata (Vari & Géry 1985)	2		2	NUP 18478
Erythrinidae				
Erythrinus erythrinus (Bloch & Schneider 1801)	30	50	80	CPUFMT 5018

Table 3. Continued on next page…

Table 3. ...Continued

Order/Family/Species	Downstream	Upstream	Total	Vouchers
Hoplerythrinus unitaeniatus (Spix & Agassiz 1829)	5	2	7	NUP 18418, CPUFMT 5054
Hoplias malabaricus (Bloch 1794)	37	9	46	NUP 18561, CPUFMT 5132
Hoplias sp.	1		1	
Iguanodectidae				
Bryconops caudomaculatus (Günther 1864)	72	199	271	CPUFMT 5135
Bryconops cf. *giacopinii* (Fernández-Yépez, 1950)	3	42	45	CPUFMT 4884
Prochilodontidae				
Prochilodus nigricans Spix & Agassiz 1829	6	9	15	CPUFMT 4987
Serrasalmidae				
Utiaritichthys longidorsalis Jégu, de Morais & Santos 1992	1	3	4	
Metynnis sp.		2	2	
CICHLIFORMES				
Cichlidae				
Aequidens gerciliae Kullander 1995	68	123	191	NUP 18558, CPUFMT 5141
Caquetaia spectabilis (Steindachner 1875)	1		1	CPUFMT 5044
Crenicichla cf. *johanna* Heckel 1840	2		2	NUP 18559, CPUFMT 4953
Crenicichla hemera Kullander 1990	5	23	28	CPUFMT 5033
Crenicichla santosi Ploeg 1991	7	1	8	NUP 18560
Geophagus mirabilis Deprá, Kullander, Pavanelli & Graça 2014		16	16	CPUFMT 4894
Heros spurius Heckel 1840	1		1	CPUFMT 5050
GYMNOTIFORMES				
Gymnotidae				
Gymnotus aff. *carapo* Linnaeus 1758	4	4	8	CPUFMT 5049

Table 3. Continued on next page…

Table 3. ...Continued

Order/Family/Species	Downstream	Upstream	Total	Vouchers
Hypopomidae				
Brachyhypopomus sp.		2	2	CPUFMT 4890
Rhamphichthyidae				
Gymnorhamphichthys rondoni (Miranda Ribeiro 1920)	3		3	CPUFMT 5048
Sternopygidae				
Eigenmannia macrops (Boulenger 1897)	76	17	93	CPUFMT 4921
Sternopygus macrurus (Bloch & Schneider 1801)	2		2	CPUFMT 5064
SILURIFORMES				
Auchenipteridae				
Tatia aulopygia (Kner 1858)		6	6	
Thachelyopterus porosus (Eigenmann & Eigenmann, 1888)	1	21	22	NUP 18462
Callichthyidae				
Callichthys callichthys (Linnaeus 1758)	2		2	
Corydoras aff. *rabauti* La Monte 1941		91	91	CPUFMT 4934
Corydoras sp. 1	2		2	NUP 18532
Corydoras sp. 2		2	2	
Cetopsidae				
Cetopsis sp.		2	2	NUP 18495
Heptapteridae				
Cetopsorhamdia sp.	144	353	497	CPUFMT 5144
Imparfinis aff. *cochabambae* (Fowler 1940)	7	3	10	NUP 18471
Imparfinis cf. *hasemani* Steindachner 1915	6	15	21	NUP 18454
Imparfinis stictonotus (Fowler 1940)	4		4	NUP 18539
Myoglanis sp.	17	41	58	NUP 18565, CPUFMT 5008
Pimelodella gracilis (Valenciennes 1835)	7		7	CPUFMT 4949
Rhamdia sp.	1	22	23	NUP 17443

Table 3. Continued on next page…

Table 3. ...Continued

Order/Family/Species	Downstream	Upstream	Total	Vouchers
Loricariidae				
Ancistrus spp.	66	520	586	CPUFMT 5142
Farlowella oxyrryncha (Kner 1853)	19		19	
Hypostomus dardanelos Zawadzki & Carvalho 2014	4		4	
Hypostomus pyrineusi (Miranda Ribeiro 1920)	2	13	15	CPUFMT 4931
Hypostomus sp.	3		3	NUP 18538
Lasiancistrus schomburgkii (Günther 1864)	4		4	NUP 17803
Loricaria sp.	2		2	CPUFMT 5139
Parotocinclus aripuanensis Garavello 1988	62	178	240	NUP 18526
Rineloricaria lanceolata (Günther 1868)	18		18	NUP 18425, CPUFMT 5062
Rineloricaria sp.	8	451	459	CPUFMT 4875
Trichomycteridae				
Ituglanis aff. *amazonicus* (Steindachner 1882)	87	145	232	NUP 18563, CPUFMT 4866
SYNBRANCHIFORMES				
Synbranchidae				
Synbranchus sp.	2	4	6	NUP 18427
Total	**4044**	**7290**	**11334**	

species/stream). Other studies on the Amazon basin fish communities reported between nine and 16 species per stream (Mendonça *et al.* 2005, Espírito-Santo *et al.* 2009, Dias *et al.* 2010, Fernandes *et al.* 2013), values similar to those reported here.

