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Ichthyological Overview and Remarks on Freshwater Fishes from Capim River, Lower Amazon Basin, Brazil

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Abstract

The Capim River drainage should be considered small and thin by comparison with large Amazonian rivers. It rises by confluence of the Surubiú and Ararandeua rivers near 400 m high and their headwaters would be comfortably included in the Dry Emerged Lowland (terra firme) forest area of Sternberg's Amazonian concept. Because of this reason the freshwater fish fauna of Capim River is comprised mainly by Amazonian fish families found in tributaries also with origin in terra firme areas. The ichthyofauna from the main channel of the poorly sampled Capim River, in the stretch between its confluence with Tauarí River and its mouth at Guamá River, is herein reported by way of rapid assessment. Also broad comparisons were made among freshwater fishes of the Capim with that from Tocantins and Guamá rivers. Two rapid access research surveys of collecting ichthyological material were performed in dry and humid periods of the year 1998 comprising the regional hydrologic cycle. The ichthyological diversity showed by the 461 studied specimens includes 79 species probably derived from Guamá and Tocantins rivers. These species are distributed between two situations: 1) downstream Capim River, at confluence with Guamá River, where is under tidal waters influence and periodically flooded, and 2) upriver Capim that is less humid and with water rapids, independent from sea hydrologic influence. This fish fauna includes local species common at high areas of the Amazonian Dry Emerged Lowland that are in part shared with that from Tocantins River. In view of these observations, we assume that the Capim River freshwater ichthyofauna may reflect diverse origin from the simple transfer of populations from Guamá River, but originate through a more complex process including the past ichthyofauna of the earlier drainages of terra firme forest and their reorganization.

Keywords

Neotropical, Ichthyofauna, Biodiversity, Tocantins, Amazon

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1. Introduction

To comprehend the geologic structure and distribution of the ichthyofauna from the Capim-Guamá river system is important to understand that the Amazonian basin is characterized as a disordered sedimentary drainage. Its freshwater ichthyofauna is primarily derived from rivers of the former Guyana Shield as anticipated by Weitzman and Weitzman [1]. According to Silva and Rosseti [2], part of the geological structure of this large hydrographic basin is surely generated in geologic Holocene times, which conditions all the Holocene alluvial sedimentation with particular effects on the ichthyofauna distribution. On the other hand, in accord with Silva *et al*. [3] is visible the adjustment of an ample hydrographic net of the low Amazon basin to a system of successive acquired fractured geologic sites. More, the Amazonian rivers are, observed by Sternberg [4], aligned in northeast-southwest direction following a line of small resistance of early crystalline ancient soil with influence on the ichthyofauna distribution. Following Sternberg, the geologic nature and design of the variable grounds of Low Amazonian Plate may be subdivided into two main parts: 1) Flood Lowland (Quaternary origin), and 2) Dry Emerged Lowland (Tertiary or Pleistocene origin). The flood lowlands include two kinds of landscape: 1) the "Igapó" (having dense arboreal inundate vegetation along most of the year), and 2) the "Várzea" (an extensive field of low vegetation, sometimes intermittent flood and playing important rule on ichthyofauna distribution).

This introduction to the past of Amazon basin is necessary to understand the area of dominance of Capim-Guamá hydrographic system. They form the last drainage at the low Amazon River, between Tocantins River and the isolated Gurupi River, which flow directly to the Atlantic Ocean (**Figure 1**). It includes an area of Flood Lowland downward and an area of Emerged Lowland in headwaters. Extensive areas of the Guamá River are under marine influence and the Capim River include areas free from this aspect; the system shows a diversity of environment displaying a rich and diverse ichthyofauna.

