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Ichthyofauna And Fishing In The Congo River, DR Congo

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Abstract: This study on ichthyofauna and fisheries in the Kindu river region was conducted with the aim of characterizing fishing activities, inventorying fish species and determining the growth of the most captured fish species. A survey and inventories were carried out for nine months, from February to October 2020. For lack of fishing gear, the fish were paid to the artisanal fishermen working upstream and downstream of the Congo River, who use different capture gears including nets (cast net, drifting, fixed), baited hooks and longlines (bottom and surface). Fish species were identified using identification keys such as Fauna of fresh and brackish water fishes of West Africa, Fishes of the Congolese part of the Inkisi, Fresh and brackish water fishes of Lower Guinea, West Central Africa, Fish of the Upper Congo Basin: ichthyological study and establishment of a collection at the University of Kisangani, DR Congo. The fish collected were each time counted and weighed individually in the fresh state using a 0.1 g digital scale of the SCA-301 brand and measured using a 30 cm long ichthyometer. Three measurements were taken from each specimen analyzed, namely: total weight (in g), standard length (in cm) and total length. The standard length is the straight length from the end of the mouth to the end of the most arched caudal peduncle. The results show that the activity of river fishing contributes to the improvement of the living conditions of fishermen by providing income; several fishing gears are used but only the cast net has a higher use (56.2%) by fishermen. The Kindu river region is diversified in fish species in the sense that an identification resulted in 38 species belonging to 14 families. The species *Synodontis notatus* (9.7%), *Labeo senegalensis* (7.8%), *Distichodus rostratus* (5.8%), *Chrysichthys nigrodigitatus* (5.3%) and *Auchenoglanis occidentalis* (5.3%) are the most captured. Almost all of the most captured fish species have positive allometric growth except *Chrysichthys nigrodigitatus* which has negative allometry. Condition factors show that the majority of species studied live in good conditions. Thus, it is crucial that fishing is effectively controlled in the environment because this activity contributes to the survival and well-being of the population.

Key words: Fish, Fishing, Congo River, Growth, Weight, Condition, Length, Kindu

1. INTRODUCTION

Fish are a group highly threatened by human activities [1]. Consequently, they can be used as a biological indicator to assess the impacts of developments or more generally of the use of hydrosystems.

After the Amazon Basin, the Congo Basin, whose area is estimated at 3,067,000 km^2, is the most diversified in the world in terms of freshwater fish species [1-5]. Its watershed occupies a vast area of which 62% is in DR Congo and includes at least 1,250 valid species of fish [6], with a significant endemicity of 70 to 75% [2, 4, 6].

In addition, in DR Congo, fishing in inland waters is practiced mainly in two areas, notably the great lakes in the east of the country and in the Congo River basin including its tributaries. Unfortunately, to this day, fishing is still artisanal, that is to say unprofitable and unsustainable. The major weaknesses of fishing in the DR Congo are the lack of scientific expertise, the lack of efficient fishing equipment and the limited financial means. Added to this is the lack of professionalization of the fishing sector

[7]. However, inland fishing is of paramount importance for the populations living near rivers and bodies of water insofar as it contributes to food and nutritional security, not to mention monetary income and socio-cultural utilities [8]. Also, fishing gives rise to a considerable number of auxiliary activities, such as the making of nets, the manufacture of canoes and ships, the repair of engines and the maintenance of boats. All of these fishing-dependent activities are sources of employment and additional income, often located close to ports and places where catches are landed [9].

This is why studies on fishing techniques, the diversity and dynamics of fish species provide essential information for decision-making, for the implementation of policies and programs for the sustainable management of resources, fisheries and aquaculture [10]. Indeed, they make it possible to analyze the structure and dynamics of fish populations, to evaluate mortality and to estimate production with a view to developing strategies for the sustainable management of biodiversity [11, 12]. Thus, the Congo River in its part of Kindu is threatened by anthropogenic and/or environmental activities, from which the latter exert increasing pressure on aquatic resources through substantial fishing using gear leading to the destruction of aquatic ecosystems and to the extinction of certain species.

2. MATERIALS AND METHODS

2.1. Study environment

The city of Kindu is the capital of the province of Maniema. It is located on a longitude of 25°55' East, a latitude of 2°57' South and an altitude of 464m. The city of Kindu has a humid tropical climate with two seasons (dry season and rainy season) with a temperature varying between 23°C and 35°C. This city has a very dense hydrographic network which is structured around the Congo River. At this point, the majestic Congo River is watered by a few small tributaries from both the left bank and the right bank: the Mikonde, Misubu, Muchado, Mangobo, Kamabala, Kamikunga, Mikelenge, Mukoloshi, Makopo, Lwandoko, Canon, Rukukuye and Ngwangwata [13].

