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Preliminary study of fish fauna of Loulali River, tributary of Louesse River (Kouilou-Niari basin), Lekoumou Departement (Congo Brazzaville)

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Abstract

This study was carried out for the first time in the Loulali River, tributary of the Louesse (basin Kouilou-Niari) in the period from August 2014 and June 2016. 930 specimens of fish belonging to 32 species, 19 genera, 10 families and 5 orders were caught using cash nets. Cypriniformes have a high species richness with 12 species (38%), followed by Siluriformes and Perciformes (7 species, 22%). Enteromius holotaenia is the emblematic species of the environment with a relative specific abundance of 54%. The population of the Loulali River is diversified (H'= 2.78) and heterogeneous because the specific distribution is unbalanced (E = 0.56).

Keywords: Loulali River, Population, Species richness, Shannon index, Equitability, Congo.

Introduction

The management of aquatic ecosystems and fish populations in african freshwater is becoming a necessity. It is in this perspective that the identification of a large number of species inhabiting african fresh and brackish waters and the study of their bio-ecological characteristics have for many years been an important aspect of scientific research. This contributes to providing information on the fish fauna of different basins and rivers of the continent so as not to affect both the basic needs of local communities and the rich biodiversity of the continent[1]. The river system of the Republic of Congo is organized in two main basins: the Congo River basin and its main tributaries which extend from the North to the South-East of the country are in the Congolese province; the Kouilou-Niari basin and its main sub-basins in the south-west of the country are classified in the Lower Guinea province[2]. In Congo, there is very little data on the ichthyofauna of Lower Guinea. Kouilou-Niari fish caught between Niari bridge and Loudima were described and those from the right bank of the Middle Congo[3,4], and five years later, they surveyed fish from the lower Kouilou, the Noumbi basin and the lower and middle Loemé. Subsequently, the mission carried out in the lower Kouilou to the Sounda Gorge[5], contributed to the increase in numbers of fish species never before known. Later, freshwater fish fauna in the Dimonika Biosphere Reserve in Mayombe have been studied[6]. Others authors did the study of ichthyofauna of the Niari and Chaillu Basin[7]. Another study was carried out in the Kouilou basin, the Noumbi and the small coastal basin systems[8]. The discovery and description of new species and identification of endangered fish species is still an important scientific activity in Africa and has even been the subject of close collaboration between the RMCA and IUCN[9]. It is in this perspective that it seemed interesting to inventory the ichthyofaunal of the Loulali River (tributary of the Louesse) in the Department of Lekoumou, in an area not yet studied.

Materials and Methods

Sampling site: The inventory of the Loulali River ichtyofauna was carried out at several fishing points, prospected (Figure-1) at the study station located on both sides of the Sibiti-Mapati road bridge. Crossing this river. The geographical coordinates of this site were taken from a Holux GPS model GM-132: 3° 33'28.5 "S South latitude and 13°21'32.1"E East longitude.

Physicochemical parameters: The physico-chemical parameters (temperature, conductivity, pH and TDS) of the surface water were recorded at the beginning of each fishing session using a Combo brand multi-parameter device. Sampling and identification of fish. The fish were caught in the morning and evening using a cast net, from 14 to 16 August 2014 and from 23 to 24 June 2016. The fish are then fixed in 10% formalin and preserved in 5% formalin. Identification of the captured specimens was done using the different keys available[6,10,11]

Diversity indices: Two diversity indices were used to evaluate the specific diversity: Shannon-Wiener index and equitability (E) whose formulas are as follows:

$H' = -\sum_i P_i \log_2 P_i$; $P_i = \frac{n_i}{N}$

Where, Pi is the relative abundance of each species; ni is the number of individuals of the species i ; N is the total number of individuals;

