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Preliminary Data on the Ichtyofaun of Djiri River (Affluent of right bank of Congo River)

Mikia M[1,2]., Mady-Goma Dirat I.[1], Tsoumou A.[1,2] , Mabanza J.,[4] Vouidibio J.[2] and Diatewa M.[3]
[1]Laboratory of Research for Animal Biology and Ecology, ENS, University Marien Ngouabi, B.P. 69 Brazzaville, CONGO [2]Faculty of Sciences and Techniques, University Marien Ngouabi, B.P. 69 Brazzaville, CONGO
[3]Faculty of Health Sciences , University Marien Ngouabi, B.P. 69 Brazzaville, CONGO
[4]Center of Research in Genetic Amélioration of Plants Brazzaville CONGO

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Abstract

A preliminary study of the ichtyofauna of the lower course of the Djiri River, tributary of right bank of the Congo River was undertaken during period of February 2008 to January 2009. Located at 20 kilometers in the North of Brazzaville, the Djiri River has never been the subject of an ichtyologic study. Median values of the following physicochemical parameters: temperature, pH, conductivity, dissolved oxygen, TDS, show that there is little variation during the year. Only turbidity varies considerably with minima in April (7,83 NTU) and maxima in May (33,1 NTU) and November - December (28,67 NTU). 2808 specimens of fishes, 95 species and 53 genera belonging to 23 families and 11 orders were inventoried during this study. The order of Characiformes is most representative with 30% of species, follow-on by Siluriformes (22%), Osteoglossiformes (20%), then by Perciformes and Cypriniformes (8,5% each one). The family of Mormyridae is the most diversified with 17% species, followed by Alestidae (15%) and Distichodontidae (11%). Two species dominate the collection: Synodontis nigriventris (13%) and Bryconaethiops boulengeri (11%), they are followed by Bryconaethiops microstoma (10%) and Micralestes stormsi (8%). The temporal evolution of specific diversity shows that the Shannon index is very high (superior to 2), and whatever the period of the year, that characterizes diversified populations, however a weak equitability is observed in January, March and April.

Keywords: Djiri River, Ichtyofauna, specific diversity, Shannon index, equitability.

Introduction

The continental or littoral watery ecosystems are the most exploited, the most modified, threatened, and weakened environments[1]. Indeed, in addition to intensive fishings which are practiced there, these ecosystems are frequently affected by other natural disturbances (dryness, stranding, anoxic crises) or anthropic (raising of barrage, pollution, reduction of the habitat). Some visible consequences of the disturbances are the modification of populations structure and the disappearance of taxa which are sensible to environment fluctuations. If the conservation of the biodiversity currently constitutes a great concern of the governments and scientific community, the protection of the aquatic environments and their components neither hold the attention of public authorities nor mobilized the international opinion as well as the protection of the large mammals, vegetable cover, the degraded ground, etc[2]. Fishes are one of the best indicators of quality of any aquatic ecosystem and occupy a remarkable position from socioeconomic point of view[3]. However, the rational management of the ecosystems requires first a whole knowledge of the various components of these ecosystems; unfortunately, the freshwater ecosystems in general and congolese freshwater fish biodiversity is poorly studied and some areas are still untouched and there is no proper documentation on freshwater fish resources of right bank of Pool Malebo[4]. It's the same situation for many Indian river[5]

Some studies were already carried out on Right Bank of the Congo Basin namely: fishes of Alima and Sangha[6,7], listed fishes of the national park of Odzala[8], fishes of lower course Alima[9], fishes of the Pool-Malebo[10] and very recently, the ichtyofauna of Léfini[11]. We purport to make an inventory of fishes of the lower course of the Djiri River, in order to contribute to the study of fishes diversity of Congo basin. These fishes inventory is important for knowledge of fishes populations[12].

Presentation of site of study: Djiri River, just like the majority of affluents sprinkling Right Bank of the Congo River, takes its source in the South of the plate of Mbé and in the high hills which prolong the Batékés plateau[13]. With a length of 50 kilometers, a surface of 853 km^2, a flow of 850 mm/an, a deficit of flow of 960 mm, a flow of 27 l/s/km2 and a coefficient of flow of 47%. Djiri which runs in direction NW-SE, presents the next principal tributaries: Kouala-Kouala, Bamba and Souo on left bank and Bilolo and Bitatolo on Right Bank[14]. Our sampling was carried out in the area located between 04,18117 - 04,13095 of Southern latitude and 15,31177 - 015,32192 of Eastern longitude (figure- 1).