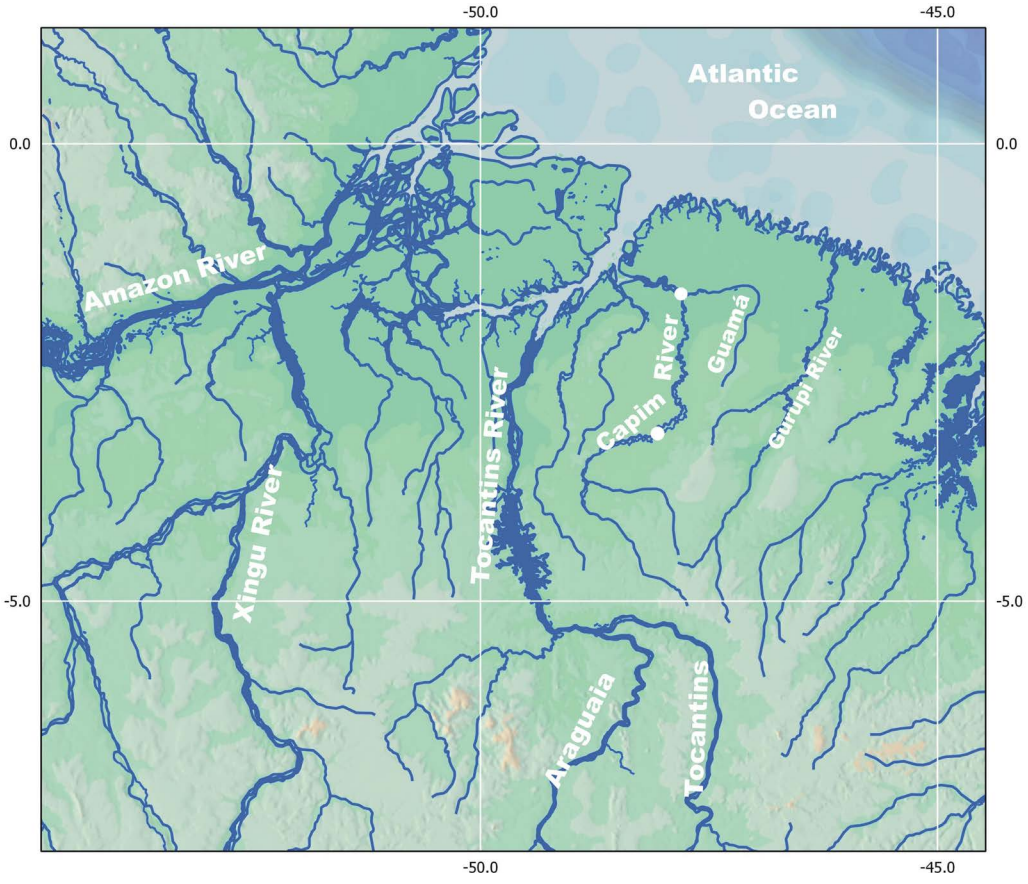

Figure 1. Map showing the delta of lower Amazon River and its main right bank tributaries. Collecting places are distributed in the river stretch between Tauarí River and Capim River confluence with Guamá River (dots).

On the other hand, the Capim River may be considered a small and thin drainage when compared with the large Amazonian rivers. It is formed by the junction of Surubiú and Ararandeua rivers, in an elevated area that will be comfortably included in the Dry Emerged Lowland (terra firme). The mouth of Capim River at flood periods is influenced by the "pororoca", an event resultant from the marine water incursion through the Guamá and Capim River mouth. By this reason, the main channel of Capim River has its freshwater fishes combining ordinary species from Guamá River families with species common to other Amazonian tributaries with origin at the Dry Emerged Lowland, as the Tocantins River ichthyofauna.

In this study the freshwater ichthyofauna from Capim River main channel is reported on basis of rapid assessment from several collecting sites in the stretch between the confluence of Tauarí River (near coordinates 3˚5'S and 48˚2'W) and the mouth at Guamá River (near coordinates 1˚40'S and 47˚47'W). Also comparisons are made among the freshwater fish species from Capim River with that from Guamá and Tocantins.