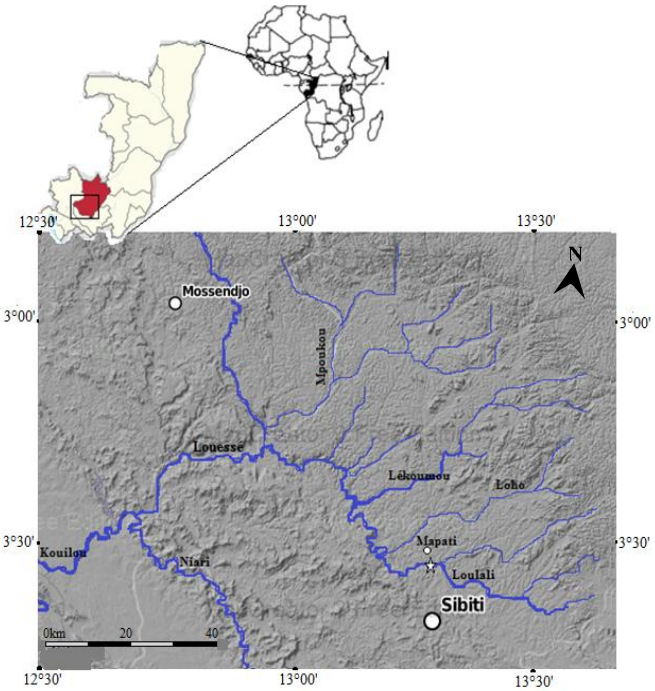

Figure-1: Sampling site.

An expression of equitability (regularity of a distribution) is often given from the Shannon index. The value of equitability (E) varies from 0 to 1. Equitability equals 1 when all species have the same abundance and less than 0.7, when almost all the population is concentrated on a single species[12].

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

Where: H' is Shannon's index; H max is maximum index; H max is Log_2 S; S is the specific richness.

Results and Discussion

Physico-chemical characteristics of surface water changes in the physicochemical quality of the surface water of the Loulali River were established daily during the dry season from 23th to 24th June 2016. These physicochemical parameters (temperature water, air temperature, conductivity, TDS and pH) measured in order to characterize the biotope in which the fish live were recorded in Table-1. The water transparency is equal to 60cm.

The average of the water is 22.6±0°C, lower than air temperature (25.2±1.4°C). The average conductivity is 23.3µS ± 97 and the average TDS is 11.7±5ppm. The average pH of the surface water is 7.4, the neutral pH was also found in the Dimonika Biosphere Reserve[6]. At the Dimonika Biosphere Reserve the conductivity is 147µS / cm and the TDS s equal to 59ppm. The difference could be explained by the study area geology located in the Chaillu massif which is different from that of the Niari valleyand Mayombe.

Specific composition: The repeated fishing sessions at the various fishing points of the chosen site allowed to capture 930 specimens, divided into 32 species belonging to 19 genera, 10 families and 5 orders (Table-2).

The species obtained are different with those identified in previous studies in the Mayombe, Sounda and Passy-Passy; then in the Niari Valley and in the Chaillu massif[6,7]. It should be noted that this study was carried out on a single site, a spatiotemporal study will allow a better comparison.The following species: *Labeobarbus micronema*, *Labeobarbus habereri* and *Labeobarbus versluysii*, *Varicorhinus frimbriatus* and *Coptodon camerunensis* has been identified for the first time in this congolese part of the lower Guinea province. These species have been identified in the Sanaga (Cameroon), Ivindo (Gabon) and Equatorial Guinea Basin[11].

Table-1: Physicochemical parameters of surface water.

Physicochemical Parameters	23-06-2016	24-06-2016		Mean
	Evening	Morning	Evening	
Air temperature (°C)	26.2	24.2	27.1	25.2±1.4
Water temperature (°C)	22.4	22	23.5	22.6±0.8
Conductivity (µS/cm)	15	34	21	23.3±9.7
TDS (ppm)	7	17	11	11.7±5
pH	7.66	7.48	6.98	7.4±0.35

Table-2: Specific composition of Loulali River ichthyofauna.