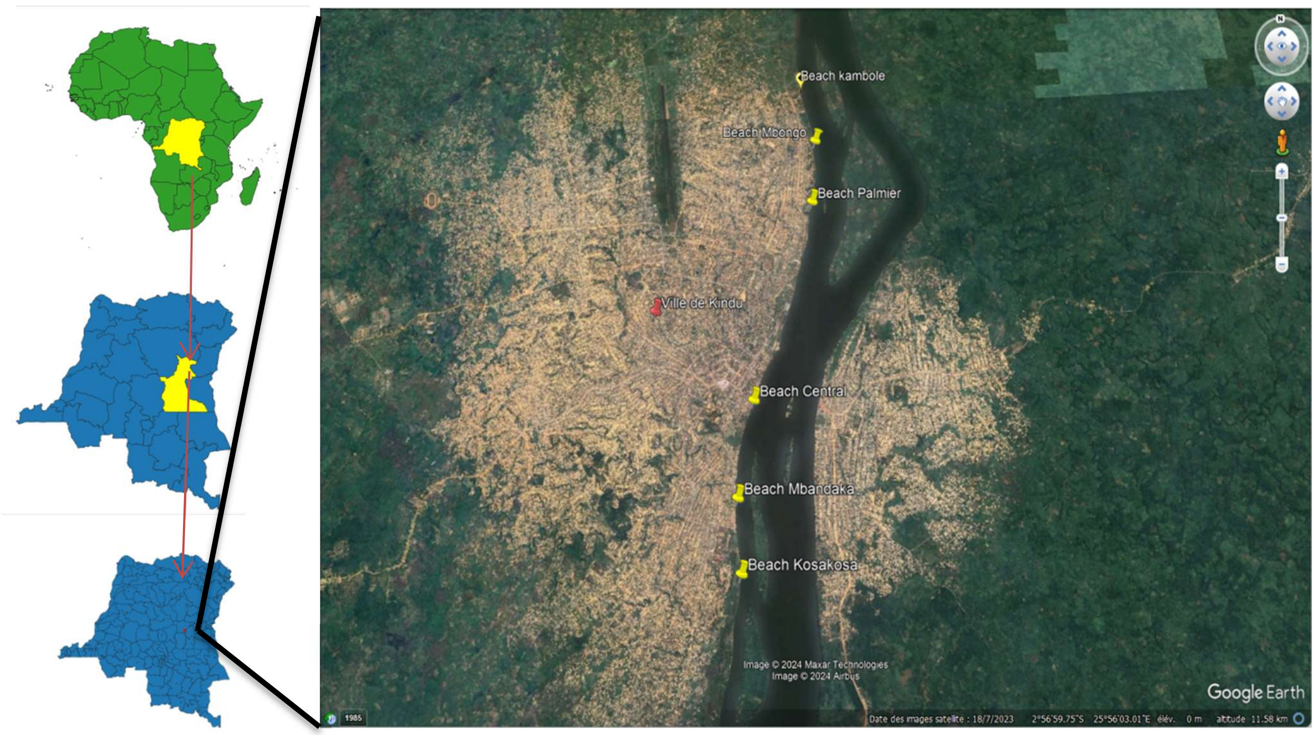

Figure 1. Map indicating the different capture sites on the Congo River in the town of Kindu (Google Earth, 2023).

2.2. Collection of data

2.2.1. Investigation

To better characterize fishing techniques, a survey was carried out among fishermen working in different Beaches (Kambole: 2°54'43.47"South et 25°56'3.49"Eastern; Mbongo: 2°55'14.11"South et 25°56'7.89" Eastern ; Le Palmier: 2°55'45.33"South et 25°56'4.53" Eastern ; Beach Central: 2°57'16.35"South et 25°55'32.66" Eastern ; Mbandaka: 2°57'57.00"South et 25°55'24.11" Eastern ; Kosakosa: 25°55'24.72" Eastern et 2°58'27.13"South) in the Kindu river region for a period of 9 months ranging from February 2020 to October 2020. The choice of these Beaches was motivated by the easy accessibility of sampling sites, a strong practice of fishing activities, the regular landing of fishermen and the greater quantity of fish from the river sold in the city of Kindu come from these sites. A total of 32 fishermen were interviewed on the basis of a pre-established survey questionnaire. The fishing gear used by the fishermen surveyed was photographed using an Android device.

