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Ichthyological Inventory of the Kamikingi River: Identification and Classification of Predominant Species

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ABSTRACT

Today, fish is one of the world's most precious and widely consumed natural resources, in both developed and developing countries. In addition, for as long as man has existed on Earth, food has been one of his main preoccupations. Thanks to its rich protein content, fish is becoming an increasingly important part of our diet. That's why, this study aims to identify the species of fish living in the Kamikingi River and to classify them into different families. To achieve this, a documentation-based approach via fieldwork was used for data collection and interpretation. These methods were supported by various techniques such as the capture technique (using tools such as Traps, Hooks, and Nets), the specimen preservation technique (using formalin as an anti-oxidant), and the specimen identification technique (using fish species identification keys such as those of Lévêque, Paugy, and Poll) to compare fish species present in the Kamikingi River). To facilitate the presentation and/or interpretation of these field data, a number of indices were calculated. These are Jaccard's similarity index, relative abundance, Shannon-weaver diversity index (H), equitability index and Dominance index. As a result, 495 specimens were identified in the Kamikingi River. Represented successively by two families: Cyprinidae and Claridae; and two genera: Barbus and Clarias. Which can be divided into 6 species: Barbus stigmatopygus, Clarias gariepinus, Barbus gourmansis, Barbus chlorotaenia, Barbus thys and Barbus sublineatus. Furthermore, the classification proposed by Jaccard's similarity index classifies these species into three groups, with a certain similarity between these groups in terms of the number of species per site. The first is the group formed by Barbus sublineatus and Barbus thys, the second by Clarias gariepinus, Barbus gourmansis and Barbus stigmatopygus, and the third by Barbus chlorotaenia. By the way, in this study, we highlight and have made available to the Bubolese population a number of fish species that were long unknown. These species are edible and pose no threat to human life. In view of the very small size and number of these species in the Kamikingi River, we reserve the right to encourage the fishing of these fish in this river for conservation reasons.

1. INTRODUCTION

At present, fish is one of the most valuable natural resources in both developed and developing countries. Since the existence of man on Earth, food has been one of the major concerns. With this in mind, fish offer an increasingly large share of food availability, especially animal protein in human catering. Furthermore, fish flesh, with its richness in proteins and vitamins, contributes enormously to health and is a source of protein with high biological value, currently covering nearly 20% of the world's protein intake [1-3].

In the Democratic Republic of Congo, fish are a great source of animal protein for people in villages and towns. This animal resource can be used effectively in sustainable wildlife management to reduce the impact of illegal fishing [4, 5].

Indeed, the ichthyological fauna of the Congo River basin is the second basin in the world in animal biodiversity after that of the Amazon in Latin America, and includes about 30 families and 890 species except Lake Tanganyika [6, 7]. Lack of sustainable environmental management requires the use of biological resources. In this perspective, the protection of biodiversity requires prior knowledge of the living beings that we want to manage or preserve [8, 9]. Similar studies had already been done across the world. In this study, we will fetch some of the technics and methods usually used to conduct ichthyological studies. And we will refer to their results to compare with the reality of the Kamikingi River.

In exploring baseline information on the diversity and abundance of fish and their relation to environmental variables in five sections of Kamala River, Ghimire and Koju (2021) used the cast nets for collecting fish samples and they determined physiochemical parameters onsite and in the laboratory. Altogether 19 freshwater fish species belonging to 5 orders, 8 families, and 15 genera were recorded. Cyprinids were the most dominant in the river, while Channids, Mastacembelids, Botiids, Sisorids, Gobiids were represented less. The Redundancy Analysis (RDA) ordination method revealed that species variation was correlated with temperature, Electrical Conductivity (EC), Total Dissolved Solids (TDS), and nitrate. Nonetheless, different river sections were disturbed due to mining, deforestation, and construction activities, which could pose a real threat to fish diversity and population, and other aquatic organisms [10].

