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Ichthyofaunal Diversity of Komo River, tributary of Alima River, Congo Brazzaille

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Abstract

The fish fauna of the right bank of Congo River was little known, but the investigations were currently underway. They aimed to take stock of the different streams of Congo Brazzaville. A study of the fish fauna of the Komo River was conducted in two stations using gill nets, and nets.86 species grouped in 44 genera, 20 families and 9 orders were identified. Osteoglossiformes was the most represented order with 31%. The Mormyridae was the most represented family with 26%of species. Xenomystus nigri was the most abundant species (13%) in station 1; the two most abundant species in station 2 were Phenacogrammus interruptus (34.8%) and Alestopetersius hilgendorphi (33.2%). The Shannon index was high in both stations, the settlement of the station 1 was balanced with a value of equitability greater than 0.8. On the contrary, equitability value was 0.6in station 2, proof of an unbalanced population.

Keywords: Komo River, Congo Brazzaville, Ichthyofaunal diversity, Shannon index, Equitability.

Introduction

The main threats (habitat destruction, habitat fragmentation, pollution, climate change, over exploitation of resources, invasive exotic species and disease spread) are related to human activities. These seven factors may interact synergistically and accelerate the loss of biodiversity[1]. Any conservation strategy requires knowledge of indigenous plant and animal species and their interactions with their environment. Anthropogenic activities such as modification of the environment, culture, harvesting and effects of modernization have contributed to the pollution of the water bodies which serve as habitat for fishes[2].

Fish research has become an increasingly important study area, as fish population is declining throughout the world. Studies of spatial and temporal patterns of diversity, distribution and composition of freshwater fishes are useful to examine different factors that influence the structure of the fish abundance and health of fish will show the health of water bodies[3]. Fish is used as a significant source of protein for millions of people around the world. Human population explosion has placed a significant demand on fish as a food source. The decline of fish has an adverse impact on aquatic ecosystems as well as a significant impact on human population as it is one of the primary food sources[4]. A perfect understanding of the ichthyofaunal diversity of a system is an essential prerequisite for successful implementation of fisheries development, sustainable utilization of fishery resources and for adopting suitable conservation measures[5]. The fish fauna of the right bank of the Congo Basin, is very poorly known. Some fragmentary studies mostly old, on fish fauna of Alima and Sangha[6], on the right bank of the Middle Congo[7]; a summary census work of the fish fauna of the Congo Basin was given[8] and the study of fish fauna of Likouala aux Herbes River[9]. During this last decade, differents works were conducted to inventory fish fauna ofthe right bank tributaries of Congo River: in the Mambili River[10]; in Alima River[11]; in Likouala aux herbes River[12]; in right bank of Congo River (Pool Malebo)[13]; in Lefini River[14]; in Djiri River[15], in Tsieme River[16], Mfilou River[17]. Present investigations, were undertaken to study fish fauna of Komo River, fish species has been inventoried and identified; diversity and equitability of fish population were assessed.

Materials and Methods

Study area: The survey was conducted on the Komo River tributary of the Alima, sub-tributary of the Congo River which is located north of Plateaux Department on the National Road 2, altitude on the road bridge is 311meters (Figure-1). Station 1 is located at 15°95'67.5" South latitude and 1°18'28.70" East longitude. Station 2 is located at 01°11'16.1" South latitude and 15°57'47.7" East longitude.

Sampling methods: Sampling of fish fauna was conducted in two stations from 20 to 22 July 2004 and from 20 to 22 April 2008, on either side of the bridge on the national 2. Station 1is upstream of the bridge and station 2 is downstream of the bridge. The physico-chemical parameters of the water surface were measured: air temperature and surface water temperature using thermometer, dissolved oxygen using an oxymeterbr and WTW, conductivity using a WTW brand conductimeter and turbidity with aturbidimeter brand Eutech. The fish capture was

made using the following fishing gears: gillnets, castnets and nets. Fishes identified using conventional identification keys[10,18-26], were then photographed and fixed in10% formalin before storage in 70°C alcohol.

Results and Discussion

Physico-chemical parameters of surface water: Physico-chemical parameters of surface water are recorded (Table-1). The water temperature in the two stations was similar, pH of Komo River was acidic in station 1 (4.05) and station 2 (4.5); dissolved oxygen rate was lower in station 1(1.03mg.l^{-1}) and in station 2(1.57mg.l^{-1}). The conductivity varied considerably between station 1(21.9µS.cm^{-1}) and station 2(10,96µS/cm), proof of low mineralization water. A previous study in the same river showed that pH values (4.5) and dissolved oxygen (1.5 mg.l^{-1}) were similar to those obtained in station 2; the conductivity value was 18.28 (µS.cm^{-1}) is close to that of the station 1. Turbidity was very low with 0.3NTU in station 1and0.52NTU in station 2.