2.2.2. Fish sampling and identification

Due to the lack of fishing gear, specimen fish were paid for by local fishermen using a variety of fishing gear. Thus, 206 fish specimens were collected during the sampling campaigns. Purchased fish were preserved in a 10% formaldehyde solution and placed in a tightly closed plastic jar for later analysis in the laboratory. In the jar, a label mentioning the river, the place of purchase and the date of capture were placed. In addition, the identification of fish species was carried out using the various fish identification keys, scientific works and doctoral thesis [4, 14, 15, 16, 17].

2.2.3. Length-weight relationship

The fish collected were first weighed individually in the fresh state using a digital scale of 0.1g precision brand SCA-301 and measured using a graph paper of 1mm precision. The total length (TL) is a horizontal distance from the anterior end of the snout to the most posterior ray lobe, and standard length (LS), is a horizontal distance from the anterior end of the snout to the base of the caudal fin. The standard-length variable was taken in millimeters and then converted to centimeters. The relationship between length and weight is generally of the exponential type, making it possible to verify the growth of the fish population studied. The regression curves of the type $P = a\ LS^{b}$ is obtained from the length-weight pairs, where P represents the weight of the individual (g), LS the standard length (cm), *a* the initial growth coefficient and *b* the slope of the regression line. After logarithmic transformation in the form: (log P = loga + logb), the parameters *a* and *b* for each of the length-weight relationship equations were estimated by linear regression analysis [24].

The length-weight relationship reflects isometric growth when the value of b is equal to 3 and allometric growth when the values of *b* are less than or greater than 3. However, positive or increasing allometric growth is observed when *b* is greater than 3, and negative or lowering/ decreasing allometric growth when *b* is less than 3 [18].

The Student's t test is carried out according to SOKAL and ROHLF [24] $ts = (b-3)/ESb$, where ts is the value of the Student 's t test ; *b* is the slope of the regression line and ES *b* is the standard error of *b* . All tests were significant at the 5% level ($p < 0.05$).

2.2.4. Condition Factor

The condition factor was used to determine the physiological status of the most caught fish species in the upper Lualaba. The relative importance of its height and its thickness in relation to its length was carried out using the formula $K = (100P/ LS^{b})$ [19], where P represents the weight of the l individual (g) and LS the standard length (cm). The condition factor K is given by the ratio between the weight and the size of the fish [20, 21, 22].

2.2.5. Statistical analysis of data.

Survey data related to fishing activities were compiled and analyzed using Excel software (2007 version) to present the results in the form of figures. As part of the inventories, the relative abundance of fish species was calculated using the following formula:

$$AR = \frac{n}{N} x\ 100$$

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Vol. 53 No. 1 October 2025, pp. 251-264

With AR: Relative Abundance; n: abundance of the species and N: total number of specimens collected [23].

The length-weight relationship was estimated using Statview software version 1992-1998 (SAS Institute INC).

3. RESULTS AND DISCUSSION

3.1. Characterization of fishermen, Description of fishing gear and techniques used.

3.1.1. Distribution of fishermen by sex

Table 1: Gender of fishers surveyed.

Sex	Effective	%
Male	32	100
Female	0	0
Total	32	100

The fishing activity was reserved only for men (100%).

3.1.2. Description of fish catches periods.

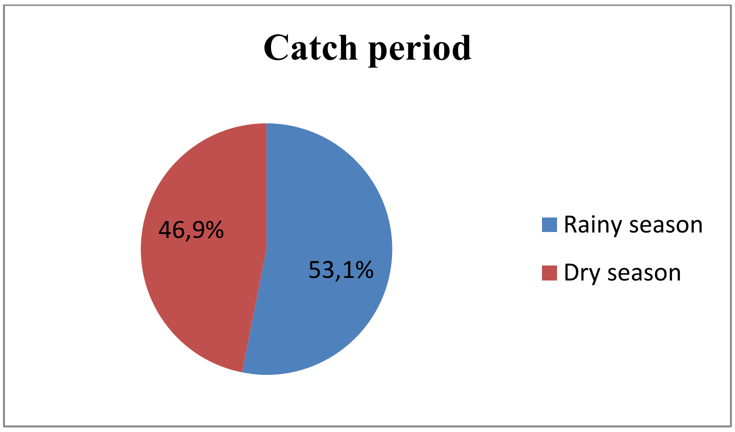

Figure 2: Distribution of fishermen according to catch periods.

The results show that 53.1% of fishermen considered the rainy season as the best period for catching fish against 46.9% of fishermen who considered the dry season.