Moreover, Loss of fish biodiversity, especially in the inland and coastal areas, is a major concern in sustainable fish production [11]. Indiscriminate fish catch, climate change and many other anthropogenic activities synergistically affect fish biodiversity [12]. To formulate a sustainable fish biodiversity conservation plan, fish biodiversity in the Andharmanik River, Ali et al. [13] collected samples of fish in three sampling stations between December 2014 and November 2015. A total of 93 fish species were found belonging to 66 genera, 45 families and 14 orders. Perciformes (27.65%) was found to be the most dominant order, followed by Cypriniformes (20.21%), Siluriformes (21.28%) Clupeiformes (7.45%) Mastacembeliformes (4.26%) and Channiformes (4.26%). Out of the 93 fish species of the river, the percentage compositions of the vulnerable, endangered, critically endangered and not threatened were found to be 14%, 11%, 6% and 59%, respectively. In addition, four population indices such as Shannon-Wiener's diversity index (H), Simpson's dominance index (D), Simpson's index of diversity (1-D) and Margalef's index (d) were applied to demonstrate species diversity, richness and evenness of fish species in sampling areas, and the overall values of the indices were 2.70-3.51, 0.10-0.12, 0.88-0.90 and 7.84-8.19, respectively. According to Ali et al. (2020), the main threats to fish biodiversity are indiscriminate fishing using biodiversity destructive gears, and losing hydrological and ecological connectivity with the surrounding habitats in the Andharmanik River. And for limiting these threats, effective sanctuary-based co-management, immediate actions for habitat enhancement to conserve and improve fish biodiversity in the river, and necessary steps to improve hydrological and ecological connectivity for habitat protection and elimination of all destructive fishing gears in order to conserve biodiversity in the Andharmanik River are the best solution for stopping these issues.

On the other hand, Durand et al. [14] tried to combat various anthropogenic pressures including the intense damming of the main river and fish diversity that threaten the sustainability of the Mekong River. Not forgetting the increase in salt-water penetration into the Mekong Delta and the disrupted connectivity of the river. To achieve this, water samples were collected at 15 sites along the salinity gradient in the Mekong Delta and along 1500 km of the main stream, from Vietnam to Thailand and Laos. A total of 287 OTUs were recovered, of which 158 were identified to the species level using both reference sequences available in GenBank and references obtained locally. Thanks to an agglomerative hierarchical clustering and PCA, up to three main species assemblages have been identified in the samples. Dominated in 60% and 95% of the freshwater species that is potamodromous.

The similar study was made by Tumbahangfe et al. [15] in Tamor River. With the objectives of understanding the relationships among spatio-temporal variation in fish and environmental variables of Tamor River, and to reduce the gap in the information and hence dilate the fish diversity profile of Nepal. Tumbahangfe et al. [15] hypothesized that fish numbers in the Tamor River would be greater during the annual dry season when water current and volume are reduced. They also hypothesized that fish assemblage structure would vary between seasonal variation defined by environmental variables. Using two cast nets of different sizes, one with a mesh size of 2 cm, 6 m diameter and 6 kg weight and another having 0.5 cm, 3 m diameter and 2 kg weight, and monofilament gill nets with mesh sizes of 6, 8, and 10, a total of 6,373 fish individuals representing 28 species belonging to three orders, seven families, and 16 genera were recorded. Statistical analysis such as One-way permutational multivariate analysis of variance (perMANOVA) on the Non-metric Multidimensional Scaling (NMDS) showed no significant ($P > 0.05$) difference between winter, spring, and autumn season but summer season showed significant ($P < 0.05$) difference from winter, spring, and autumn seasons. Furthermore, one-way analysis of variance on redundancy analysis (RDA) vindicated that among the selected parameters, pH, air temperature and total hardness were the influencing factors ($P < 0.05$) to determine the fish community structure in Tamor River.

Using the same method as previously, Onwude et al. [16], studied the fish fauna and biodiversity along Niger River. As a result, a total of 35 species belonging to 18 families were identified, including Solidae and Catostomidae. The sole fish (Solea solea) (0.16%) with only 1 representation while the Catastomids were represented by 3 species; Ictiobus niger (1.73%), Ictiobus cyprinellus (2.20%), Ictiobus bubalus (2.52%). Other species obtained were the Mormyrus rume 3.93%, Polyterus bichir (2.99%) and Protopterus annectens (7.08%). The most dominant species was Gymnarchus niloticus (8.49%) of the family Gymnarchidae while the least represented was Solea solea (0.16%). The biodiversity indices revealed that Station 2 had the most evenly distributed species and the most of diverse species though Station 1 had the greatest number of species. Station 3 however had a minimum number of species.