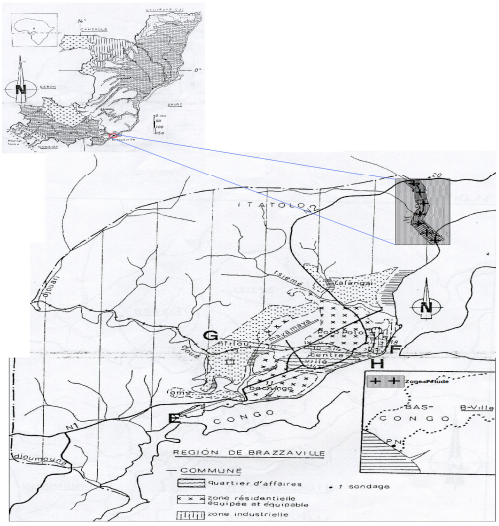

Figure-1
Representative Chart of the propection site (Moukolo, 1984)

Material and Methods

Fishes were captured during monthly fishing from February 2008 to January 2009, in the lower course of the Djiri river. They were immediately plunged in formalin 10% for fixing, then transferred in formalin 5% or alcohol 70% for conservation.

Fishes species determination is based on the morphometric and meristic characters according to identification keys described by different authors[15,16,17].

The specific diversity of fishes populations were calculated by Shannon Weaver index (H').
$H' = \sum - pi \ln pi$; with $pi = Ni/N$
Where: Ni number of specimens of each species, N total number of specimens.

The equitability E is represented by the following formula[18]:

$$E = \frac{H'}{H'\max}$$

Where: H' max = lnS, H': real diversity, H' max: maximum, diversity, S: Total number of species.

Results and Discussion

In order to characterize the biotope in which fishes live, physicochemical parameters of surface water were measured (figure- 2).

Among these five parameters, only turbidity varies considerably with a minimum (8,15 NTU) in April and a maximum in December (28,09 NTU). Water of Djiri has a fairly acid pH, around 5,80 ; conductivity is 7,50 ms/cm, the value of dissolved oxygen is very low, 7,60 mg/l; turbidity is low, around 19 NTU (slightly turbid water) and the average temperature is 25,5°C. Results are so very close to those of the two authors above mentioned[13,14], with light variations related to the environmental conditions.

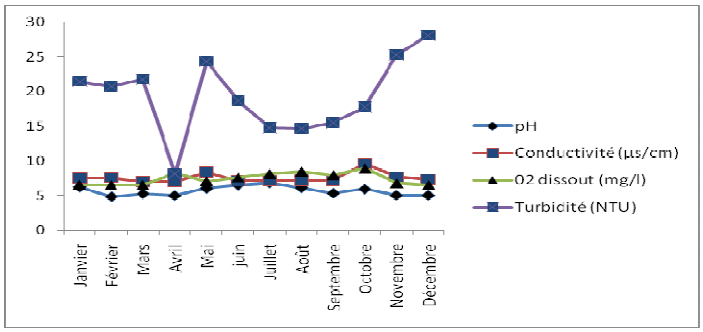

Figure-2
Monthly variation of the physicochemical parameters

List of species: 2808 fishes specimens belonging to 95 species, 53 genus, 23 families and 11 orders were listed in Djiri River sampling (table- 1). The various species are classified according to evolutionary order[4]; then, each species is presented by its scientific name followed by a vernacular name in lingala and kikongo.

Spectrum of fishes species according to the orders: Figure- 3 illustrates the proportions of the various orders according to the number of species.

It arises that of the 94 species listed in Djiri River, the order of Characiformes is more diversified with 28 species either 29,8%, followed by Siluriformes (21 species, 22,3%), Osteoglossiformes (19 species or 20%), Perciformes and Cypriniformes (8 species or 8,5%), Polypteriformes and Clupeiformes (3 species or 3%), finally Lepidosireniformes, Gonorhynchiformes, Synbranchiformes, and Tetraodontiformes with 1 specie each one or 1%.

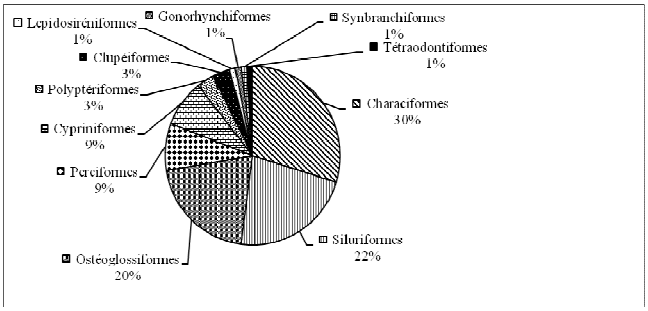

Figure-3
Spectrum of inventoried fishes orders

According results obtained in Congo Basin[18], the order of Siluriformes is most representative in Congo basin with 23,5%, it is followed by the order of Perciformes (18,7%), then Osteoglossiformes (16,5%), Cypriniformes (16,3%), Characiformes (14,3%) finally of Cyprinodontiformes (6,6%). In the national park of Odzala[8], the catfishes (Siluriformes) are the more diversified group with 22,66%.