3.1.3. Fish catch time.

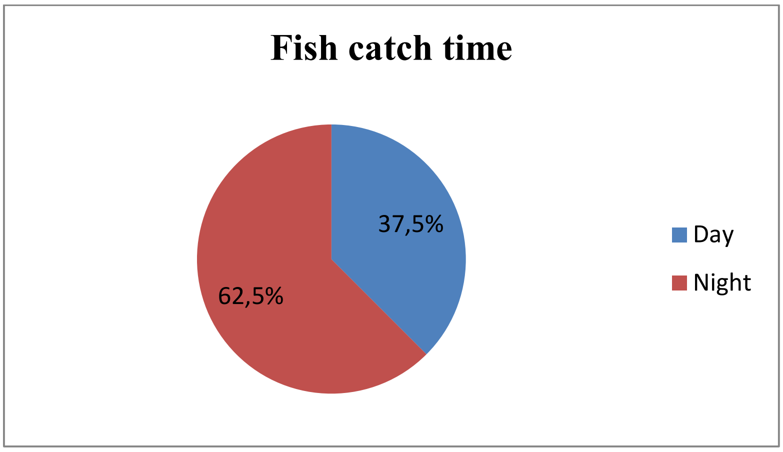

Figure 3: Distribution of respondents on the favorable time for catching fish.

The data highlights that 62.5% of fishermen considered night as the best time to catch fish while 37.5% of anglers were for the day.

3.1.4. Destination of fish caught.

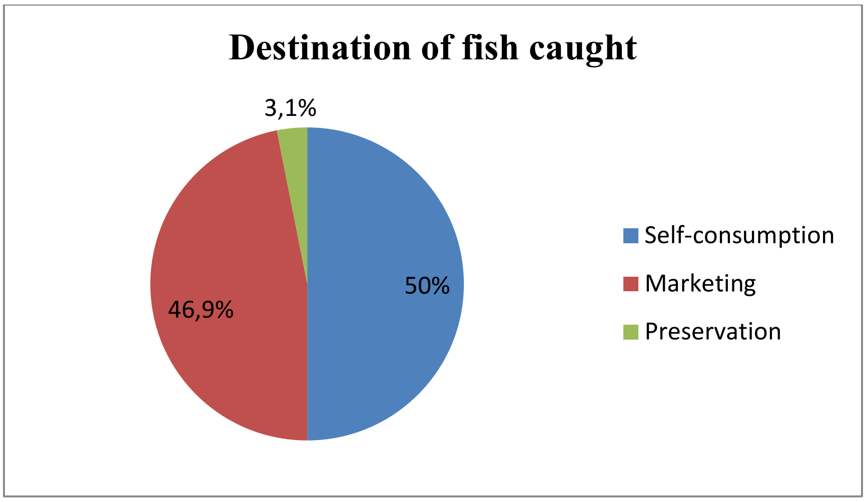

Figure 4: Distribution of respondents according to the destination of fish caught.

The results show that 50% of fishermen caught fish for self-consumption, followed by 46.9% of fishermen who caught for marketing and finally, 3.1% of fishermen caught for conservation (smoking).

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https://ijpsat.org/
Vol. 53 No. 1 October 2025, pp. 251-264

