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Fishes from Baía da Medalha, southern Pantanal, Brazil: A 20 years review

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Abstract: Located in the Pantanal of Miranda-Abobral, the Baía da Medalha is the largest pond close to the Base de Estudos do Pantanal of the Universidade Federal de Mato Grosso do Sul. The Baía da Medalha has been a study site for several didactic and scientific projects for years. Nevertheless, its fish fauna has never been inventoried. Based on data collected from the beginning of the 1990s up to 2011, we provide a list of fish species from the Baía da Medalha. A total of 97 species were recorded, corresponding to about 40% of the species stated for the Pantanal. Characiformes and Siluriformes were the most species-rich orders, being Characidae and Cichlidae the families with the highest number of species. Regional seasonal flood dynamics and the abundance of aquatic macrophytes may be associated with this high diversity. The representative richness found in this lagoon highlights the importance of such taxonomic surveys to preserve the diversity of aquatic habitats within the Pantanal ecosystem.
Keywords: *lagoon, wetlands, Rio Miranda, ichthyofauna.*

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Resumo: Localizada no Pantanal do Miranda-Abobral, a Baía da Medalha é a maior e mais próxima lagoa da Base de Estudos do Pantanal da Universidade Federal de Mato Grosso do Sul. A Baía da Medalha tem sido área de estudo de diversos projetos didáticos e científicos há anos, entretanto, nenhum inventário sobre sua ictiofauna foi realizado. Aqui é apresentada uma lista de espécies de peixes da Baía da Medalha baseado em dados de coletas do começo da década de 90 até 2011. Um total de 97 espécies foi registrado, correspondendo à cerca de 40% do total de espécies registradas para o Pantanal. Characiformes e Siluriformes foram as ordens mais ricas em espécies, sendo Characidae e Cichlidae as famílias com maior número de espécies. Dinâmicas de inundação sazonal e a abundância de macrófitas aquáticas podem ser associadas a esta alta diversidade. A representativa riqueza encontrada nesta lagoa ressalta a importância de levantamentos taxonômicos a fim de preservar a diversidade dos habitats aquáticos do dentro do ecossistema do Pantanal.
Palavras-chave: *Lagoa, áreas úmidas, rio Miranda, Ictiofauna.*

Introduction

The Pantanal is one of the largest continuous wetlands of the world (Junk et al. 2006) and currently possesses an ichthyofauna estimated around 270 species (Britski et al. 2007). The seasonal flooding of the large rivers that cross the Pantanal floodplain sustains a large number of temporary lentic systems, such as lagoons, ponds and meanders (Junk et al. 2006). These aquatic environments associated with large rivers are known as nursery and feeding areas for long-distance migratory species or even permanent habitats for sedentary species. For this reason, such aquatic environments are considered as hotspots of regional fish diversity (Kwak 1988, Bayley 1995).

The Pantanal is divided into 10 subareas according to their geomorphological, hydrological and biogeographical features (Lourival et al. 2000). The Base de Estudos do Pantanal (BEP) of the Universidade Federal de Mato Grosso do Sul (UFMS) is located in the Miranda subregion, which has the following boundaries: to the north, Abobral wetlands; to the south, the

Chaco forests of Porto Murtinho; to the east, the Aquidauna wetlands; and to the west, the Bodoquena Plateau and the Nabileque wetlands (Allem & Valls 1987). With its diversity of aquatic organisms, the BEP is an important site for scholars and researchers at all levels engaged in scientific studies (see Carvalho et al. 2003, Carvalho et al. 2007, Pivari et al. 2008). The Baía da Medalha is the closest lagoon to BEP, and, for logistical reasons, it is the most sampled aquatic habitat in the region. Despite the popularity of this study site and the numerous surveys, no list of fish species has ever been prepared. Therefore, we herein provide a list of fish species for the Baía da Medalha, southern Pantanal, based on a compilation of samplings that have taken place over the last 20 years.

Material and Methods

Study site

The Baía da Medalha (Figure 1) is a tributary lagoon of the Rio Miranda (19°34'34" S, 57°00'46" W), with a total area of approximately 5.4 ha. About 25% of its surface is covered by aquatic macrophytes, such as *Eichhornia azurea* (Pontederiaceae), which corresponds to 45% of the covered area, as well as species of the genera *Rhynchosphora* and *Oxycaryum* (Cyperaceae) (Figure 2). The seasonal flooding of the region follows a unimodal annual cycle whose amplitude varies between two and five meters and lasts from three to six months (Harris et al. 2005), with the high water period generally beginning in late December to April/May, when the river returns to its main channel.