2. Methodology of the Ichthyofauna Study

Period of Study and Collection Effort

Two rapid access research surveys of collecting ichthyological material were done along the main channel of Capim River, coincident with the dry and humid periods in the year of 1998 and comprising the regional hydrologic cycle. A research ship traveled in the area during 12 days at each period and each research day spent near 20 hours, realizing two samples in early morning and falling night at each collecting site. Additional collections were done in lakes, small tributaries, and "igarapés" and lake channels. Two days and two nights was spent, in a total of four collecting effort and local observations at Guamá River and eight days and eight nights spent in sixteen collection effort at the Capim in each journey. The visits also included other tributaries of Capim River: Igarapé Ananaí or Goiabal, Igarapé Curatauaçu and Lake Maria Preta. The collecting effort included gill nets in all sites. A battery of nets of 30 and 50 meters long by 1.5, 2.5 and 4.5 meters high was sorted at three points in each collecting site at each period, arranged by mesh size between 1.5 to 6.0 cm at each site in a total of ten mesh nets by site and by period. All mesh nets utilized in the study area full a total of 650 meters of exposed nets at each 12 hours by collecting site. In lagoons the number of mesh nets was restricted to net meshes of 1.5 meters high in agreement with the completion and profundity of each visited lagoon. The caught fishes was initially selected, identified, split by species and fixed in 10%, formalin solution, later transferred to alcohol 70% and so ingress in collection. Voucher specimens are housed in the fish collection of the Laboratório de Ictiologia Sistemática da Universidade Federal de São Carlos (LISDEBE-UFSCar) under numbers 4840 to 4948.

3. Results

3.1. Regional Characterization and Collecting Sites

The Guamá River rises in the Serra do Tiraçambu, splitting waters with the Gurupí River at the border of Pará and Maranhão States (map of the **Figure 1**). The drainage is situated at a region of open fields of Pará State, outside from forested areas of Amazon basin. The headwaters of Guamá River are near that of Capim River, its main tributary with origin by the confluence of Surubiú and Ararandeua rivers, near to Tocantins River drainage. Meanwhile the Capim River digresses from the Guamá, which crosses extensive areas of flood forest, flowing to northwest in direction to the Marajó delta. This area, permanently under the ocean influence does not have marginal lagoons and the flooded forest would offer viable situations for fish reproduction. Very few tributaries occur in this area of the Guamá, which is characterized by the excessive volume and the monotonous image of flood areas under marine influence. This situation was verified mainly at Guamá River, downriver from São Domingos do Capim and at Jutuba beach, upriver from São Domingos Island. The remaining visited sites are placed at medium Capim River when it crosses open elevated areas with low vegetation and several "cerrado" flora fragments.

The collecting sites visited during field surveys were: 1) Guamá River downriver from São Domingos do Capim; 2) Capim River, Jutuba beach, upriver from São Domingos island; 3) Right bank of Capim River at Boa Esperança; 4) Left bank of Capim River at Boa Esperança; 5) Maria Preta lake, tributary of Capim River at Santo Reis; 6) Mouth of Igarapé Ananaí or Goiabal a tributary of Capim River; 7) Capim River, downriver from Cobras beach at Queimados farm; 8) Mouth of igarapé Curatauaçu, Capim River tributary at Balalaica farm.

By general rule the water levels of the Capim-Guamá system, mainly in the Guamá area, meet their minimum

level at December (sometimes November) to January and its maximum levels at March or April at each year. The vegetation along Capim River main channel includes diverse formations of Amazonian forest, going from dense forest of flood ("igapó") to areas permanently flood, with ("várzea") low vegetation derived from the deciduous stationery forest. An extended area of Cerrado was found at the highest regions of the Capim drainage. These forested stratum is situated in a climate classified as raining tropical zone, a tropical climate of continuous humid forest were the minimum rainfall is situated near 60 mm and the relative humidity of air is between 78% and 80%; the median annual temperatures not exceeds values between 24.7˚C and 27.3˚C.

3.2. Ichthyological Diagnostic

The diversity showed by the Capim River main channel ichthyofauna, studied from 461 specimens, includes 79 species probably derived from Guamá and Tocantins rivers basins (**Table 1**). Different from the main channel species, Raiol *et al.* [5] had studied the fishes from the Taiassuí and Benfica river basins, both minor tributaries of Guamá River at Benevides, PA, revealing a diversity of small fishes apt to small streams but seeing in the same families herein studied. Fish species from Capim River belong to Clupeiformes, Characiformes, Siluriformes, Gymnotiformes, Perciformes and Pleuronectiformes fish orders. As a rule for freshwater fishes from Amazon and South America Basin, most diversity of fish families and species belong to the Ostariophysi group (Characiformes, Siluriformes and Gymnotiformes orders). The Perciformes by its families Cichlidae and Sciaenidae also represent some diversity, while the orders Clupeiformes and Pleuronectiformes showed less diversity.