3.1.5. Allocation of after-sales income from fish

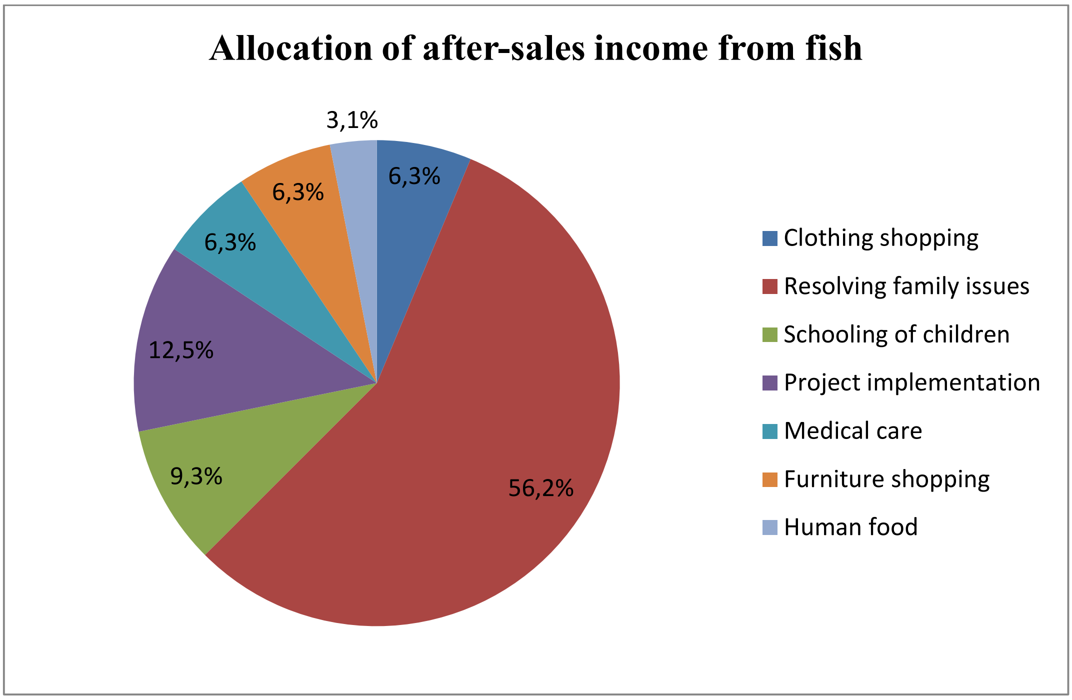

Figure 5: Distribution of fishers in relation to fishing income allocation.

The results of income allocation by fishermen indicated that 56.2% of the fishermen allocated their income to solving family problems, followed by 12.5% who used their income to carry out projects, 9.3% allocated their income for the schooling of children, 6.3% allocated respectively to medical care, the purchase of furniture and the purchase of clothing and finally, 3.1% allocated their income to human food.

3.1.6. Bottom longline

Figure 6: Bottom longline

The longline consists of a nylon main line, fitted with numerous baited hooks and bits of metal and pebbles, from which the latter allow the gear to go deep. The line is gradually dropped into the water from a canoe and then spotted on the surface using tree sticks and/or small plastic containers that float.

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3.1.7. Derived net

Figure 7: Derivative net

The drift net is a fishing gear that is held in the water between a canoe and a float. During an outing, the fisherman brings back the net which has been immersed for a while, unravels the fish and goes upstream to its starting point. Such an operation can be repeated several times. This net is made of nylon threads, plastic bottles or pieces of slippers or even pieces of bamboo allowing the net to float, and the terracotta allows the net to descend in depth.

3.1.8. Sleeping net

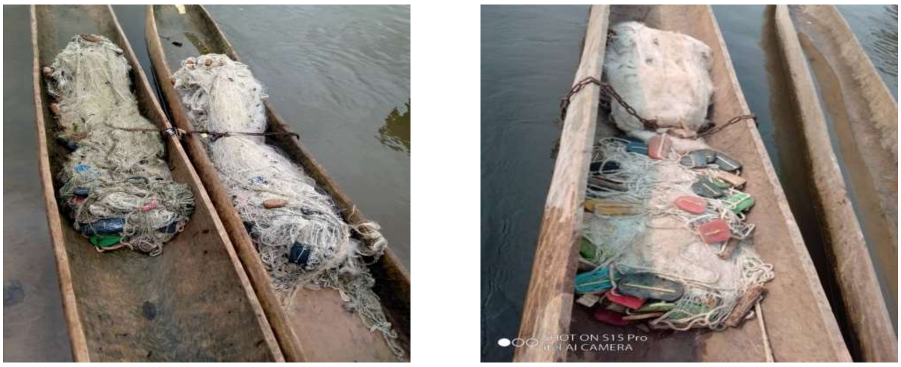

Figure 8: *Sleeping* net

The set net is a catching device stretched between two stakes and remains in the water all night then raised in the morning. Moving fish get caught in the mesh. Often the mesh used, the weight chosen, and the mounting rate chosen depends on the species of fish sought. Thus, this net is placed on the surface, between two waters or above the bottom and is made with nylon threads, pieces of slippers and terracotta.

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3.1.9. Cast net

Figure 9: Cast net

The cast net (Figure 9) is a net which is made from nylon threads and aluminum sinkers which are attached along its radial rope, where these sinkers allow the net to descend in depth. A rope is attached to the center of the net, ensuring its flared conical shape during handling. This device is launched from the shore or on a canoe, falls into the water and catches the fish by closing on them. It is often used by a single fisherman, the owner.

3.1.10. Single line

Figure 10: Single Line

The single line commonly called a hook, consists of a nylon thread (monofilament), a thin and flexible tree stump and fitted with a baited hook (earthworms) or number hook [16, 18, 20]. The technique consists of throwing the line in the water and bringing it up when the fish approaches the hook and wants to consume bait.