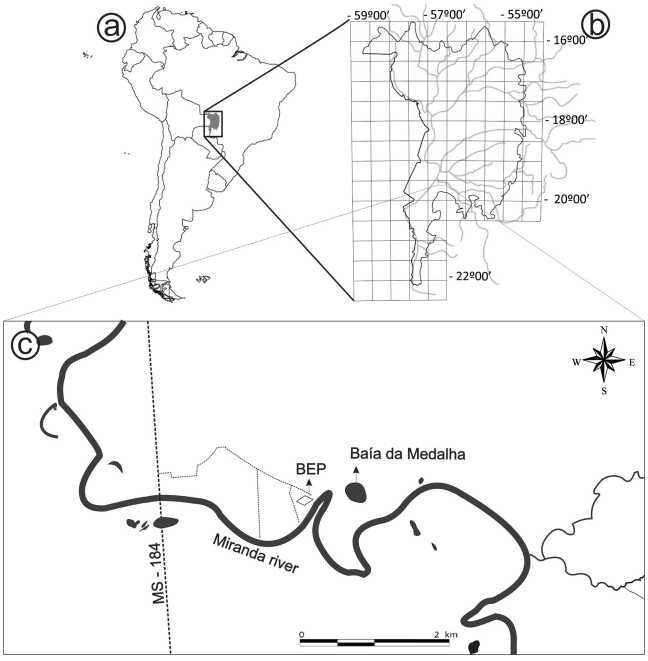

Figure 1. Location of Baía da Medalha, Miranda-abobral Pantanal subregion, mucipality of Corumbá, Mato Grosso do Sul, Brazil.

Samples

The data were compiled from fish samplings performed at the Baía da Medalha from the early 1990s up to 2011. Since these are random samplings for teaching and research purposes, there is no regular periodicity between samples. All samplings were performed during the daytime, generally with throw nets in the open areas and sieves below the macrophyte banks. As a result of the variety and the non- standardized samplings, only the species richness was considered for this study. Alternatively, an accumulation curve was made based in the total number of species collected over the years. Voucher specimens are hosted in the Coleção Ictiológica do Núcleo de Pesquisas em Limnologia, Ictiologia e Aquicultura (NUP) and in the Coleção Zoológica da Universidade Federal de Mato Grosso do Sul (ZUFMS-PIS). The identification of the specimens was made following Britski et al. (2007) and posterior revisionary studies of specific groups. The list of species was arranged according to Reis et al. (2003), with updates provided by www.fishbase.org and http://research.calacademy.org/ichthyology, when necessary.

Results and Discussion

A total of 97 species were recorded (Table 1), representing about 40% of Pantanal fish species (Britski et al. 2007). Resende (2000) recorded 101 fish species belonging to 20 families addressing four floodplain environments in the Miranda River Basin. Catella (1992) recorded a total of 75 species in a pond during the dry season in the Aquidauna subregion, which represents the eastern boundary of the Pantanal. During the same season, Baginski et al. (2007) recorded 95 species in communities of 15 lakes in the floodplain of the Cuiabá River, and Súarez et al. (2001) found a total of 51 fish species in 19 ponds in the Nhecolândia subregion,

Figure 2. View of Baía da Medalha on Miranda-Abobral Pantanal subregion, in September 2011.

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Table 1. Fish species recorded over 20 years in the Baía da Medalha, Pantanal. Species in bold were recorded inside the macrophyte belt.