Fish fauna composition: The preliminary study of the Komo River permitted to identify 1217 fishes including 86 species grouped in 44 genera, 20 families and 9 orders (Table-2). Each species is presented by its scientific name followed by a local name (Mbochi) and vernacular name (Lingala and Kikongo).

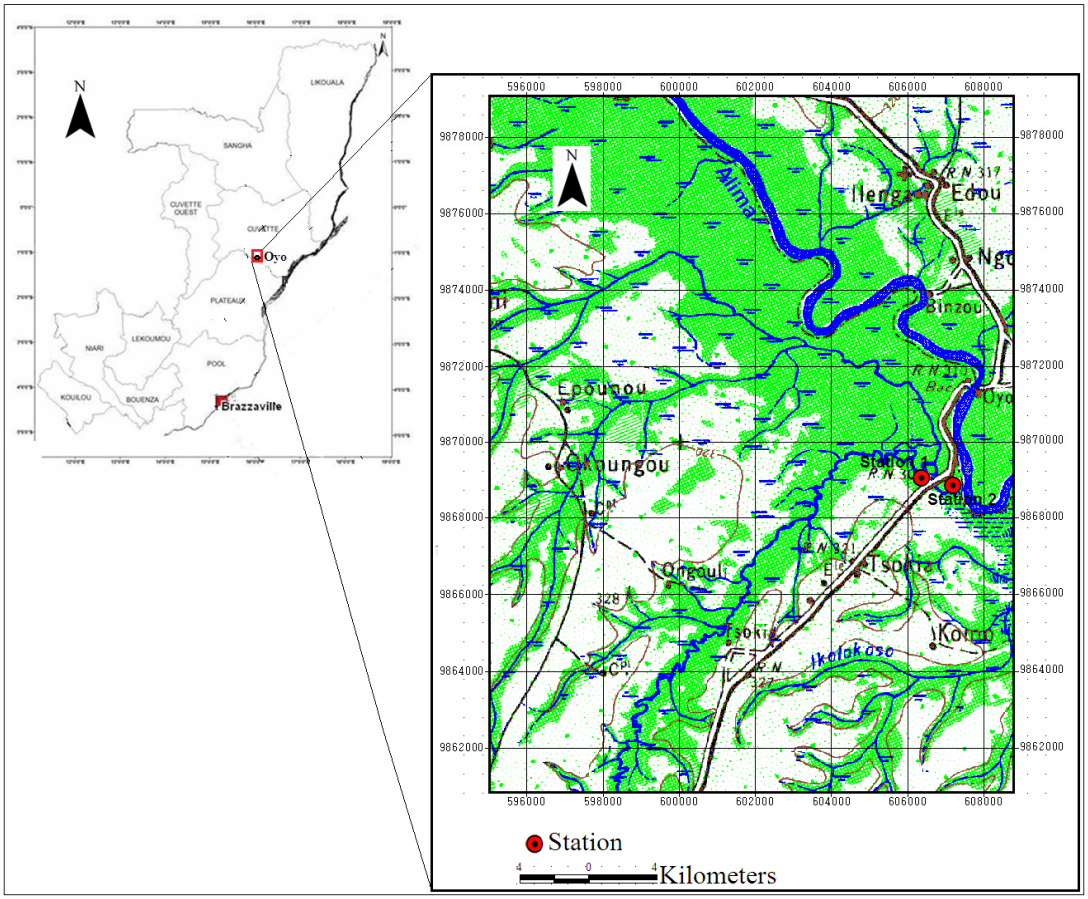

Figure-1
Study area map

Table-1
Physico-chemical parameters of surface water

	Temperature °C	pH	Dissolved oxygen (mg/l)	Conductivity (µS/cm)	Turbidity (NTU)
Station 1	24.39	4.05	1.03	21.9	0.3
Station 2	24.9	4.5	1.57	10.96	0.52

Table-2
List of identified species (20-22 July 2004 and 20-22 April 2008)