Table-1
Details of Collected Fishes of Djiri River (Fev 2008-Jan 2009)

Families	Scientific Name	Vernacular names	
		Lingala	Kikongo
PROTOPTERIDAE	*Protopterus dolloï*	nzombo	njomo
POLYPTERIDAE	*Polypterus ansorgi*	mokonga	mukuwa
	Polypterus mokelembembe	mokonga	mukuwa
	Polypterus palmas congicus	mokonga	mukuwa
OSTEOGLOSSIDAE	*Heterotis niloticus*	kongo ya sika	kongo ya sika
PANTODONTIDAE	*Pantodon buchholzi*		
NOTOPTERIDAE	*Xenomystus nigri*	Peke	pekoe
MORMYRIDAE	*Cyphomyrus macrops*	mbese	mbese
	Gnathonemus petersii	mbese	mpima
	Hippopotamyrus weeksii	mbese	mbese
	Marcusenius greshoffi	mbese	boso
	Marcusenius kutuensis	mbese	boso
	Marcusenius macrolepidotus angolensis	mbese	boso
	Marcusenius moorii	mbese	boso
	Marcusenius schilthuisae	mbese	boso
	Marcusenius stanleyanus	mbese	boso
	Mormyrus ovis Boulenger	mbese	mpima
	Wild *Petrocephalus ballayi*	mbese	mbese
	Petrocephalus christyi Boulenger	mbese	mbese
	Petrocephaus microphthalmus	mbese	mbese
	Wild *Petrocephaus simus*	mbese	mbese
	Petrocephalus sp	mbese	mbese
	Pollimyrus nigripinnis	mbese	mbese
CLUPEIDAE	*Odaxothrissa will losera*		nsangui
	Pellonula leonensis		nsangui
	Pellonula vorax		nsangui
PHRACTOLAEMIDAE	*Phractolaemus ansorgii*	mokisi	mubiri
CYPRINIDAE	*Clypeobarbus matthesi*		
	Clypeobarbus stanleyi		
	Clypeobarbus sp		nionzi
	Labeo lineatus	monganza	
	Labeo sp	monganza	
	Leptocypris weeksii	sardine	mulima
	Raïmas buchholzi	sardine	mulima
	Raïmas christyi	sardine	mulima
HEPSETIDAE	*Hepsetus odoe*	muengue	muengue
ALESTIDAE	*Alestes liebrechtsii*	mokobe	mpemo
	Bathyaethiops greeni		
	Brachypetersius altus		
	Brycinus comptus	mapoyo	nsangui za kuala
	Brycinus imberi	mapoyo	nsangui za kuala
	Brycinus macrolepidotus	mapoyo	ntsuele
	Brycinus poptae	mapoyo	ntsuele
	Bryconaethiops boulengeri		mpemo
	Bryconaethiops microstoma		mpemo
	Duboisialestes tumbensis		
	Hydrocinus vittatus	mbenga	mbenga
	Micralestes acutidens		
	Micralestes stormsi		