Orders	Families	Genus	Species	Ni
Cypriniformes	Cyprinidae	Enteromius	*Enteromius holotaenia* Boulenger, 1904	498
			Enteromius martorelli Roman, 1971	3
			Enteromius prionacanthus Mahnert et Géry, 1982	1
			Enteromius sp	10
		Labeo	*Labeo annectens* Boulenger, 1903	27
			Labeo lukulae Boulenger, 1902	13
		Labeobarbus	*Labeobarbus compiniei* (Sauvage, 1879)	2
			Labeobarbus habereri (Steindachner, 1912)	2
			Labeobarbus malacanthus (Pappenheim, 1911)	2
			Labeobarbus micronema (Boulenger, 1904)	17
			*Labeobarbus versluysii (*Holly, 1929)	1
		Varicorhinus	*Varicorhinus fimbriatus* Holly, 1926	2
Siluriformes	Mochokidae	Chiloglanis	*Chiloglanis sp (Cf Atopochilus)*	7
			Chiloglanis cameronensis Boulenger, 1904	48
	Clariidae	Clarias	*Clarias sp1*	5
			Clarias sp2	2
	Amphiliidae	Doumea	*Doumea typica* Sauvage, 1878	78
		Phractura	*Phractura brevicauda* Boulenger, 1911	2
	Claroteidae	Parauchenoglanis	*Parauchenoglanis punctatus*Boulenger, 1902	1
Characiformes	Hepsetidae	Hepsetus	*Hepsetus odoe* Bloch, 1794	17
	Alestidae	Brycinus	*Brycinus longipinnis* Daget, 1946)	3
		Nannopetersius	*Nannopetersius lamberti*Poll, 1967	37
		Phenacogrammus	*Phenacogrammus sp1*	59
			Phenecogrammus sp2	3
Osteoglossiformes	Mormyridae	Brienomyrus	*Brienonyrus kingsleyae* Günther, 1896	5
Anabantiformes	Channidae	Parachanna	*Parachanna insignis* Sauvage, 1884	3
	Cichlidae	Hemichromis	*Hemichromis elongatus* Guichenot, 1861	53
		Sarotherodon	*Sarotherodon nigripinnis* Guichenot, 1861	1
		Oreochromis	*Oreochromis niloticus* (Linnaeus, 1758)	9
		Coptodon	*Coptodon camerunensis*Holly, 1927	1
			*Coptodon guineensis*Bleeker, 1862	14
			*Coptodon thollonii*Sauvage, 1884	4

5	10	19	32	930

Species richness of orders: Figure-1 shows the proportions of the various orders in relation to the number of species caught listed in the Loulali River, the Cypriniformes order is the richest with 12 species (37%), followed by Siluriformes and Perciformes, which each have 7 species (22%) and Characiformes (16%); Osteoglossiformes are less rich (3%). The Cypriniformes constitute the richest order (37%) in Loulali River and in the Dimonika biosphere reserve (26.5%). Five of the seven orders identified in the Dimonika biosphere reserve are present in this study[6]: Cypriniformes, Characifornmes, Siluriformes, Perciformes and Osteoglossiformes, except for the two additional orders in the reserve (Cyprinodontiformes and Synbranchiformes). It can be explained by the fact that in this study, cast net were the only fishing technique used.The four main orders recorded in the Loulali River are the same as those of the whole of Lower Guinea[13], apart from the Cyprinidonti forms which are absent from the Loulali River, because only the cast net and gill nets were used.

Species richnessof families: The Figure-3 shows a predominance of Cyprinidae (12 species, 38%), followed by Cichlidae (6 species, 19%), Alestidae (4 species, 13%), Mochokidae, Clariidae and Amphiliidae (2 species, 6%). The least represented families are Claroteidae, Hepsetidae, Channidae and Mormyridae (1 species, 3%). Throughout theLower Guinea, the Cyprinodontidae family is the most represented, followed by the Cyprinidae, the Cichlidae, the Mormyridae, the Characidae, the Distichodontidae, the Bagridae et the Claroteidae and others families[13]. The lack of Cyprinodontidae in Loulali River collection could be explained by the fact that only two fishing techniques were used in this river.