Orders and Families	Scientific Name	Local name	Vernacular name	
		Mbochi	Lingala	Kikongo
Lepidosireniformes				
Protopteridae	*1.Protopterus dolloï (*Boulenger, 1900	Niombo	Ndzombo	Njomo
Polypteriformes				
Polypteridae	*2.Polypterus congicus* Poll,1954	Konga	Mokonga	Mukuwa
Osteoglossiformes				
Pantodontidae	*3.Pantodon buchholzi* Peters, 1877	Itsatsa	-	-
Osteoglossidae	*4. Heterotis niloticus*	-	Congo ya sika	-
Notopteridae	*5.Papyrocranus afer* (Günther, 1868)	Ilembe	-	Peko
	6.Xenomystus nigri(Günther, 1868)	Lépè	Peke	Peko
Mormyridae	*7.Campylomormyrus tamandua* ((Günther, 1864)	Obubusu	-	-
	8.Gnathonemus petersii (Günther,1862)	Lembubè lonô ola	Mbese	Mpima
	9.Gnathonemus sp.	Lembubè lonô ola	Mbese	Mpima
	*10.Marcusenius fritelli (*Pellegrin,1904*)*	Lembubè	Mbese	Boso
	11.Marcusenius kutuensis(Boulenger, 1899)	Lembubè	Mbese	Boso
	12.Marcusenius moorii (Gill,1862*)*	Lembubè	Mbese	Boso
	13.Marcusenius sp1	Lembubè	Mbese	Boso
	14.Marcusenius sp2	Lembubè	Mbese	Boso
	15.Marcusenius sp3	Lembubè	Mbese	Boso
	16.Mormyrops anguilloïdes (Linné, 1758)	Lenianda	Ndzanda	Mbese
	17.Mormyrops deliciosus (Leach, 1818)	Lembubè	Mbese	Mbese
	18.Mormyrops nigricans Boulenger, 1899	Lembubè	Mbese	Mbese
	19.Mormyrops zanclirostris (Günther, 1898)	Lembubè	Mbese	Mbese
	20.Mormyrops sirenoïdes Boulenger, 1898	Mokouro	Monoko ndzombo	Mbese
	21.Petrocephalus ballayi Sauvage, 1898	Iguiènde	Mbese	Mbese
	22.Petrocephalus microphthalmus Pellegrin, 1908	Iguiènde	Mbese	Mbese
	23.Petrocephalus sauvagi Boulenger, 1887	Iguiènde	Mbese	Mbese
	24.Petrocephalus sp1	Iguiènde	Mbese	Mbese
	25.Petrocephalus sp2	Iguièndè	Mbese	Mbese
	26.Petrocephalus sp3	Iguièndè	Mbese	Mbese
	27.Pollimyrus sp Taverne, 1971	Lémbubè	Mbese	Mbese
Clupeiformes				
Clupeidae	*28.Pellonula leonensis* Boulenger, 1916	Lendzâa	-	Nsangi
	29.Pellonulavorax Günther,1868	Lendzâa	-	Nsangi
Gonorhynchiformes				
Phractolaemidae	*30.Phractolaemus ansorgii* (Boulenger, 1901)	Okisi	-	-

Orders and Families	Scientific Name	Local name	Vernacular name	
		Mbochi	**Lingala**	**Kikongo**
Characiformes				
Hepsetidae	*31.Hepsetus odoe* (Bloch, 1794	Muengue	Muengue	Muengue
Alestidae	*32.Alestes liebrechtsii* (Boulenger, 1898)	Okowfi	Mokobe	-
	33.Alestes dentex (Linné, 1758)	Okowfi	Mokobe	-
	34.Alestopetersius caudalis (Boulenger, 1899)	Lendzâa		Mpemo
	35.Alestopetersius hilgendorfi (Boulenger, 1899)	Lendzâa	-	Mpemo
	36.Alestopetersius nigropterus (Poll, 1967)	Lendzâa	-	Mpemo
	37.Brachypetersius altus (Boulenger, 1896)	-	-	-
	38.Brycinus carmesinus (Nichols et Griscom, 1917)	Engondokoro	-	Mapoyo
	39.Brycinus kingsleyae (Günther, 1896)	Engondokoro	-	Mapoyo
	40.*Bryconaethiops boulengeri* (Pellegrin, 1900)	Letsuèlè	-	Mpemo
	41.Hydrocynus forskalii (Cuvier, 1819) *	Mbenga	Mbenga	Mbenga
	42.Hydrocynus goliath (Boulenger, 1898)	Mbenga	Mbenga	Mbenga
	43.Micralestes occidentalis (Günther, 1899)	Lendzâa	-	-
	44.Phenacogrammus interruptus (Boulenger, 1899)	-	-	-
Distichodontidae	*45.Distichodus affinis* (Gunther, 1873)	Mboro	Mboto	-
	46.Distichodus altus (Boulenger, 1899)	Mboro	Mboto	-
	47.Distichodus noboli (Boulenger, 1899)	Mboro	Mboto	-
	48.Eugnathichthys macroterolepis (Boulenger, 1899)	-	-	-
	49.Mesoborus crocodilus (Pellegrin, 1900)	-	-	-
	50.Microstomatichthyoborus bashforddeani Nichols (Griscom, 1917)	Nzambakana	-	-
	51.Phago intermedius (Boulenger, 1899)	Osogno	-	Mutitikidi
Citharinidae	*52.Citharinus macrolepis* (A. Tinant,1937) *	Iyanga	Liyanga	Yanga
	53.Citharinus gibbosus (Boulenger, 1899)	Iyanga	Liyanga	Yanga
Siluriformes				
Claroteidae	*54.Chrysichthysornatus* (Boulenger, 1902)	Ibarâbara	mosuaro	ke
	55.Chrysichthys punctatus (Boulenger, 1899)	-	mosuaro	-
	56.Chrysichthys thonneri (Steindachner, 1912)	-	mosuaro	
	57.Parauchenoglanis punctatus (Sauvage, 1879)	Ikagna	-	-
Schilbeidae	*58.Schilbe grenfelli* (Boulenger, 1900)	Ilangwa	Lilangwa	Langwa
	59.Schilbe marmoratus (Boulenger, 1911)	Iwfelèlè	Lilangwa	Langwa
	60.Pareutropius debauwi (Boulenger, 1900)	Ilangwa	Lilangwa	Langwa
Clariidae	*61.Channallabesapus* (Günther, 1873)*	Ongambiri	Mongambili	N'tondi
	62.Clarias buthupogon Sauvage, 1879	Ibongo	Ngolo	Ngola
	63.Clariasgariepinus (Burchell, 1922)	Ngolo	Ngolo	Ngola
Malapteruridae	*64.Malapterurus electricus* (Lacépède, 1803)	Nina	Nina	Tsula