	Phenacogrammus interruptus		
CITHARINIDAE	*Citharinus gibbosus*	liyanga	yanga
	Citharinus latus	liyanga	yanga
	Citharinus macrolepis	liyanga	yanga
DISTICHODONTIDAE	*Distichodus altus*		
	Distichodus antonii	mboto	mbutu
	Distichodus atroventralis	mpongui	
	Distichodus lusosso	lusoso	
	Distichodus noboli		
	Distichodus sexfasciatus		
	Eugnathichthys macroterolepis		
	Ichtyborus ornatus		minkari nkari
	Mesoborus crocodilus		
	Nannocharax schoutedeni		
	Phago boulengeri		mutitikiri
CLAROTEIDAE	*Auchenoglanis occidentalis*	mboka	mbuka
	Chrysichthys ornatus		suaro
	Chrysichthys punctatus	kamba	suaro
	Chrysichthys thonneri	kamba	suaro
	Parauchenoglanis punctatus		ke
SCHILBEIDAE	*Parailia congica*	malewa	malewa
	Pareutropius debauwi	lilagwa	lagwa
	Schilbe intermedius	lilagwa	lagwa
	Schilbe marmoratus	lilagwa	lagwa
	Schilbe mystus	lilagwa	nkembi
CLARIIDAE	*Channallabes apus*	ngabili	tondia
	Clarias gariepinus	ngolo	ngola
	Clarias sp	ngolo	ngola
MALAPTERURIDAE	*Malapterurus electricus*	Nina	tsula
MOCHOKIDAE	*Synodontis alberti,*	likoko	nkoko
	Synodontis congicus	likoko	nkoko
	Synodontis contractus	likoko	nkoko
	Synodontis flavitaeniatus	likoko	nkoko
	Synodontis nigriventris	likoko	nkoko
	Synodontis nummifer	likoko	nkoko
	Synodontis schoutedeni	likoko	nkoko
MASTACEMBELIDAE	*Mastacembellus congicus*		mfulatse
CICHLIDAE	*Hemichromis bimaculatus*		kingulu
	Hemichromis elongatus		kingulu
	Hemichromis stellifer		kingulu
	Tilapia tholloni	libundu	bundu
	Tilapia zillii	libundu	bundu
	Tylochromis lateralis	libundu	bundu
ANABANTIDAE	*Ctenopoma nebulosum*		tsimpete
CHANNIDAE	*Parachanna insignis*	mungusu	nsinga
TETRAODONTIDAE	*Tetraodon miurus*	mbulitsui	

Spectrum of fishes species according to the families: The figure- 4 illustrates the proportional representation of the number of species according to the various families observed.

The distribution of the species according to the families indicate a clear predominance of Mormyridae (16 species 17%); they are followed by Alestidae (14 species either 15%), Distichodontidae (10 species or 10,6%), Cyprinidae (8 species or 8,5%), Mochokidae (7 species or 7,4%), Cichlidae (6 species or 6%) and finally the other families the proportions of which are lower than 6%.

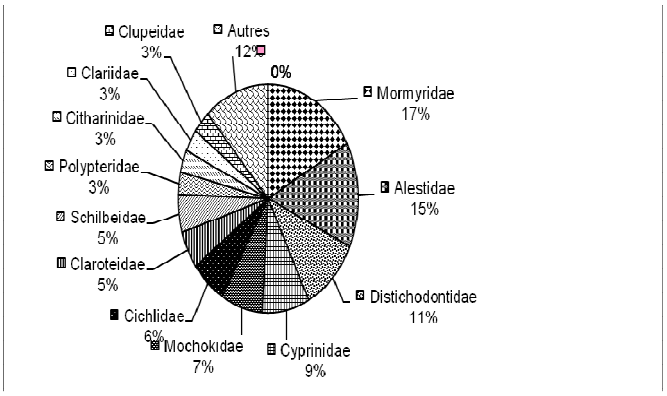

Figure-4
Spectrum of the families of listed fishes

Our results are very close to those of the national park of Odzala[8], with a clear predominance of the family of Mormyridae with 22%, followed by Distichodontidae (14%) and Mochokidae (10,7%). The family of Mormyridae is more diversified with (17%) of the total of the listed species; it is followed by Alestidae (14,9%), Distichodontidae (10,7%), Cyprinidae (8,5%), and Mochokidae (7,5%). The differences observed are related to each type of biotope characteristic of each river. In Congo Basin[19], the family of Cyprinidae is the most diversified with 16,3% as well as Mormyridae (16,2%); they are followed by Cichlidae (13,1%), Mochokidae (8,7%), Characidae (7,0%), Distichodontidae (6,8) and Cyprinodontidae (6,6%).

Specific richness: The specific richness of twelve months study is represented by figure- 5.

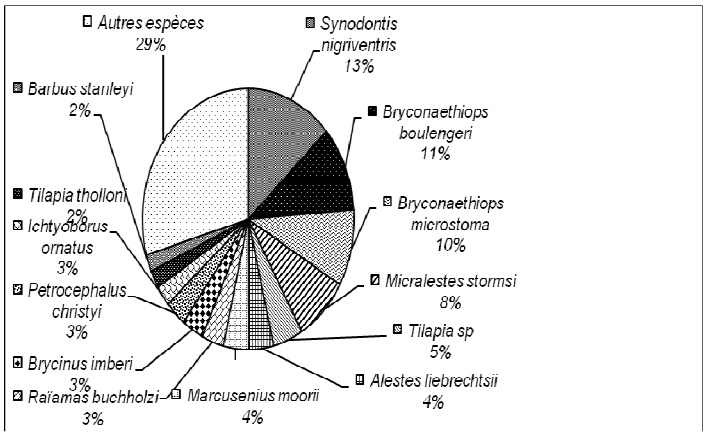

Figure-5
Total biological spectrum

This figure 5 shows that five species dominate the river: *Synodontis nigriventris* (13%), *Bryconaethiops boulengeri* (11%), *Bryconaethiops microstoma* (10%).