Locally, fish harvesting remains a resource of prime importance, whether in terms of food, nutrition, income, or livelihoods. The results obtained in this study underline that the sale of captured fish provides income, hence these incomes are earmarked to satisfy certain household needs and the night would be the good time to catch fish (62.5%). These results corroborate those of Manga [25] in his research on the biology, ecology and marketing of fish taken from the Congo River in Kindu, which shows that fishing is a lucrative activity providing income and this fishing has a high efficiency at night (90%). A variety of fishing gear is used in this river region, such as longlines, drift nets, set nets, cast nets and single lines. These results are consistent with those of Manga [26] and Akonkwa et *al*. [27] but differ from the fishing gears such as traps, mosquito nets, beach seines and plaice nets that have been identified by these authors. Thus, this difference would probably be due to the period and place of study.

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https://ijpsat.org/
Vol. 53 No. 1 October 2025, pp. 251-264

3.2. Inventory of fish species caught.

Table 2: List of fish species captured during the study.

No.	Families	Species	Effective	%
1	Mochokidae	*Synodontis pleurops*	8	3.9
		Synodontis number	6	2.9
		Synodontis decorus	6	2.9
		Synodontis notatus	20	9.7
		Synodontis greshoffi	2	1.0
		Synodontis acanthomias	8	3.9
		Synodontis albertischilthuis	4	1.9
2	Mormyridae	*Marcusenius chin*	8	3.9
		Cyphomyrus psittacus	7	3.4
		Mormyrops engystoma	1	0.5
		Campylomormyrus alces	3	1.5
		Campylomormyrus tamandua	2	1.0
		mormyrus ovi	2	1.0
		mormyrus macrops	1	0.5
		Mormyrops anguilloides	3	1.5
		Pollimyrus isidori fasciaticeps	5	2.4
		Petrocephalus christyi	2	1.0
3	Mastacembelidae	*Mastacembalus sp.*	2	1.0
4	Citharinidae	*Citharinus latus*	3	1.5
5	Claroteidae	*Chrisichthys nigrodigitatus*	11	5.3
		Chrisichthys brevibarbus	5	2.4
6	Auchenoglanidae	*Auchenoglanis occidentalis*	11	5.3
7	Cichlidae	*Oreochromis niloticus*	4	1.9
		Sarotherodon galileus	8	3.9
		Hemichromis bimaculatus	2	1.0
		Hemichromis fasciatus	2	1.0
8	Alestiidae	*Brycinus luteus*	5	2.4
		Hydrocynus vitattus	1	0.5
9	Cyprinidae	*Labeo senegalensis*	16	7.8
		Labeo grenii	7	3.4
		Labeo cyclorhyncus	1	0.5
10	Malapteruridae	*Malapterurus microstoma*	2	1.0
11	Schilbeidae	*Schilbe graftli*	7	3.4
		Schilbe intermediate	5	2.4
12	Clariidae	*heterobranchus longifilis*	2	1.0
13	Channidae	*parachanna darkened*	3	1.5
14	Dissichodontidae	*Distichodus rostratus*	12	5.8
		Distichodus sexfasciatus	9	4.3
Sum	**14**	**38**	**206**	**100**

This study inventoried a total of 206 fish specimens including 38 species belonging to 14 families. Thus, the families of Mormyridae, Mochokidae and Cichlidae were more represented with 10, 7 and 4 species of fish each, respectively. Indeed, *Synodontis notatus* , *Labeo senegalensis* , *Distichodus rostratus* , *Chrisichthys nigrodigitatus* and *Auchenoglanis occidentalis were* the most captured species with 9.7%, 7.8%, 5.8%, 5.3% and 5.3% ,respectively; followed by *Distichodus sexfasciatus* with 4.4%; *Synodontis pleurops* , *Marcusenius mento* , *Synodontis Acanthomias* and *Sarotherodon galileus each* with 3.9%; *Cyphomyrus psittacus* , *Labeo grenii* and *Schilbe greffeli* with 3.4% each; *Synodontis Decorus* and *Synodontis nummifer* each with 2.9%; *Pollimyrus isidori fasciaticeps* , *Chrisichthys brevibarbus* , *Brycinus luteus* and *Schilbe intermedius* with 2.4% each; *Oreochromis niloticus* and *Synodontis alberti schilthuis* with 1.9% each; *Campylomormyrus alces, Mormyrops anguilloides* , *Citharinus latus* and *Parachanna obscura* with each 1.5%; *Synodontis greshoffi* , *Mastacembalus sp* , *Mormyrus ovis* , *Hemichromis bimaculatus* , *Campylomormyrus tamandua, Hemichromis fasciatus* , *Malapterurus microstoma* , *Heterobranchus longifilis* and *Petrocephalus christyi* with 0.9% each and finally *Mormyrops engystoma* , *Mormyrus macrops* , *Labeo cyclorhyncus* and *Hydrocinus vitatus* with 0.5% each.