Much of the species registered in the samples may be encountered in freshwater conditions free from the estuarine influence from the mouth of the Guamá River at the delta of lower Amazon River in the Atlantic Ocean.

On the other hand, fish populations of local species were encountered, and this fact gives individuality to the Capim River ichthyofauna that will be discussed in the following sections of this issue.

According to Barthem and Goulding [6], downriver of Guamá River an ample aquatic area of mixed salt and freshwaters would be encountered under influence of Pará River delta. There, these authors registered the presence of small freshwater fishes, fish larvae and juveniles of different species, mainly from the Siluriformes freshwater fish fauna. The Guamá basin is an ample hydrologic system that directly furnishes nutrients based on organic matter primarily produced. The Guamá estuarine waters permit enough light penetration for large algae production. These authors studying at that area identified high primary production and considered that as a nursery of young large sized fishes of order Siluriformes. There they feed, and annually create and recreates as soon as other fish species from estuarine waters. So, the rivers Guamá by direct and Capim by indirect manner are benefited by those natural nursery beds with presence of young catfishes; young and juveniles feeds on rich waters of the Capim and Guamá river bays. The Guamá at that area hold character of the lower Amazonian delta, where large rivers are submitted to diary flow and reflow of near three meters high by oscillatory action the ocean level.

Goulding [7] characterizes the flood forest ("igapó") of the Pará River delta, where the Guamá drain, as a "specialized forest by their properties in unifying plant species resistant to the diary inundation and block of river mouth by ocean movements. Its area includes fish species able to support influence of the normal variation of acid and or salt in the waters". The large catfishes practically spent almost all of their feeding and reproductive activities at this flood forest. The "Tidal Forest", as identified by Goulding [7], occurs near the estuarine region of Pará River that includes specialized fish species apt to support flow and reflow of the water level.

Following Barthem and Goulding [6], with respect to the delta of Pará River, and in comparison, we may observe that the delta of Guamá River do not receive mostly of the freshwater fish populations normally apt to take migratory movements; on the contrary, it receives mostly the large Amazonian catfishes that normally done migratory movements upriver Xingu River mouth.

Meanwhile, the high Capim River is a drainage mainly flowing over Tertiary grounds and its dweller freshwater fish species are perhaps independent from the flux caused by the oceanic oscillatory movements in the delta of the system. That species perhaps has its own migratory movements similar to that verified in Tocantins River by Garavello *et al*. [8]. The freshwater fish species actually living in Capim River inhabit distant from this environment of the Guamá River delta and are distinct at species level from this area concerning to the tolerance to the saline environment. Also as indicated by Green [9], these areas of flood environment are poor in dissolved oxygen supply, imposing to the ichthyofauna physiological behavior apt to waters under the risk of anoxia.

So, flood areas, permanently under the influence of oceanic level may determine different biological quality to select species from Guamá River that seasonally ingress the Capim for feed and reproductive activities. While

Table 1. List of species registered in Capim River and housed in LISDEBE fish collection. Number of specimens and body size (mm) range in dry and wet seasons are given. Classification follows Reis *et al*. [11].