Temporal variation of Shannon index: The Shannon index shows a variation according to months as indicated in figure- 6.

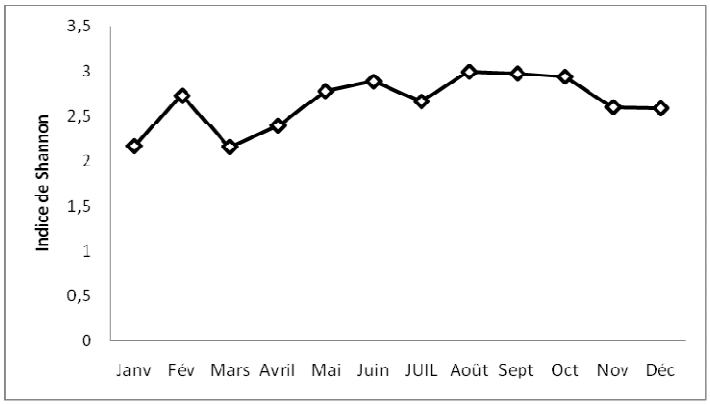

Figure-6
Temporal variation of the index of Shannon

This Figure shows that whatever the period of the year, the Shannon index is high, because it is superior to 2.

Temporal variation of equitability: The equitability shows a temporal variation (figure- 7).

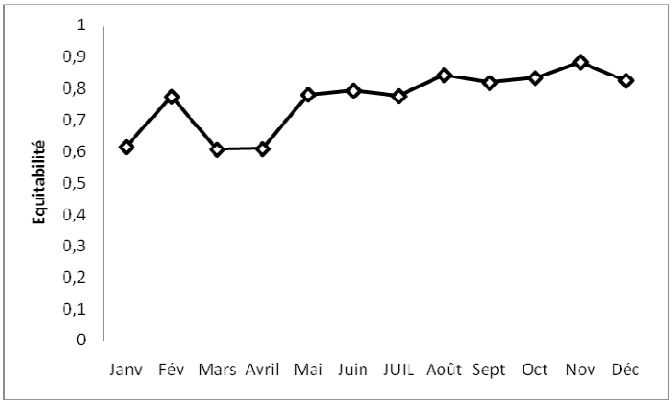

Figure-7
Temporal variation of the equitability

The equitability is fairly weak in January, March, and April (lower than 0,7) and strong during the rest of the year (higher than 0,7).

Seasonal variation of Shannon index and equitability: The seasonal variation of specific diversity and equitability are represented by figure- 8.

The analysis of this figure shows that, on the one hand, whatever the season, specific diversity is high (higher than 1). On the other, the environment is equilibrated (equitability higher than 0,7).

The temporal evolution of specific diversity shows that the Shannon index is very high (superior with 2), and whatever the period of the year; that characterizes very rich diversified population. The weak equitability in March, January, and April shows the presence of ecological niches of *Synodontis nigriventris* and, *Bryconaethiops boulengeri*.

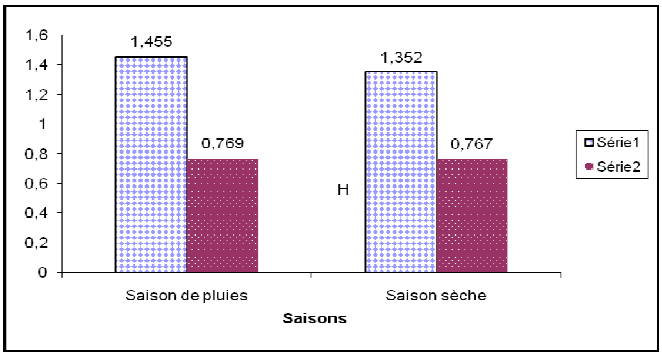

Figure-8
Seasonal variation of the index of Shannon and the equitability

Conclusion

Djiri River has a great socio-economic importance because of the various activities which are undertaken there (truck farming, breeding, fishing, pisciculture, hotel trade). The demographic pressure is more and more growing with the creation of new districts around Djiri, special attention must be lent to its environment to avoid overexploitation, the reduction and the exhaustion of the resources of this ecosystem. The public authorities should promote such studies, in order to allow the protection mechanisms for a durable management of the dulçaquicole ecosystems of this river and others.

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