It is evident that the Congo River in its part of Kindu is diverse in fish species. A total of 38 fish species were collected and identified; but *Synodontis notatus, Labeo senegalensis, Distichodus rostratus, Chrisichthys nigrodigitatus* and *Auchenoglanis occidentalis were* the most captured species. Thus, the results obtained in the present study are similar to those of Manga[26] on the biology, ecology and marketing of fish taken from the Congo River in Kindu; Ngoy et *al*. [28] on the inventory of fish biodiversity in the Congo River at Kindu; Mahamba et *al*. [29] on the study of fish populations in the Yoko and Biaro rivers (Yoko Reserve, Tshopo Province , DR Congo) and Nyembo et Muanza [30] on the diversity of fish species caught in the Lubilanji River in Kasaï-Oriental in DR Congo. Indeed, Manga [26] inventoried 34 species of fish but only 7 species are common, including *Chrysichthys nigroditatus, Oreochromis niloticus, Sarotherodon galileus, Distichodus rostratus* , *Distichodus sexfasciatus* , *Schilbe intermedius* and *Schilbe greffeli* . Ngoy et *al*. [28] inventoried 28 species of fish but 15 species of fish are similar including *Distichodus rostratus, Distichodus sexfasciatus, Heterobranchus longifilis* , *Labeo senegalensis* , *Brycinus luteus* , *Sarotherodon galileus* , *Oreochromis niloticus* , *Auchenoglanis occidentalis* , *Chrysichthys nigrodigitatus* , *Citharinus latus* , *Marcusenius mento* , *Cyphomyrus psittacus* , *Mormyrops engystoma* , *Synodontis decorus* and *Synodontis pleurops* . Nyembo and Muanza [30] inventoried 25 fish species in the Lubilanji River, which is a confluence of the Kasai River (a tributary of the Congo River); only 6 species of fish are common: *Auchenoglanis occidentalis, Hydrocinus vittatus* , *Mormyrops anguilloides* , *Petrocephalus christyi* , *Schilbe greffeli* and *Oreochromis niloticus* . Mahamba *et al*. [29] identified 59 fish species in the Yoko and Biaro rivers (tributaries of the Congo River), but *Hemichromis fasciatus, Cyphomyrus psittacus* and *Schilbe greffeli* are common species. It should be confirmed that the ecological conditions in these regions would favor the dispersal of fish species, but the difference in the number of species in the different searches could probably be due to the fishing techniques used which did not allow searching in all the habitats, because it is known that the number of species present in a given biotope is a function of the diversity of habitats [31, 32]. This difference would also be due to the season of capture. Indeed, the rivers of the Congo Basin are influenced by two seasons (dry season and rainy season) with periods of flood and decline, which would explain the presence of certain species of fish at a given time of the year and their absence at another time [33].

3.3. Length-weight relationship, Condition factor (K) and average biometric indices of the most caught fish

Table 3: Estimated parameters of the length-weight relationship of the most caught fish species during the study period.

n: number of specimens; *a:* growth coefficient; *b* : slope of the regression line; CI: confidence interval; ES: standard error; R^2 : coefficient of determination; ts : student 's test ; I: isometric; A+: positive allometry ; A-: negative allometry.

Families	Species	not	*a*	95% CI of *a*	*b*	*b* 95% CI	ES of *b*	R^2	ts	Growth
Mochokidae	*Synodontis notatus*	20	0.019	0.005-0.079	2.976	2,380-3,573	0.284	0.859	0.084	I
Dissichodontidae	*Distichodus rostratus*	12	0.014	0.002-0.105	3,159	2.282-4.037	0.394	0.865	0.403	A+
Claroteidae	*Chrysichthys nigrodigitatus*	11	0.052	0.018-0.146	2,499	2.068-2.931	0.191	0.950	2,623	A-
Auchenoglanidae	*Auchenoglanis occidentalis*	11	0.009	0.003-0.027	3,309	2.843-3.774	0.206	0.966	1,500	A+
Cyprinidae	*Labeo senegalensis*	16	0.041	0.010-0.159	2,668	2.064-3.273	0.282	0.864	1,177	A-

The results of this table indicate that *D. rostratus* and *A. occidentalis* have a positive allometric growth (b > 3; p < 0.05), that is to say that the growth of these fish species evolves much more in weight than height. On the other hand, *L. senegalensis* and *C. nigrodigitatus show negative* allometric growth (b < 3; p < 0.05), which shows that these species grow much more in size than in weight. But an isometric growth is observed in *S. notatus* (b=3; p<0.05).