			01. VII.90	16. IX.93	26. X.96	01. IX.97	10. IX.99	01. VI.00	08. IX.09	21. IX.10	01. XII.10	02. XII.10	06. X.11	22. IV.12
Characiformes														
	Curimatidae													
		Curimatella dorsalis Eigenmann & Eigenmann, 1889		X										
		Cyphocharax gillii (Eigenmann & Kennedy, 1903)			X		X		X	X				
		Potamorhina squamoralevis (Braga & Azpeculieta, 1983)					X		X	X				
		Psectrogaster curviventris Eigenmann & Kennedy, 1903					X		X	X				
		Steindachnerina brevipinna (Eigenmann & Eigenmann, 1889)					X							
		Steindachnerina conspersa (Holmberg, 1891)											X	
		Steindachnerina nigrotaenia (Boulenger, 1902)		X										
	Prochilodontidae													
		Prochilodus lineatus (Valenciennes, 1836)		X					X			X	X	
	Anostomidae													
		***Abramites hypselonotus* (Günther, 1868)**		X										
		Leporinus friderici (Bloch, 1794)							X					
		Leporinus lacustris Campos, 1945		X					X					
		Leporinus obtusidens (Valenciennes, 1836)											X	
	Crenuchidae													
	Characidiinae													
		***Characidium laterale* (Boulenger, 1895)**									X	X		
		***Characidium* aff. *zebra* Eigenmann, 1909**									X	X		
	Characidae													
	Iguanodectinae													
		Piabucus melanostomus (Holmberg, 1891)		X										
	Bryconinae													
		Brycon hilarii (Valenciennes, 1850)							X					
		Triportheus nematurus (Kner, 1858)		X			X							

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Table 1. Continued.

		01. VII.90	16. IX.93	26. X.96	01. IX.97	10. IX.99	01. VI.00	08. IX.09	21. IX.10	01. XII.10	02. XII.10	06. X.11	22. IV.12
	***Triportheus pantanensis* Malabarba, 2004**		X						X	X	X	X	
Serrasalminae													
	Metynnis maculatus (Kner, 1858)											X	
	Metynnis cf. *mola* Eigenmann & Kennedy, 1903		X					X					
	Mylossoma duriventre (Cuvier, 1818)		X										
	Pygocentrus nattereri Kner, 1858	X					X		X			X	
	Serrasalmus maculatus Kner, 1858		X				X					X	
	Serrasalmus marginatus Valenciennes, 1837		X				X					X	
Aphyocharacinae													
	***Aphyocharax anisitsi* Eigenmann & Kennedy, 1903**									X	X		
	***Aphyocharax dentatus* Eigenmann & Kennedy, 1903**									X	X		
	***Aphyocharax nattereri* (Steindachner, 1882)**										X		
	***Prionobrama paraguayensis* (Eigenmann, 1914)**			X									
Incertae sedis													
	***Astyanax asuncionensis* Géry, 1972**		X	X				X	X	X	X	X	
	Ctenobrycon alleni (Eigenmann & Mcatee, 1908)				X			X					
	***Gymnocorymbus ternetzi* (Boulenger, 1895)**		X					X		X			
	***Hemigrammus ulreyi (*Boulenger, 1895)**		X							X	X		
	***Hyphessobrycon eques* (Steindachner, 1882)**		X							X			
	Markiana nigripinnis (Perugia, 1891)											X	
	***Moenkhausia dichroura* (Kner, 1858)**									X			
	***Moenkhausia* aff. *sanctaefilomenae* (Steindachner, 1907)**		X							X	X		
	***Psellogrammus kennedyi* (Eigenmann, 1903)**		X							X	X		
	***Bryconops* sp.**		X										
Characinae													
	Charax leticiae Lucena, 1987	X	X										

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http://dx.doi.org/10.1590/1676-06032015011614

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Table 1. Continued.

			01. VII.90	16. IX.93	26. X.96	01. IX.97	10. IX.99	01. VI.00	08. IX.09	21. IX.10	01. XII.10	02. XII.10	06. X.11	22. IV.12
		*Cynopotamus kincaidi (*Schultz, 1950)		X										
		Galeocharax humeralis (Valenciennes 1834)		X										
		Roeboides microlepis (Reinhardt, 1851)											X	
		Roeboides descalvadensis Fowler, 1932					X							
		Roeboides affinis (Gunther, 1868)					X							
	Stethaprioninae													
		Brachychalcinus retrospina Boulenger, 1892								X				
		Poptella paraguayensis (Eigenmann, 1907)		X			X		X	X	X		X	
	Tetragonopterinae													
		Tetragonopterus argenteus Cuvier, 1816							X				X	
	Cheirodontinae													
		***Odontostilbe paraguayensis* Eigenmann & Kennedy, 1903**		X										
		***Odontostilbe pequira* (Steindachner, 1882)**									X			
		***Serrapinnus notomelas* (Eigenmann, 1915)**									X	X		
	Stevardiinae													
		***Piabarchus analis* (Eigenmann, 1914)**										X		
	Acestrorhynchidae													
		Acestrorhynchus pantaneiro Menezes, 1992		X					X				X	
	Erythrinidae													
		Hoplerythrinus unitaeniatus Spix, 1829		X										
		***Hoplias* aff. *malabaricus* (Bloch, 1794)**									X	X	X	
	Lebiasinidae													
	Pyrrhulininae													
		***Pyrrhulina australis* Eigenmann & Kennedy, 1903**									X	X		
Siluriformes														
	Callichthydae													
	Callychthyinae													
		Hoplosternum littorale (Hancock, 1828)	X											

Continued on next page

Table 1. Continued.