Waterfalls are important barriers for aquatic organisms, preventing the movement and the exchange of species among regions (Rahel 2007, Jönck & Aranha 2010, Torrente-Vilara *et al.* 2011). This study found a marked effect on the Dardanelos-Andorinhas waterfalls complex, which acted as natural barrier to fish species. Of the 80 captured species, only 45% occurred both in the downstream and upstream, while 44% was exclusive downstream and 11% were captured only in the upstream region.

Although the region of this study has suffered a series of anthropic environmental impacts, be it by deforestation or pasture, none of the captured species is considered to be threatened with extinction (ICMBIO 2014). However, it is important to monitor the species considered endemic to the Aripuanã River basin since their restricted distributions mean they may be vulnerable to future changes.

ACKNOWLEDGMENTS

The authors would like to thank the Fundação de Amparo à Pesquisa do Estado de Mato Grosso and Conselho Nacional de Desenvolvimento Científico

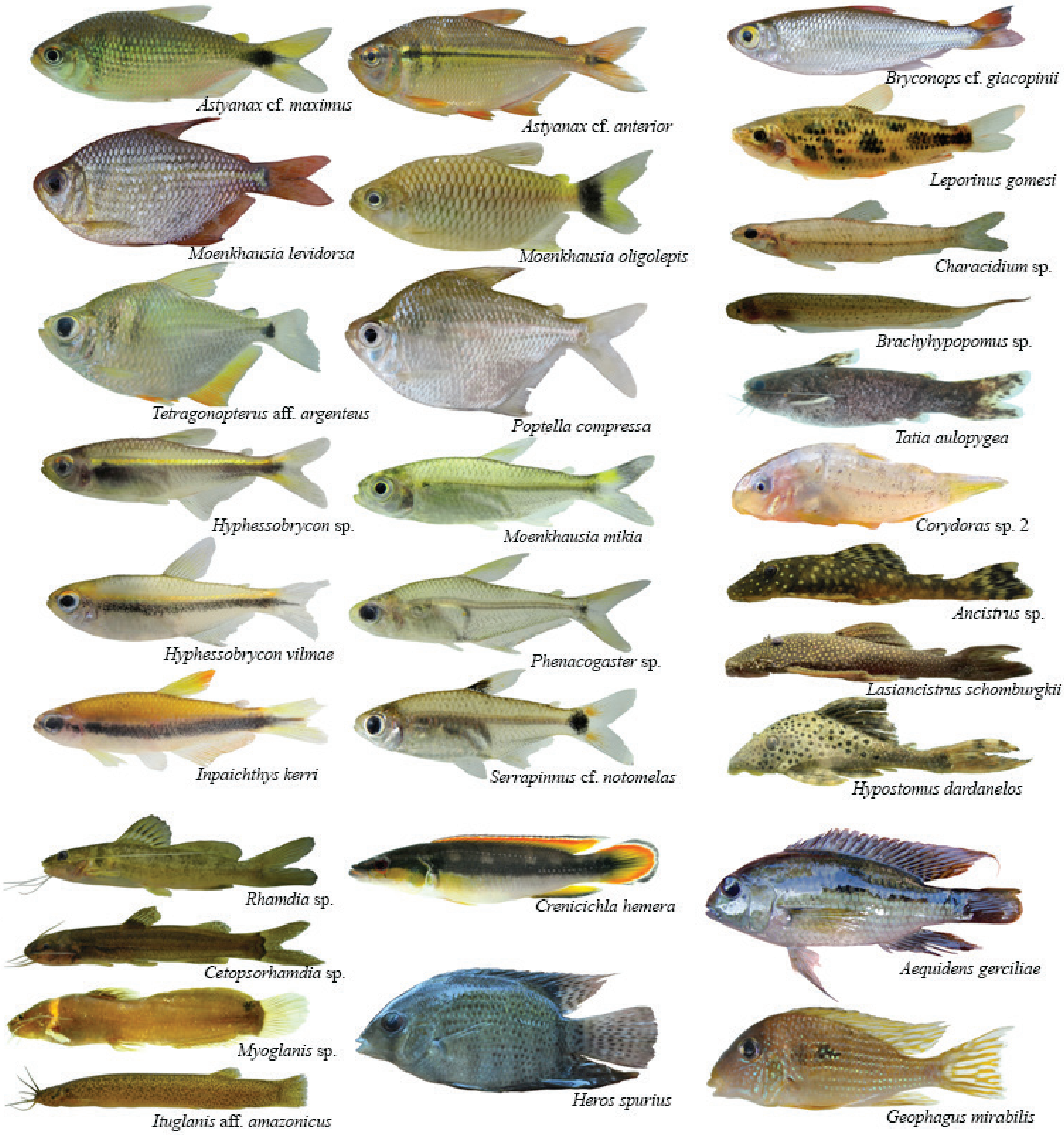

Figure 4. Some species registered in the Aripuanã River basin, state of Mato Grosso, Brazil.

e Tecnológico – CNPq, to HPS scholarship and the *Laboratório de Ecologia e Manejo de Recursos Pesqueiros* da Universidade Federal de Mato Grosso for technical support. Adrian Barnett helped with the English translation. All specimens were collected under the legal authority of permits issued by the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA), License number 37239-2.

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Submitted: 17 October 2018
Accepted: 12 April 2019
Published online:15 May 2019
Associate Editor: Thiago Costa Mendes