According to Guo et al. [17], the Ganjiang River has abundant fish resources, which plays a significant role in maintaining and replenishing the fish resources in Poyang Lake and the Yangtze River, and contains important habitat for migratory fish. However, fish diversity has rapidly declined in the Ganjiang River, especially migratory fish. That's 107 fish species (including 43 Chinese endemic species). However, only 91 fish species were found in the main channel of the Ganjiang River, which was lower than the 107 fish species historically found there. According to the Chinese Red List, 85 Least Concern, two Critically Endangered, three Vulnerable, one Near Threatened and 16 Data Deficient fish species were found in the Ganjiang River. In addition, the species number, diversity and CPUE (catch per unit effort that is the number of fish per hour) in the channel were all greater than in the reservoir. The BrayCurtis resemblance matrix and non-metric multidimensional scaling (NMDS) showed that the habitats of the Ganjiang River were divided into three areas. The analysis of RDA showed that turbidity, dissolved oxygen and water depth significantly affected fish distributions and assemblage composition. These results indicated that dam construction and other human activities have seriously destroyed the fish habitat and led to the decline in fish diversity. Therefore, the conservation of fish has become urgent in the Ganjiang River, and an integrated management plan should be developed and effectively implemented.

In assessing the identification of fish species in the Lowa river, Kisekelwa et al. [18] after using Gill net, fish-hook and fish-trap for fish sampling, they found that fish species of this part of Lowa are composed of Clarias sp, Pareutropius debauwi, Bagrus bayad, Parauchenoglanis punctatus, Chrysichtys graueri, Pollimyrus sp, Mormyrus caballus, Myomurus sp. aff. Macrops, Marcusenius sp., Oreochromis niloticus, Mastacembellus congicus, Labeo lukulae, Labeo macrostomus, Barbus spp., Raimas sp., Bryconaethiops boulengeri, Brycinus aff. poptae, Micralestes humilis and Distichodus altus. Among which Siluriformes and Mormyriformes were dominant order as well as Claroteidae and Mormyridae families.

Back to our study area, the Kamikingi River is an important aquatic ecosystem that requires the ichthyological inventory of its species. Nevertheless, the knowledge of fish in North Kivu province in general and the territory of Beni in particular has long remained ignored. Thus, our investigation focuses on the contribution to the ichthyological inventory in the Kamikingi River in Bashu chiefdom. And their classification.

This study aims to address the following questions: What are the fish families present in the Kamikingi River, and which is the most dominant?

Faced with this concern, we assume that the Kamikingi River would host the families Cyprinidae, Claridae and Cychlidae and that Cyprinidae would be the most dominant. As part of contributing to the knowledge of the ichthyofauna of the Kamikingi River, this article aims to identify the fish living in the Kamikingi River, distribute them to different families and then name and/or classify the collected specimens.

2. MATERIALS AND METHODS

2.1 Geographic location

The study was carried out in the Kamikingi River in Bashu chiefdom. The villages concerned by this study are those crossed by this river including Katamba, Vuhumbi, Vuhekwa, Kasesa, Katsehya and Vuhanga.

The Kamikingi River has its source in the Isale Vuhovi Group [19]. Its route forms a border between the city of Butembo and the chiefdom of Bashu (territory of Beni). It should also be noted that this river is a collection of several tributaries. The area concerned by this study is located between 757600E and 762100E of longitude and between 17600N and 22100N of latitude (See Figure 1).