Classification	Species	Number of specimens by season		Body size (mm) by season	
		Dry	Wet	Dry	Wet
Clupeiformes					
Pristigasteridae	*Pellona* cf. *flavipinnis* Valenciennes, 1837		1		262.0 - 333.0
Engraulidae	*Anchovia surinamensis* (Bleeker, 1865)	1	4	193.8	98.6 - 110.4
	Lycengraulis batesii (Günther, 1868)	1		103.5	
Characiformes					
Acestrorhynchidae	*Acestrorhynchus falcirostris* (Cuvier, 1819)	3	7	236.0 - 254.0	251.0 - 296.0
	Acestrorhynchus falcatus (Bloch, 1794)		12	135.7 - 179.8	
	Acestrorhynchus microlepis (Jardine, 1841)		11	114.8 - 149.6	
Characidae	*Astyanax* sp.		1		67.1
	Brycon falcatus Müller and Troschel, 1844	2	24	154.0 - 161.0	80.5 - 146.4
	Brycon pesu Müller and Troschel, 1845	1		101.4	
	Bryconops cf. *caudomaculatus* (Günther, 1864)	5		89.6 - 96.2	
	Bryconops sp.	1	1	126.7	93.7
	Charax pauciradiatus (Günther, 1864)	3		69.4 - 90.4	
	Moenkhausia cf. *lepidura* (Kner, 1858)		14		81.1 - 85.9
	Moenkhausia oligolepis (Günther, 1864)		2		62.2 - 63.4
Stethaprioninae	*Poptella brevispina* Reis, 1989	1	6	72.6	40.3 - 64.9
Cynodontidae	*Cynodon gibbus* (Agassiz, 1829)	3	1	175.3 - 200.6	117.5
	Hydrolycus tatauaia Toledo-Piza, Menezes and Santos, 1999	1	3	223.0	134.5 - 143.1
Erythrinidae	*Hoplerythrinus unitaeniatus* (Spix and Agassiz, 1829)	1			164.0
	Hoplias malabaricus (Bloch, 1794)	1	5	221.0	182.0 - 243.0
Serrasalmidae	*Catoprion mento* (Cuvier, 1819)	1		90.3	
	Metynnis hypsauchen (Müller and Troschel, 1844)	9		96.3 - 105.3	
	Metynnis sp.	1		141.0	
	Mylesinus cf. *paucisquamatus* Jégu and Santos, 1988	1		88.8	
	Myleus torquatus (Kner, 1858)		2		57.5 - 168.8
	Myloplus cf. *rubripinnis* (Müller and Troschel, 1844)	7		123.8 - 173.0	
	Pygopristis denticulata (Cuvier, 1819)	3		120.2 - 210.0	
	Serrasalmus eigenmanni Norman, 1929	1	2	157,0	122.7 - 157.8
	Serrasalmus cf. *spilopleura* Kner, 1858	2	4	101.1 - 103.7	56.1 - 91.6
	Serrasalmus cf. *gibbus* Castelnau, 1855	8	26	65.1 - 185.0	55.0 - 105.2
Ctenoluciidae	*Boulengerella cuvieri* (Spix and Agassiz, 1829)	1		314.0	
Anostomidae	*Laemolyta taeniata* (Kner, 1858)	1		215.0	

Continued

	Leporinus affinis Günther, 1864	1	14	142.8	148.3 - 261.0
	Leporinus desmotes Fowler, 1914	2		112.6 - 133.6	
	Leporinus friderici (Bloch, 1794)	10	7	82.5 - 164.9	154.2 - 281.0
	Leporinus unitaeniatus Garavello and Santos, 2009		2		107.2 - 129.5
	Leporinus parae Eigenmann, 1907	10		109.6 - 190.7	
Hemiodontidae	*Argonectes robertsi* Langeanni, 1999	2		228.0 - 247.0	
	Hemiodus unimaculatus (Bloch, 1794)	10	4	139.9 - 202.0	90.7 - 107.1
	Hemiodus semitaeniatus Kner, 1858	1		185	
Curimatidae	*Curimata* cf. *knerii* Steindachner, 1876	11		135.4 - 195.0	
	Cyphocharax notatus (Steindachner, 1908)	1	1	82.0	109.1
	Cyphocharax gouldingi Vari, 1992		6		72.1 - 83.7
Chilodontidae	*Caenotropus labyrinthicus* (Kner, 1858)	6	3	98.3 - 124.4	86.1 - 112.2
Siluriformes					
Doradidae	*Amblydoras affinis* (Kner, 1855)	1	3	80.4	61.9 - 82.9
Auchenipteridae	*Auchenipterichthys longimanus* (Günther, 1864)	15	30	97.3 - 158.0	68.0 - 152.0
	Auchenipterus nuchalis (Spix and Agassiz, 1829)	8	6	120.6 - 144.0	134.4 - 167.1
	Ageneiosus inermis (Linnaeus, 1866)	1	1	275.0	268,0
	Ageneiosus ucayalensis Castelnau, 1855	7	26	152.8 - 216.0	112.1 - 307.0
	Centromochlus cf. *heckelii* (De Filippi, 1853)		1		74.6
	Trachelyopterus galeatus (Linnaeus, 1766)		15		88.3 - 148.8
Pimelodidae	*Pimelodina flavipinnis* Steindachner, 1876		1		310.0
	Pimelodus blochii Valenciennes, 1840	2		136.0 - 177.0	
	Pimelodus ornatus Kner, 1858	2		198.0 - 268.0	
	Pseudoplatystoma fasciatum (Linnaeus, 1766)	2	6	342.0 - 344.0	117.0 - 206.0
	Platynematichthys notatus (Jardine, 1841)	1	6	294.0	311.0 - 373.0
	Brachyplatystoma platynemum Boulenger, 1898		1		404.0
	Brachyplatystoma rousseauxii (Castelnau, 1855)		1		410.0
Pseudopimelodidae	*Pseudopimelodus* sp.	1		145.5	
Heptapteridae	*Pimelodella* sp.	3	2	168.9 - 235.0	107.2 - 232.0
Loricariidae	*Hypostomus* sp. (*Cochliodon* group)	5	1	80.5 - 164.0	100.6
	Peckoltia oligospila (Günther, 1864)	1		118.3	
Gymnotiformes					
Hypopomidae	*Steatogenys elegans* (Steindachner, 1880)		1		215.0
Rhamphichthyidae	*Rhamphichthys marmoratus* Castelnau, 1855	2	1	605.0 - 700.0	387.0
Sternopygidae	*Eigenmannia limbata* Schreiner and Miranda Ribeiro, 1903		1		212.1