Orders and Families	Scientific Name	Local name	Vernacular name	
		Mbochi	Lingala	Kikongo
Mochokidae	*65.Synodontis contractus* (Vinciguera, 1928)	Ikoula	Likoko	Nkoko
	66.Synodontis caudalis (Boulenger, 1899)	Ikô	Likoko	Nkoko
	67.Synodontis centralis (Poll, 1971)	Ikô	Likoko	Nkoko
	68.Synodontis flavitaeniatus (Boulenger, 1919)	Ikô la ngongo	Likoko	Nkoko
	69.Synodontis lufirae (Poll, 1971)	Ikô	Likoko	Nkoko
	70.Synodontis nigriventris (David, 1936)	Ikô la pèli	Likoko	Nkoko
	71.Synodontis schoutedeni David, 1936	Ikô	Likoko	Nkoko
Gonorhynchiformes				
Channidae	*72.Parachanna insignis* (Günther, 1861)	Tsinga	Mongusu	Nsinga
Perciformes				
Anabantidae	*73.Ctenopoma acutirostre* (Pellegrin, 1899)	Ewfa	-	Tsimpete tsia nkuku
	74.Ctenopoma kingsleyae (Günther, 1896)	Ewfa	-	-
	75.Ctenopoma nanum (Günther, 1896)	Ewfa	-	-
	76.Ctenopoma nebulosum (Norris & Teugels 1990)	Ewfa	-	-
	77.Ctenopoma nigropannosum (Reichenow, 1875)	Olombi	Mokengue	-
	78.Ctenopoma pellegrini (Boulenger, 1902)	Olombi	Mokengue	-
Cichlidae	*79.Hemichromis bimaculatus* (Gill , 1862)	Lekanga	Libundu	-
	80.Hemichromis fasciatus (Peters, 1852)	Ikiè	Libundu	-
	81.Pelmatochromis nigrofasciatus (Pellegrin, 1900)	Mbô	Libundu	-
	82.Tilapia sp	Mbô	Libundu	-
	83.Tilapia tholloni (Sauvage, 1884)	Mbô	Libundu	-
	84.Tylochromis lateralis (A.Tinant, 1937)	Lègnèndè	Libundu	Kingulu
Cyprinodontiformes				
Aplocheilidae	*85.Epiplatys singa (*Boulenger, 1899)	Ombongo	-	-
	86.Epiplatys sp.	Ombongo	-	-
	87.Aphyosemion sp.	Ombongo	-	-

Species richness of orders: Proportional representation of species richness of orders showed that Osteoglossiformes were the most represented order with31% (Figure-2), followed by Characiformes (27%), Siluriformes (20%), Perciformes (15%), Cyprinodontiformes (2%), Clupeiformes (1%), Lepidosireni formes (1%) Polypteri formes (1%), Gonorhynchi formes (1%). The species richness of orders showed that orders were the same and dominated like in all streams of the Congo Basin excepted Cypriniformes, Tetraodonti formes and Synbranchi formes. The same most representative orders were found in varyingpro portions[9,13,15]: Siluriformes (23.5%), Perciformes (18.7%) Osteoglossi formes (16.5%), Cypriniformes (16.3%), Characiformes (14.3%). The absence of Cypriniformes, Tetraodontiformes and Synbranchiformes in Komo River, could be explained by the low rate of water oxygenation.