2.2 Work equipments

The material for this research is biological and technical. The biological material of this work consists of 495 specimens of fish caught during data collection. Data collection was made possible through the following instruments: A cane meter to determine the different measurements of the site, namely length, width and depth; The graduated latte allowed us to take some morphological measurements of the fish; The trap, hooks, a net for catching fish (this net has a mesh of 0.5 cm, and 2 m of diameter chosen depending on the sizes of the fish in the Kamikingi river); A notebook and a pen to write the various observations; Jars for transporting samples (fish) from the place of capture to the laboratory, formalin (4%) for the conservation of specimens, and fish determination keys for identification.

2.3 Methods and techniques

The survey allowed us to obtain traditional information and find the vernacular names of different fish by inquiring with local populations. The Documentary Method was used to provide the theoretical framework, assess the state of the issue, describe our research environment, gain some knowledge from various books on topics similar to our research topic, and discuss our results.

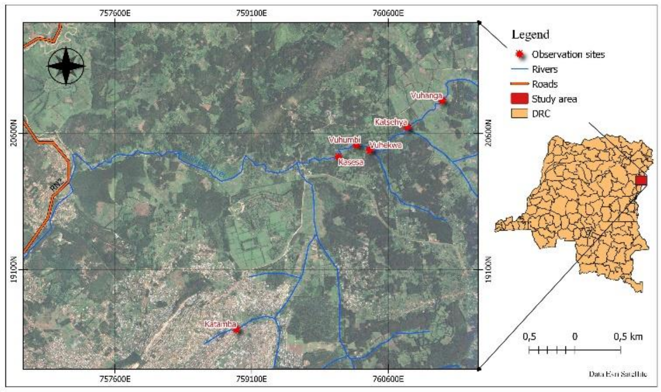

Figure 1. Location map of Kamikingi river

This study focuses on the fish stand of the Kamikingi River. During the investigations, we were interested in accessible sites. We sampled at each site where the current is more or less moderate. Our sample includes 495 specimens of fish caught during the investigation period.

For each site selected, we first took the various measurements using a 100 cm graduated cane meter. These are the width and depth of the river. Then we operated the different sites. The surveys were done either in the morning or the evening and this 1 or 2 times every two weeks in each site. Thus, in each site, we carried out 7 surveys morning and evening.

2.3.1 Capture technique

For the capture of fish, we used the following materials: ***(a) Traps:*** They were placed in the river with the opening oriented in the direction of the current on the banks of the river supported by a stick. Three traps due to a site, were deposited in the evening and raised in the morning around 7:30 a.m.; Dough, bananas, and avocados were used as bait. ***(b) Hooks:*** Each hook carried a rope on which was attached a reed: the earthworm, the locust and remained watched during the day. At the end of the rope, a small metal (lead) was attached to ensure the descent of the hook to the bottom of the river. ***(c) Nets:*** The nets were attached on either side to the tree sticks to allow introduction and fixation in the water.

2.3.2 Conservation of specimens

We first put the specimens in a bag and took pictures. Then these specimens were put into jars containing formalin. This preservative was prepared by diluting 40 ml of formalin 4% in 1 litre of spring water at room temperature. The formalin is an excellent anti-oxidant, combating decay, color change, etc. We labeled the different jars by putting the date, the name of the capture site and the vernacular and scientific name of the specimen as well as the determinator and these jars were placed in a cardboard box that was transported to the laboratory.

2.3.3 Specimen identification

For the identification of taxa, we used different fish identification keys such as the practical key to the fish families of Lévêque et al. [20]; the Genera of Freshwater Fishes of Africa by Poll et al. [21]; the practical guide to West African freshwater fish by Lévêque et al. [20]. By comparing the images of the specimens with the images available in each identification key, we were able to identify the fish species in situ. **Relative abundance (RA)** is a radical parameter to describe a stand. It is the percentage of the number of individuals of a taxon (ni) relative to the total number of individuals (N). This index was used to determine the percentages of the species with the same biological characteristics (environment, zone, migratory type).

$$RA\ (\%) = \frac{\text{Number of individuals of a taxon (ni)}}{\text{Total number of individuals (N)}} \qquad (1)$$

The diversity index of Shannon-weaver (H): This index is calculated on each of the faunal lists obtained. It measures the diversity of the stand. With ni: The size of taxon i, N: total staff. Its value varies from 0 (minimum H, only one taxon present) to 1 (maximum H, all taxa have the same abundance). It helped us to determine the specific richness and the abundance of individuals of each species.

$$H = -\sum_{i}^{s} \frac{ni}{N} \log \frac{ni}{N} \qquad (2)$$

Equitability index: It is an expression of equitability that is often given from the Shannon index. This index is the ratio between H obtained from the biotope and its maximum H. The maximum value of H is obtained when the distribution is perfectly regular. The equitability index helped to measure the evenness of the species.