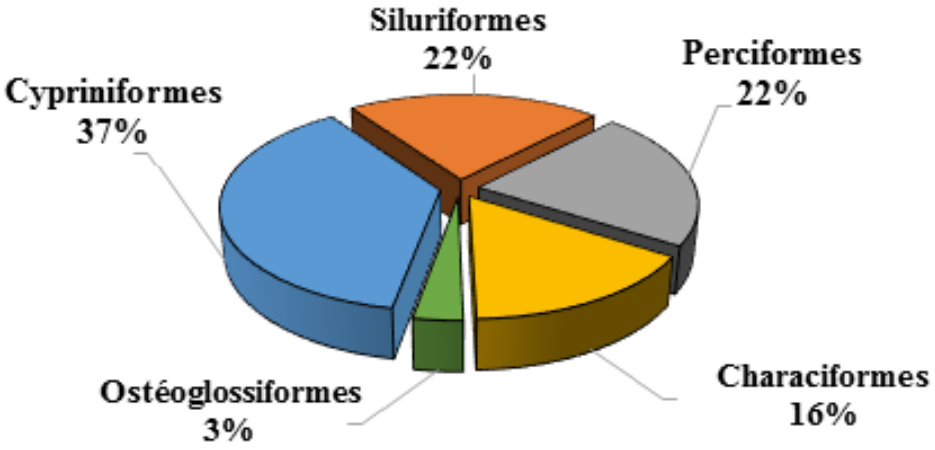

Figure-2: Repartition ofspecies richness according to orders.

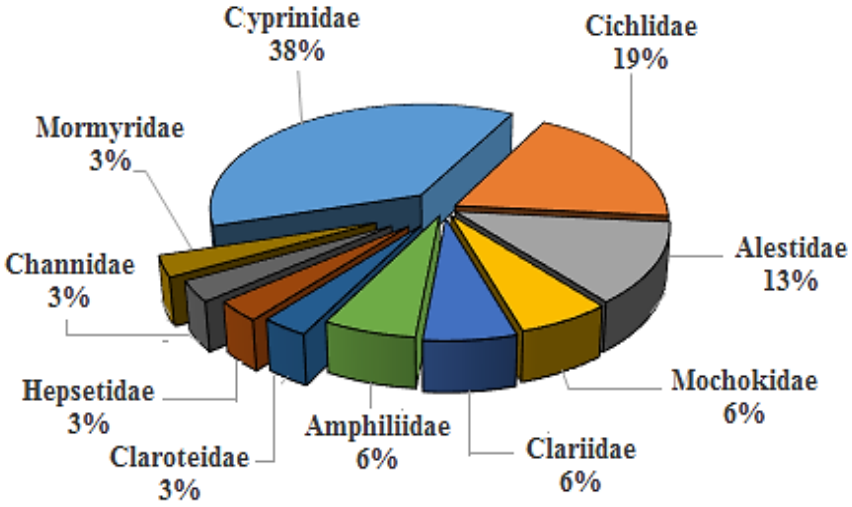

Figure-3: Repartition of species richness according to families.

Specific relative abundance: During this study 930 specimens belonging to 32 species were captured. *Barbus holotaenia* is the most abundant species with 498 specimens which represent 54%. This dominant species is followed by *Doumea typica* (9%), *Phenacogrammus sp1* (7%), *Hemichromis elongatus* (6%), *Chiloglanis cameronensis* (5%), *Nannopetersius lamberti* (4%), *Labeo annectens* (3%). *Labeobarbus micronema*, *Hepsetus odoe* and *Coptodon guineensis* each represent 2% (Figure-4). The remaining 22 species have a percentage less than or equal to 1%.These results show a population imbalance, due to the very high numerical abundance of *Barbus holotaenia*, which is confirmed by the values of the diversity indices.