	Rhabdolichops cf. *troscheli* (Kaup, 1856)	1		364.0	
	Sternopygus macrurus (Bloch and Schneider, 1801)		1		348.0
Perciformes					
Cichlidae	*Acaronia nassa* (Heckel, 1840)	1		93.4	
	Caquetaia spectabilis (Steindachner, 1875)	1		156.7	
	Cichlasoma cf. *amazonarum* Kullander, 1983	2		98.7 - 111.3	
	Cichla cf. *pinima* Kullander & Ferreira, 2006	3	1	122.8 - 265.0	140.7
	Crenicichla strigata Günther, 1862	2		171.0 - 173.0	
	Crenicichla sp.	1		232.0	
	Heros cf. *efasciatus* Heckel, 1840	1		109.5	
	Mesonauta festivus (Heckel, 1840)	5		74.7 - 93.1	
	Geophagus cf. *proximus* (Castelnau, 1855)	3		127.5 - 153.4	
	Satanoperca acuticeps (Heckel, 1840)		3		93.1 - 143.5
Sciaenidae	*Plagioscion squamosissimus* (Heckel, 1840)	3	2	167.8 - 179.4	137.3 - 345.0
Pleuronectiformes					
Achiridae	*Hypoclinemus mentalis* (Günther, 1862)	1		195.0	
Total of species	**78**	**60**	**46**		
Total of specimens		**188**	**273**		

those species show high tolerance to the oceanic oscillations, the species from Capim River, according to Lowe-McConnell [10], on the contrary, may not be able to that lenience. It may be reduced in richness of species when compared with other Amazonian rivers. Besides the few original forms, this study considers the ichthyofauna from the Capim a combination of species from the Guamá and Tocantins rivers. These species are distributed between two kinds of environment: 1) humid and under ocean influence at the Guamá confluence; 2) upriver at Capim River, with water rapids, more dry and independent from the sea influence of described hydrologic system from delta of Guamá.

4. Discussion

All sites herein visited and collected at Capim River during the first trip of this research met many fish larvae and juveniles of the diverse studied fish species. At that time and during the dry season, the lakes and lagoons were almost empty and showed to be a nursery bank of young fishes in this period of the year. The delta of Capim River included an ample area where the primary production was very high, following Barthem and Goulding [6]; it furnished enough nutrients to form an area of creation for the large catfishes and other estuarine freshwater fishes. So, the mouth of Capim River seemed to be benefit by these natural nurseries of ichthyofauna from Guamá River.

In the second visit at those collecting places during humid period the freshwater fishes practically confirmed the list from the first visit. High diversity of species and high similarity were verified between the populations through the Guamá and Capim rivers, as soon as a similarity between the Tocantins and Capim species was later verified. Also a slight reduction in population numbers was noted from the Capim River in this trip, perhaps due to the flood period when the ichthyofauna was dispersed. The second visit to the collecting sites included the register of young fish in numerous populations of schooling juveniles, suggesting that the flood lateral Capim River banks provided space to larval and young of freshwater ichthyofauna.