Dominance: It is calculated by the formula.

$$S = \sum_{i=1}^{s} \left(\frac{ni}{N}\right)^2 \qquad (3)$$

With S = Simpson coefficient, s = total number of species, ni = number of individuals of the species of taxa, and N = Total number of individuals. It was helpful to determine the most dominant species in the aquatic ecosystem.

3. RESULTS

3.1 Fish taxa inventoried in the Kamikingi River

We identified 495 specimens grouped into two families, the Cyprinidae and the Claridae, two genera (Barbus and clarias) and 6 species of which Barbus stigmatopygus is the most dominant (25.6%) followed by *Clarias gariepinus* (20.6%) and Barbus *gourmansis* (19%), Barbus *chlorotaenia* (13.7%), *Barbus thys* (11.9%) and finally Barbus *sublineatus* (9.5%) (See Table 1).

Table 1. Numbers of fish taxa inventoried in the Kamikingi River

	Family	Genera	Species	Staff	%
	Cyprinidae	Barbus	*Barbus stigmatopygus*	125	25.6
			Barbus gourmansis	94	19
			Barbus chlorotaenia	68	13.7
			Barbus thys	59	11.9
			Barbus sublineatus	47	9.5
Subtotal	**1**	**1**	***5***	**393**	**79.4**
	Claridae	Clarias	*Clarias gariepinus*	102	20.6
Subtotal	**1**	**1**	***1***	**102**	**20.6**
Total	**2**	**2**	***6***	**495**	**100**

3.2 Jaccard similarity index

Table 2. Numerical importance of species harvested in the Kamikingi River by capture site

SPECIES	Number of Species Per Site					
	Katamba	Vuhumbi	Vuhekwa	Kasesa	Katsehya	Vuhanga
Barbus stigmatopygus	0	68	20	12	20	5
Barbus gourmansis	0	14	13	17	30	20
Barbus chlorotaenia	0	18	0	0	50	0
Barbus sublineatus	4	0	10	6	0	27
Barbus thys	9	30	15	5	0	0
Clarias gariepinus	12	25	22	16	20	7
Actual	**86**	**30**	**6**	**4**	**7**	**3**
Subtotal	**111**	**178**	**71**	**75**	**134**	**82**
Percentage	**17.6**	**28.2**	**11.3**	**12**	**21.2**	**13**
Taxa_S	3	5	5	5	4	4
Dominance_D	0.3856	0.2776	0.2153	0.2392	0.2917	0.3456
Shannon_H	1.013	1.441	1.571	1.505	1.309	1.187
Equitability_J	0.9224	0.8952	0.9759	0.9351	0.944	0.8559
Fisher_alpha	0.8901	0.9877	1.182	1.328	0.7965	0.9698

The Jaccard similarity index shows that the distribution of species numbers at different sites has three groups, with some resemblance in terms of the number of species per site. These are firstly the group formed by the species Barbus sublineatus and Barbus thys, secondly that constituted by the species Clarias gariepinus, Barbus gourmansis and Barbus stigmatopygus; and finally, that represented by the species Barbus chlorotaenia (See Figure 2).

Jaccard's similarity index shows that the sites are similar and constitute a single biological community. This index reveals a certain lack of affinity between the species Barbus Chlorotaenia and Barbus Sublineatus in the Kamikingi River, especially at the sampling sites. This hypothesis is confirmed by the data in Table 2, which shows that the absence of Barbus Chlorotaenia implies the presence of Barbus Sublineatus. And reciprocally. In addition, Clarias gariepinus is present and in abondance in all the sampling sites at the Kamikingi River (See Table 2). It seems to be a species that has much more affinity with the others.