Diversity indices: The fish population of Loulali River is very diversified, with Shannon index (H') equal to 2.78. The population is heterogeneous because the specific distribution is unbalanced, the equitability is equal to 0.56. Diversity indexes are given in Figure-5.

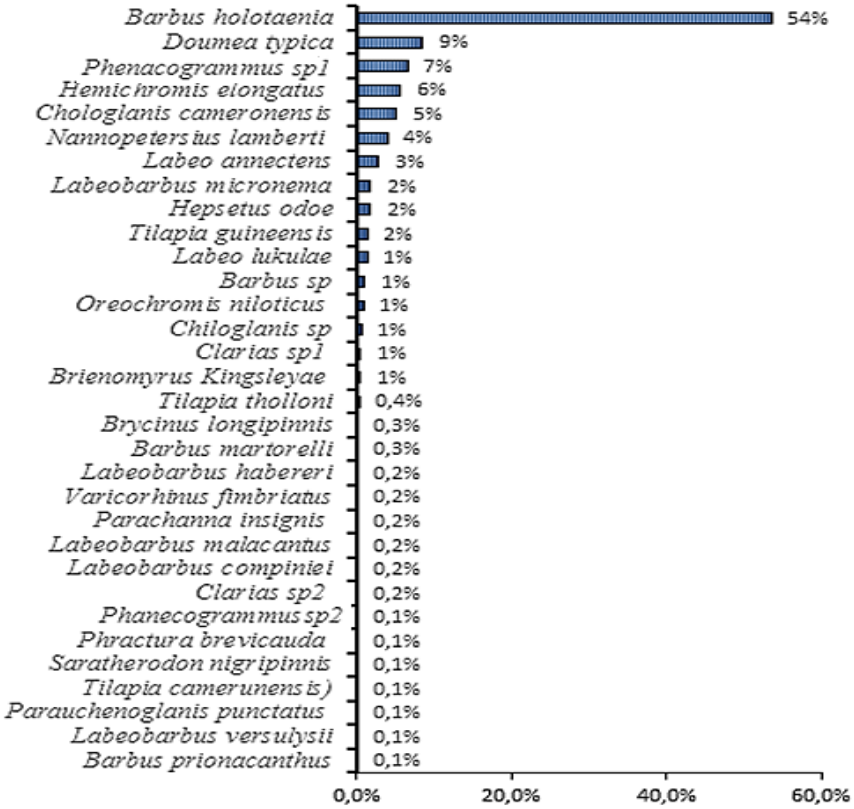

Figure-4: Distribution of specific relative abundance.

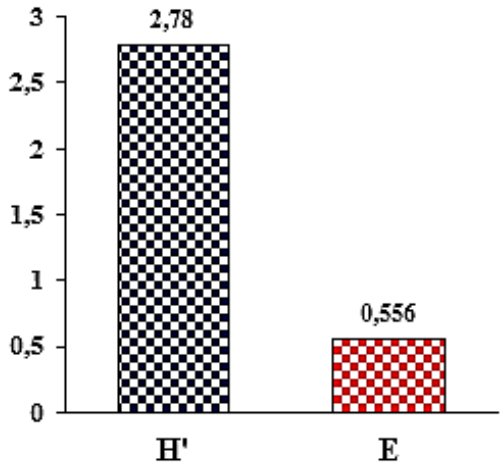

Figure-5: Shannon index (H') and equitability (E).

Conclusion

This preliminary study of the ichthyofauna of the Loulali River in Lekoumou Department showed that the Cypriniformes order has the species richness most, consisting essentially of the family Cyprinidae, which is the most abundant at the fishing site. *Enteromius holotaenia* is the most abundant species in the environment. Five species are already known from other basins in the province of lower Guinea other than Congo, were identified during the present study. These results constitute a preliminary database on the Loulali ichthyofauna, which could be continued by creating several sampling stations, using diversified fishing techniques for a longer time.

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