Species richness of families: During this study, 21 families were identified. Species proportional representation per family (Figure-3) showed that Mormyridae 26%) dominated the collection, followed by Alestidae and Distichidontidae (12%) followed by Mockokida especies (9%) Anabantidae (7%), Cichlidae (6%), Clariidae and Claroteidae (4%), Schilbeidae, Notopteridae and Aplocheleidae (2%). The others families represented 1%. The specific distribution of families of the Komo River is similar to that obtained in the Alima River[12], the four most represented families were Alestidae and Mormyridae (15.17%) followed by the Cichlidae (14.28%) and Distichodontidae (10.71). The three most represented families found in Mambili river, Lefini river, Djiri river were similar, but in a different order[11,15-17]: Mormyridae was the most represented (22%), followed by Distichodontidae (14%), Alestidae (12.6%) and Mockokidae (10,66%). The study of Congo Basin fish

fauna, showed the predominance of Cyprinidae (16.6%) and Mormyridae (16.3%) followed by Cichlidae (13.1%), Mockokidae (8.7%), Alestidae (7%) and Distichodontidae (6.8%)[9]. Cyprinidae, Mastacembelidae and Tetraodontidae were present in the others rivers of Congo basin but were absent in Komo River, probably because water was less oxygenated.

Relative abundance: The distribution of species in station1 was balanced with a slight predominance of *Xenomystus nigri* (13%) followed by station 2, two species were most represented: *Phenacogrammus interruptus* (35%) and *Alestopetersius hilgendorphi* (33%), which suggested existence of an ecological niche for the two species (Figures-4a and 4b).