Barthem and Goulding [6] also noted that the area of Guamá delta did not have freshwater fish migratory movements, including the large catfishes and other scaled fish species that normally realized migrations outside of the Amazon delta. On the other hand, the Capim River encloses freshwater fish species apt to realize local

migratory movement's independent from the oscillatory sea level. Those species movements of Capim River ichthyofauna had other ecological requirements different from tolerance to salty environment. So, these species common to Capim River might be considered in part exclusives when compared with the neighboring basins. This study identified species in common with the Guamá and species shared with Tocantins River (see [8]). These species were apt to realize migratory upriver movements in areas free from the sea influence.

The results obtained permit to assume that the freshwater fish populations from the rivers Guamá and Capim have major components; small to medium sized species accomplish the rule of distribution where small to medium sized species are more frequent in tributaries as sign by Lowe-McConnell [12]. Garavello [13] in his revision of genus *Leporinus* Agassiz also informs about a division in size of genus *Leporinus* species, identifying a group of miniaturize *Leporinus* very diverse from that from the major hydrographic basins including Amazon basin, occurring in parallel with large the sized *Leporinus* species but always native from secondary rivers.

Our observations also reveal that the fish populations from Capim River are formed mainly by small to medium sized fishes, between 15 and 20 centimeters long, and two groups are formed.

First, freshwater fishes are from the families Characidae ("piabas" and "ueuas"), Prochilodontidae ("jaraquis" and "curimatãs"), Anostomidae ("aracus"), Ctenoluciidae ("bicudas"), Hemiodontidae ("barís" and "ubaranas"), Curimatidae ("branquinhas"), and Serrasalmidae ("piranhas", "pacús and "tambaquis"). Those species are known (see Géry [14]) by their ability in surviving in environment with limitation to size, temperature and dissolved oxygen, realizing reproductive migrations as attest the studies of Godoy [15] with the Prochilodontidae of the high Paraná basin and Goulding and Carvalho [16] on scaled fish "tambaquis" of family Serrasalmidae at central Amazon basin. These migratory species are benefit by tributaries that flood banks receiving eggs, larvae and young during the freshwater fish spawning period. These species has only one annual spawning act as a rule.

Second, freshwater fishes that do not have the ability to realize extensive migrations: Erythrinidae ("trairas" and "jejús"), Pimelodidae ("bagres", "jundiás" and "mandis"); Cichlidae ("acarás", "jacundás", "tucunarés" and "apaiaris"); Gymnotidae ("tuviras"); Loricariidae ("acarís"); Synbranchidae ("mussuns") and Achiridae ("linguados" and "mulatas"). This group with species that have spawning abilities, *i.e*., species in which the spawning period may be extended because only a gonad parcel acquires maturity to spawn, while the remaining parcels of gonads are reserved for a next period of maturity in the same year. By this rule it can proceed to more than one egg-layer period along the year. The studies of Ferreira and Godinho [17] and Sato *et al*. [18] can attest this activity by them considered as much specialized.

Other observation herein discuss includes the registration of large catfishes in the Capim River during the humid period. Populations of genera *Pseudoplatystoma*, *Platynematichthys* and *Brachyplatystoma* are periodically encountered at the Capim and this fact may be associated with the feeding habits of juveniles and nearly adults of those species. According to Barthem and Goulding [6], the spawn of these species occurs outside of Capim-Guamá system. From these, only the "pintados" of the genus *Pseudoplatystoma* has been found in number able to inform on its reproductive activity at Capim River. But the occurrence of those other genera of large catfishes may also indicate that this area furnishes cover to populations of these species.