		01. VII.90	16. IX.93	26. X.96	01. IX.97	10. IX.99	01. VI.00	08. IX.09	21. IX.10	01. XII.10	02. XII.10	06. X.11	22. IV.12
Corydoradinae													
	Corydoras britskii (Nijssen & Isbrücker, 1983)					X		X					
	***Corydoras hastatus* Eigenmann & Eigenmann, 1888**					X					X		
Loricariidae													
Hypoptopomatinae													
	***Hypoptopoma inexspectatum* (Holmberg, 1893)**									X	X		
Loricariinae													
	Loricariichthys platymetopon Isbrücker & Nijssen, 1979		X					X					
	***Rineloricaria parva* Boulenger, 1895**		X										
	***Rineloricaria* sp.**									X			
Hypostominae													
	***Hypostomus boulengeri* (Eigenmann & Kennedy, 1903)**									X	X		
	***Pterygoplichthys ambrosettii* (Holmberg, 1893)**							X	X				
Heptapteridae													
	Pimelodella mucosa Eigenmann & Ward, 1907											X	
	Pimelodella sp.		X										
	Rhamdia quelen (Quoy & Gaimard, 1824)		X										
Pimelodidae													
	Iheringichthys labrosus (Lütken, 1874)		X										
	Pimelodus argenteus Perugia, 1891			X		X			X				
	Pimelodus maculatus Lacépède, 1803			X								X	
Doradidae													
	***Anadoras weddellii* (Castelnau, 1855)**										X		
	***Ossancora eigenmanni* (Boulenger, 1895)**			X								X	X
Auchenipteridae													
Auchenipterinae													
	***Auchenipterus osteomystax* (Ribeiro, 1918)**	X											
	***Trachelyopterus striatulus* (Steindachner, 1877)**										X		

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http://dx.doi.org/10.1590/1676-06032015011614

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Table 1. Continued.

			01. VII.90	16. IX.93	26. X.96	01. IX.97	10. IX.99	01. VI.00	08. IX.09	21. IX.10	01. XII.10	02. XII.10	06. X.11	22. IV.12
		***Trachelyopterus coriaceus* Valenciennes, 1840**										X		
Gymnotiformes														
	Gymnotidae													
		***Gymnotus inaequilabiatus* (Valenciennes, 1839)**										X		
	Sternopygidae													
		***Eigenmannia trilineata* López & Castelo, 1966**										X		
	Rhamphichthyidae													
		***Gymnorhamphichthys britskii* Carvalho, Ramos & Albert, 2011**				X								
	Hypopomidae													
		***Brachyhypopomus* sp.**		X										
Cyprinodontiformes														
	Rivulidae													
		Pterolebias longipinnis Garman, 1895												X
		Pterolebias phasianus Costa, 1988												X
Beloniformes														
	Belonidae													
		Potamorhaphis eigenmanni Ribeiro, 1915		X										
Synbranchiformes														
	Synbranchidae													
		***Synbranchus marmoratus* Bloch, 1795**												X
Perciformes														
	Sciaenidae													
		Pachyurus bonariensis Steindachner, 1879		X										
	Cichlidae Astronotinae													
		***Astronotus crassipinnis* (Heckel, 1840)**		X						X				
		Chaetobranchopsis australis Eigenmann & Ward, 1907												
	Cichlasomatinae													
		***Aequidens plagiozonatus* Kullander, 1984**		X							X	X		X
		***Bujurquina vittata* (Heckel, 1840)**		X	X								X	
		***Cichlasoma dimerus* (Heckel, 1840)**		X							X	X		
		***Laetacara dorsigera* (Heckel, 1840)**		X										

Continued on next page

Table 1. Continued.