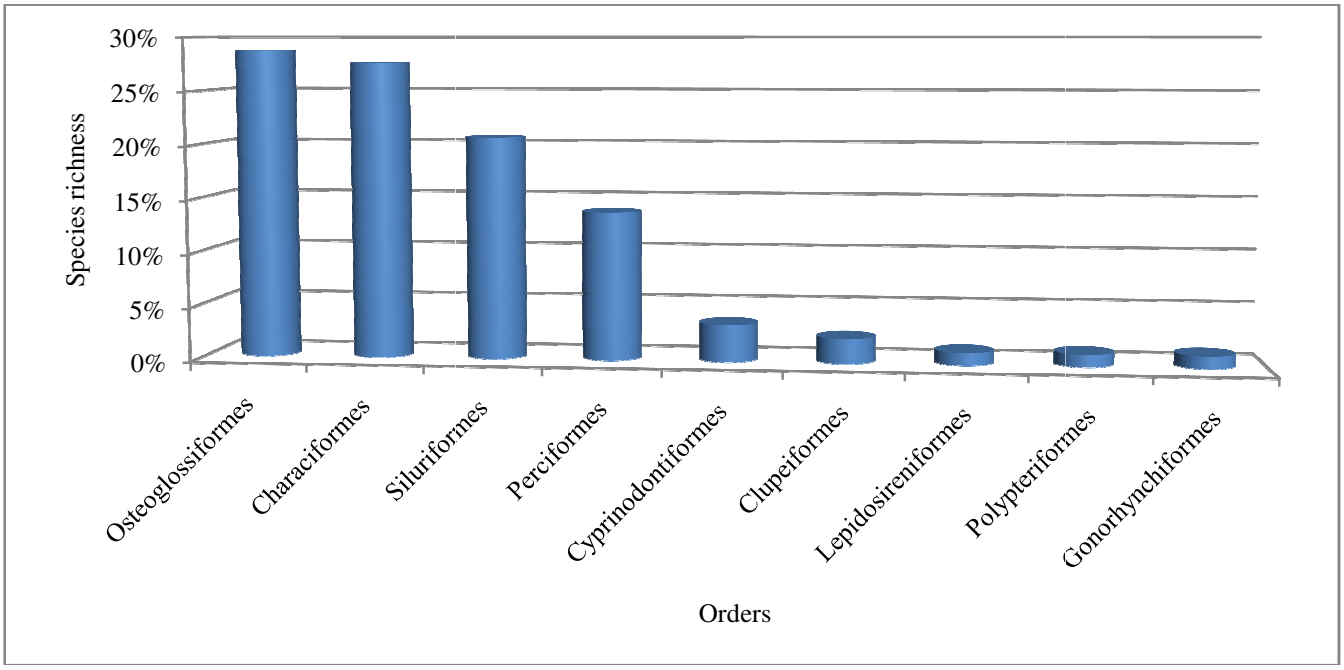

Figure-2
Proportional representation of specific richness of orders

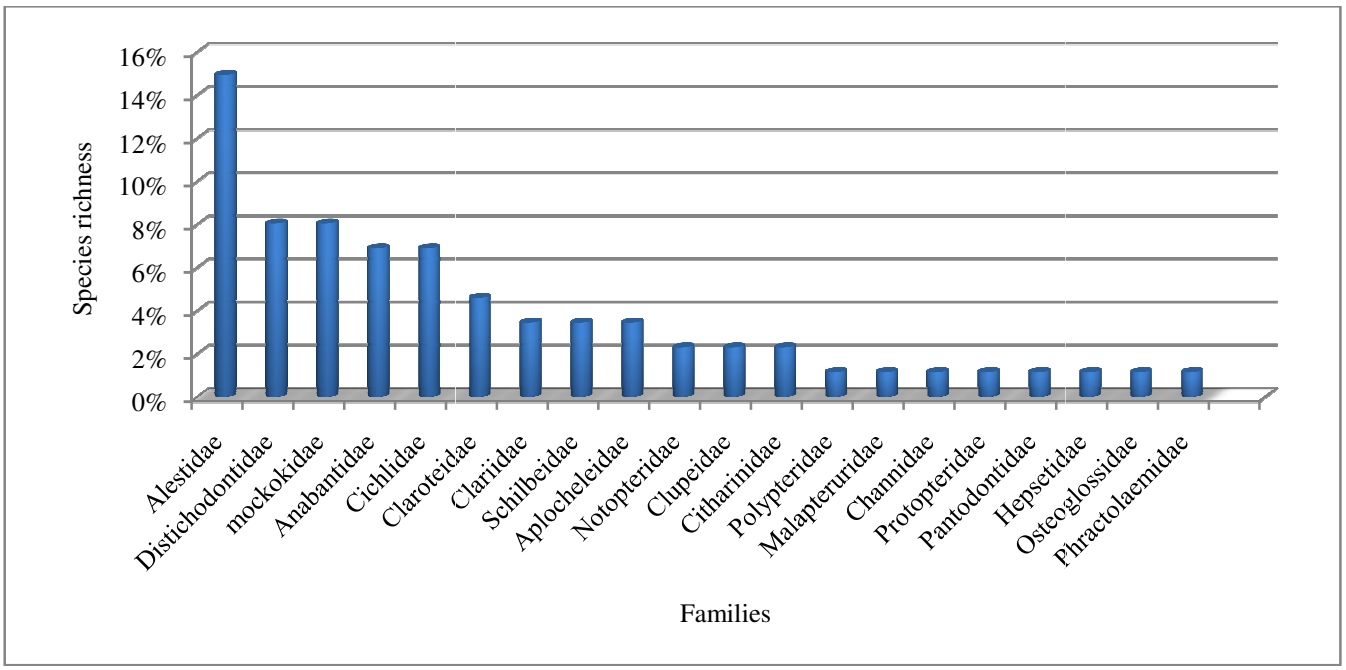

Figure-3
Proportional representation of specific richness of families

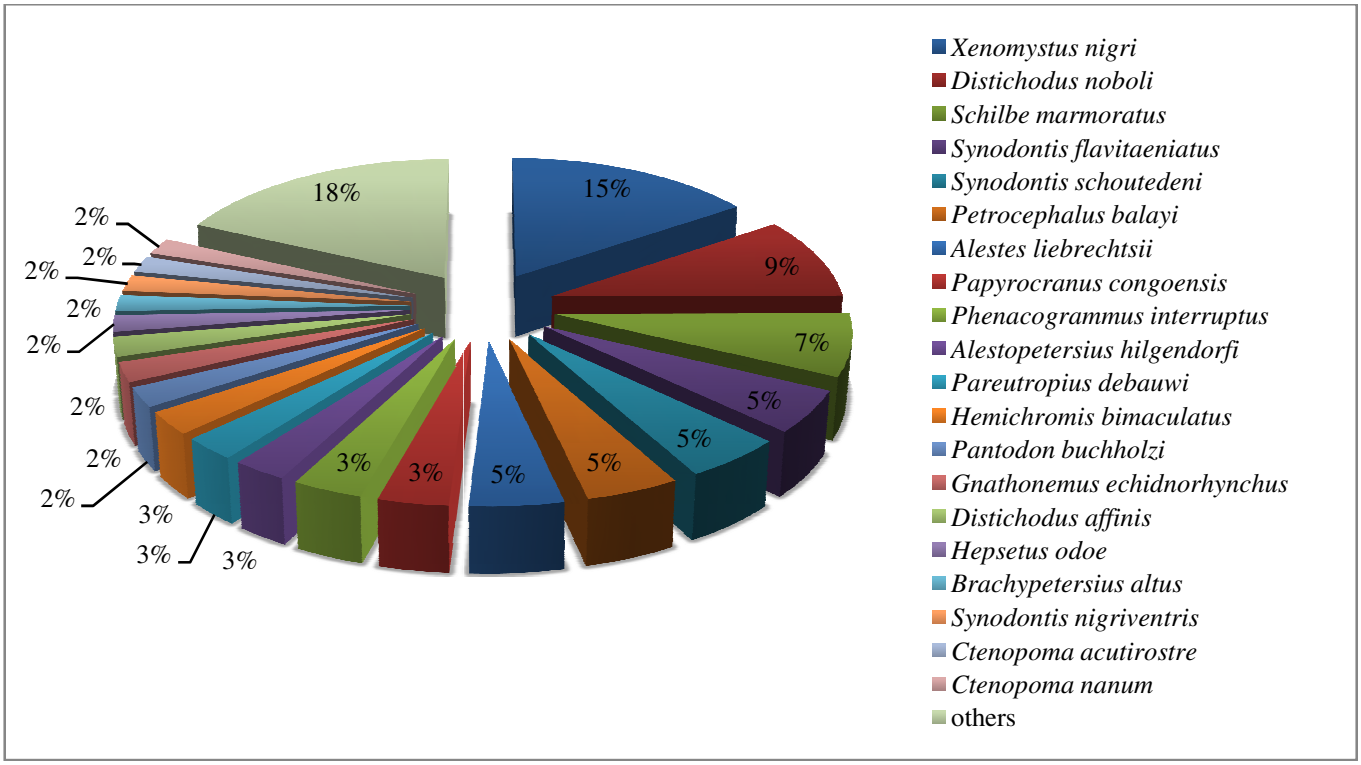

Figure-4a
Specific relative abundance in station 1

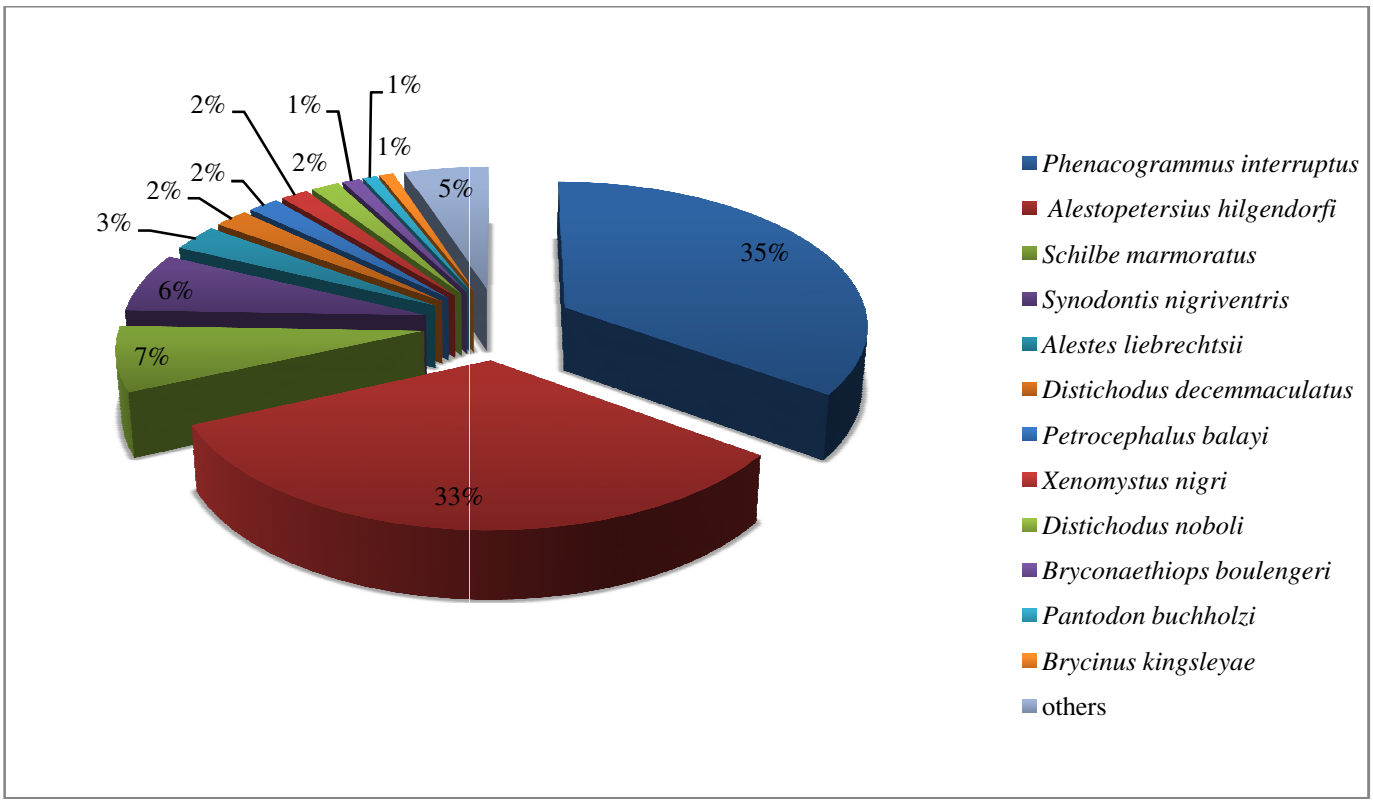

Figure-4b
Specific relative abundance in station 2

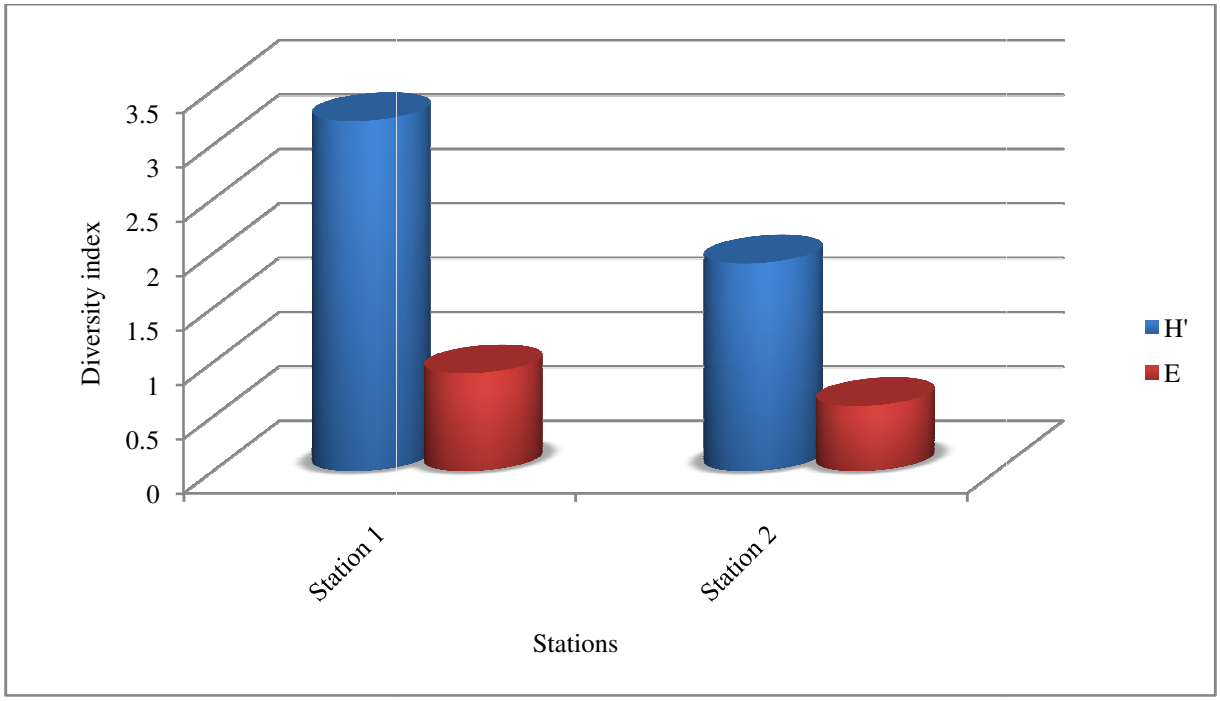

Figure-5
Diversity index in the two stations

Diversity index: Diversity index were calculated in the two sampling stations with fishes captured with gillnets. Shannon index was lower in station 1(H '= 3.22) than in the station 2(H'=1.91). Equitability in the station 1 was 0.9, reflecting a balanced population. In contrary, in station 2, equitability was 0.6, this value was less than 0.7, which corresponds to an unbalanced population (Figure-5).

Conclusion

This preliminary study of fish fauna of the lower course of the Komo River (Alima basin) showed that this river has high species richness with 86 species of fishes including 20 families grouped in 44 genera and 9 orders. This river as a feature, the oxygen level was very low; hence the absence of Cyprinidae, Mastacembelidae and Tetraodontidae that require well oxygenated water. Spatio-temporal studies should be conducted to complement this study to better describe the fish populations in the lower course of this river.

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