At the period when this study was realized the species of this stratum was found at spawning phase as revealed the biopsy of several specimens; and it was registered in *Pseudoplatystoma fasciatum*, *Hemiodus unimaculatus* and *Curimata* cf. *knerii*. A total of forty eight (48) specimens of the species *Pseudoplatystoma fasciatum*, *Hydrolicus tatauaia*, *Pellona* cf. *flavipinnis*, *Auchenipterichthys longimanus*, *Parauchenipterus galeatus*, *Ageneiosus ucayalensis*, and *Platynematichthys notatus* had their gonads examined and their development stadiums read. The lecture was around the levels "empty" or "in regression" according to the rule of Vazzoler [19] that revealed that species outside from the reproductive period, but on the other hand, revealed gonad maturation cycle in this area of Capim River

Also the fishermen from Vila Canaã at high Capim River however registered *Pseudoplatystoma fasciatum* ("pintado"), two species of *Brachyplatystoma* ("dourada" and "filhote") and *Phractocephalus hemiliopterus* ("pirarara") during a large part of the year, making people believe that the Capim included populations of these Amazonian catfishes in these waters during flood period. This winter ichthyofauna engaged fish-eating species represented by these catfishes that normally arrived at Capim River probably from Guamá River to enlarge the list of species.

Barthem and Goulding [6] on the contrary, postulate that species develop part of their biological reproductive cycle at the large Amazon delta and migrate to up white waters far from the hydrographic of Capim-Guamá river system. They also believe that the large catfishes of Amazon basin realize their migratory activities in white

waters upriver of the Capim-Guamá system, mainly in the regions upper to River Xingu's mouth. Despite the registration of those species in this area, the catfish specimens encountered by this study at Capim River are always at juvenile stages.

On basis of the knowledge on Amazonian freshwater fish fauna, Barthem and Goulding [6] establish that the estuarine waters of the Amazon basin, where the rivers Guamá and Capim are near situated and their elevated primary productivities are the nursery of the large catfishes of genus *Pseudoplatystoma*. In fact, juvenile specimens of these species that have been encountered at the Capim waters reveal that their recruits are perhaps living for at least the flood period in this area.

Lowe McConnell [12] identifies the continuous geographic isolation between juveniles and adult specimens as a common phenomenon between migratory freshwater fishes from Neotropical freshwaters. Juveniles generally distribute through aquatic zones with dense primary production, remaining practically absent from the main channel of the large rivers. Barthem and Goulding [6] confirm the availability of food at the main channel of large rivers that are very low to guarantee the survival of large catfishes' juvenile populations at low Amazonia.

On the other hand, the extensive areas under influence of ocean oscillation are restrictive to the reproductive migrations of almost all the freshwater fish families noted by the absence of this activity on populations of most of migratory ichthyofauna from other regions of Amazonian basin. Goulding [7] also identifies several areas of upper Amazon basin including the Madeira, Tapajós and Xingú Rivers as areas where migratory activities of the Amazonian ichthyofauna occur. As studied by Goulding, fishes from genera *Semaprochilodus* ("jaraquis"), *Prochilodus* ("curimatãs"), *Schizodon* and *Leporinus* ("aracús"), *Colossoma* ("tambaquís" and "pirapitingas"), and *Cyphocharax* and *Curimata* ("branquinhas") are the common migratory components of the ichthyofauna. With exception of the large "tambaquis" and "pirapitingas", all other species are common migratory species in Capim River as herein studied.

To recognize the distribution of these stratums of the Capim ichthyofauna is necessary to better understand the distribution of the dweller fish species and that of the secondary invaders. Also a comparison between the resident species from the main channel of Capim River and the Tocantins as listed by Garavello *et al*. [8] shows similarities of these species that are much coincident at species level (see also Merona [20]). How the Characiformes and Siluriformes ichthyofauna of these basins from the Amazonian Dry Lowlands includes native species, is possible to identify some individuality in the Capim ichthyofauna. For example, small sized species of the families Anostomidae, as observed by Garavello and Santos [21], Characidae, Curimatidae, Auchenipteridae, Doradidae, Pimelodidae and Loricariidae are much frequent than the own large ones of each family suggesting a selection of species on basis of size in the Capim River. This event is also very common in the Tocantins River, while it is uncommon in Guamá River basin.

Furthermore, in view of the differences found in the ichthyofauna from Capim in relation to the Guamá River, we assume a complex derivation for its ichthyofauna which is different from the simple transfer of fish populations from Guamá to Capim. Probably the freshwater fish composition of the Capim River, in the area free from sea level influences, results from the complex drainages reorganization occurring in ancient times (in Tertiary or Quaternary ages). The elucidation of this ichthyofauna's relationship with other Amazon rivers (chiefly Tocantins River) still awaits further investigation.

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