			01. VII.90	16. IX.93	26. X.96	01. IX.97	10. IX.99	01. VI.00	08. IX.09	21. IX.10	01. XII.10	02. XII.10	06. X.11	22. IV.12
+		***Mesonauta festivus* (Heckel, 1840)**		X										
	Cichlinae													
		***Crenicichla lepidota* Heckel, 1840**		X							X	X		
		***Crenicichla semifasciata* (Heckel, 1840)**									X			
	Geophaginae													
		***Apistogramma inconspicua* Kullander, 1983**									X	X		X
		Gymnogeophagus balzanii (Perugia, 1891)		X		X			X	X				
		Satanoperca pappaterra (Heckel, 1840)							X	X				

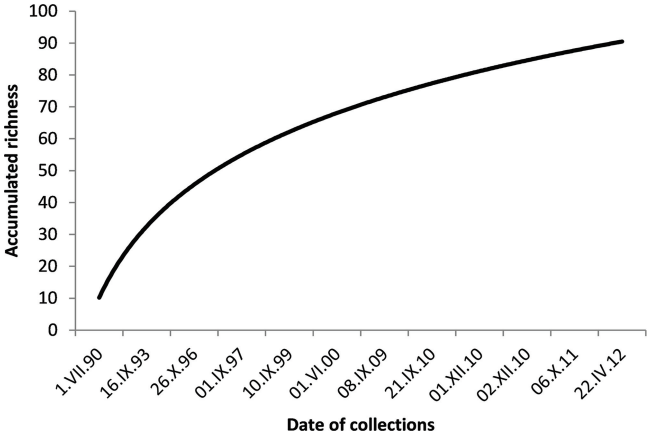

Figure 3. Accumulation curve of fish species over 20 years of sampling in a bay of the Pantanal, Brazil.

varying from seven to 26 species between ponds. As in the aforementioned works, the total number of species and the composition are similar to the ichthyofauna of the Baía da Medalha, which follows the pattern for the Neotropical communities (Lowe-McConnell 1999), with Characiformes as the most representative order (n = 57), being consecutively followed by Siluriformes (n = 21), Perciformes (n = 13), Gymnotiformes (n = 4), Cyprinodontiformes (n = 2), Beloniformes (n = 1) and Synbranchiformes (n = 1). Accumulation curve of species over the years is presented in Figure 3.

Among the 25 families recorded, Characidae and Cichlidae were the richest, with 29 and 12 species, respectively. Characidae is the largest family within Characiformes and accounted for approximately 80% of the abundance in a pond in the Aquidauna subregion during the dry season (Catella 1992). Britski et al. (2007) reported 16 valid species of native cichlids for the Pantanal region, and from that total, 75% were recorded in the Baía da Medalha. This large representation follows the South American pattern, where cichlids are especially successful in lateral lakes of riverine systems (Lowe-McConell 1999).

Macrophytes increase the heterogeneity of microhabitats and therefore may be associated with greater species richness in local communities (Agostinho et al. 2002). Allied to this, macrophytes provide refuge from predators, food source and suitable sites for breeding and larval development for many fish species (Chick & Mclvor 1994, 1997, Grenouillet & Pont 2001). At Baía da Medalha, practically almost half of the richness registered (47 spp., Table 1) was under the macrophyte belt. These are basically small species, such as members of Aphyocharacinae and Cheirodontinae, most likely seeking refuge among the branches from predators, as well as the juvenile forms of *Hoplias malabaricus* and *Triportheus pantanensis*. Among Siluriformes, *Hypoptopoma inexspectatum* was the most frequent in this region, probably feeding on periphyton that grows on the stalks of aquatic macrophytes. Other representatives exclusively found in this meso-habitat are nocturnal and photophobic species, such as Gymnotiformes and Auchenipteridae members, hiding in dens in the transition between the ravine and the macrophytes.

Besides the representative coverage of macrophytes, the hydrodynamics of the Miranda River flooding pulse may also

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be associated with local species richness. According to Chernoff & Willink (2000), Pantanal environments that are seasonally flooded, such as ponds, harbor the major diversity of the plain, like plants, zoobenthos, fish and decapod crustaceans, compared to habitats that are subject to river current. Moreover, the flood season acts as a homogenizing factor in the floodplain, so the local species composition is maintained by stochastic factors (Thomaz et al. 2007), explaining, in part, the fact that the accumulation curve has not reached the asymptote, despite the large number of species found in these two decades. Thomaz et al. (2007) emphasize that floodplains are formed by a variety of aquatic habitats, such as permanent ponds, canals, backwaters, and main channels of rivers, and that maintaining the diversity and connectivity of these environments is the key to preservation of the entire ecosystem.

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