Table 4: Parameters of condition factors and average biometric indices of the most caught fish species.

LS: standard length; K: condition factor; Min: minimum; Max: max; Avg: average; SD: standard deviation

Families	Species		SL (cm)		Weight (g)	
		K	Min-Max	Avg±SD	Min-Max	Avg±SD
Mochokidae	*Synodontis notatus*	2.1	7.2-15.1	10.6 ±1.6	8.0 - 64.0	23.9±12.6
Dissichodontidae	*Distichodusrostratus*	1.4	8.3-11.2	10.0 ± 1.0	11.0-35.0	21.0±7.0
Claroteidae	*Chrysichthys nigrodigitatus*	5.7	7.6-15.9	11.0± 2.4	8.0 – 55.0	23.1±14.0
Auchenoglanidae	*Auchenoglanis occidentalis*	0.9	8.9-15.6	12.1±1.9	11.0 - 73.0	35.5±18.5
Cyprinidae	*Labeo senegalensis*	4.3	7.3-12.6	9.5± 1.2	9.0 - 36.0	17.7±7.1

The condition factors of the set of fish species studied range from 0.9 to 5.7. Indeed, the higher value of K was observed in *C. nigrodigitatus* (5.7) and the lower value in *A. occidentalis* (0.9). Regarding the standard length, the species *A. occidentalis* had a high mean value (12.1±1.9 cm) while *L. senegalensis* had a low mean value (9.5±1.2 cm). The highest average weight value was 35.5±18.5g in *A. occidentalis* and the lowest average weight value of 17.7±7.1g was in *L. senegalensis.*

Allometry is closely related to water quality, sex, growth phase, stomach contents, gonad development, and food availability [34, 35]. Out of a total of 5 fish species studied, only 2 species including *Distichodus rostratus* and *Auchenoglanis occidentalis had* positive allometric growth (b > 3; p < 0.05). In other words, these fish have a much greater growth in weight than in length. These results obtained corroborate with those of Ngoy *et al*. [36] and Aliko *et al*. [37] respectively in their studies on the length-weight relationship and the condition factor of some fish species of commercial interest caught in the upper Lualaba, part of Kindu (DR Congo) and *Distichodus rostratus* captured at the Taabo dam lake in Ivory Coast. On the other hand, *Chrisichthys nigrodigitatus* and *Labeo senegalensis* showed negative allometric growth (b < 3; p < 0.05) characterized by much more growth in length than in weight. These results agree with those of Bitja [38] in *Chrisichthys nigrodigitatus* captured in the Sanaga River in Cameroon. Indeed, the results of Ngoy et *al*. [36] in the Congo River region at Kindu in DR Congo, show isometric growth in *Synodontis decorus* (b = 3; p > 0.05) *;*however, these results do not agree with those of the present study in *Synodontis notatus*, which showed positive allometric growth. The condition factor K is an index of the increase and decline of feeding which gives a good idea of the fatness of the fish [39]. Thus, the results of the present study vary between 0.9 and 5.7. These values obtained are almost similar to those of Ngoy *et al*. [36], Ecoutin et Albaret [40] and Aliko *et al*. [37] in *Synodontis decorus, Auchenoglanis occidentalis*, Labeo *macrostomus*, *Chrysichthys nigrodigitatus.*

4. CONCLUSION

The purpose of this study was to characterize fishing activities, inventory the species of fish caught and determine the growth of the most caught species in the Congo River at Kindu. Thus, the results obtained on the fishing activities confirm that the fishing practiced by the local fishermen of Kindu is of the artisanal type, because it is carried out with techniques and machines of the artisanal type. Fishing in the Kindu River region is an activity that contributes to improving the living conditions of the population by providing income to fishermen to meet certain household needs. Regarding fishing techniques, the results reveal that the fishermen surveyed used 5 fishing techniques including longline fishing, drift net fishing, set net fishing, cast net fishing, and single line fishing. The Congo River in its part of Kindu abounds with a diversity of fish species as 38 species belonging to 14 families have been identified. Indeed, the families of Mormyridae, Mochokidae and Cichlidae were better represented in terms of species. Regarding the length-weight relationship, *D. rostratus* and *A. occidentalis species* showed positive allometric growth, while *C. nigrodigitatus* and *L. senegalensis* showed negative allometric growth. But isometric growth is observed in *S. notatus.*

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