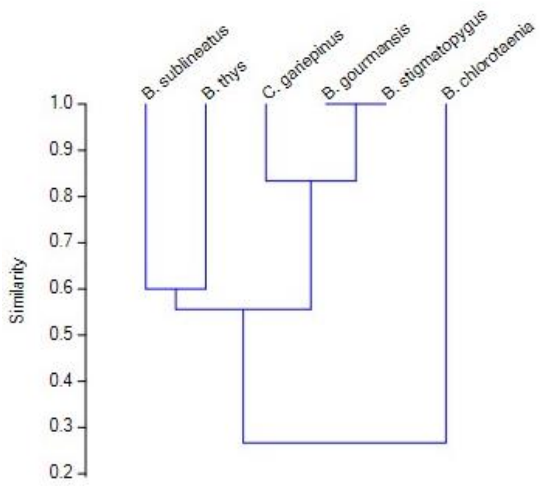

Figure 2. Jaccard similarity index dendrogram

3.3 Fisher index

There is a great biological diversity in the stations of Vuhumbi and Katsehya (See Figure 3). On the other hand, a rarety of species in the resorts of Katamba, Vuhekwa, Kasesa and Vuhunga.

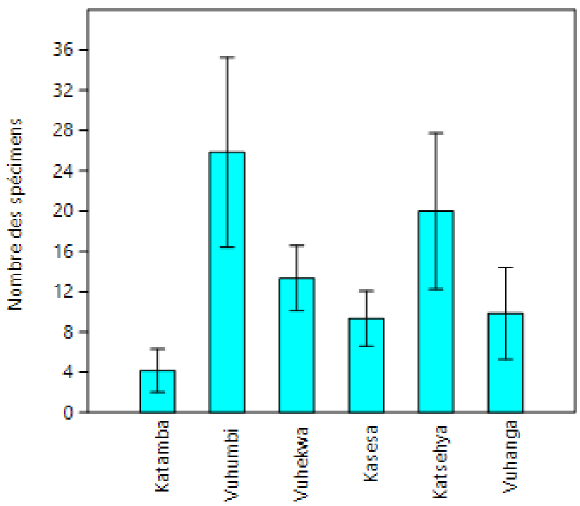

Figure 3. Fisher index – alpha in the six stations

4. DISCUSSION

During this research 6 species grouped into 2 genera and 2 families were identified (See Figure 2). In terms of abundance, fish belonging to the family Cyprinidae, in this case the genera Barbus was dominant with 393 individuals or 79.4% of the total number of individuals caught divided into 5 species namely Barbus *stigmatopygus*, *Barbus gourmansis*, *Barbus chlorotaenia*, *Barbus thys* and finally *Barbus sublineatus*. The family claridae with a genera, the genera clarias and a species, clarias gariepinus comes second with 102 individuals or 20.6% of the total population.

The results obtained in this research show that the most dominant family is the Cyprinidae. This same result was found in five sections of the Kamala River by Ghimire and Koju [10] in Nepal, and in the sanctuary of the Andharmanik River by Ali et al. [13] in Bangladesh. For Ghimire and Koju [10], Cyprinids is the most dominant family in the Kamala River, followed by Channids, Mastacembelids, Botiids, Sisorids, Gobiids. These results are similar to our own, probably due to the similarity of ecological conditions, although the biotopes are located on two different continents. Indeed, Nepal is a landlocked country between India and China, occupying 0.03% of the world's surface area and 0.3% of the total Asian territory. Three-quarters of the country's surface is covered by mountains. According to Ghimire and Koju [10], Nepal can be subdivided into three zones from east to west. The north is characterized by a mountainous area, the center comprises a zone dotted with hills, while the south, known as the Terai or "wetlands", is a low-lying, flat and fertile region, forming part of the great Ganges plain. These conditions in the central region are almost identical to those in the east of the DRC in general [22, 23] and the Beni territory in particular. This would be favorable to the development of this family of fish and would justify this similarity.

Furthermore, Ali et al. [13] found that the most dominant family in the Andharmanik River in Bangladesh is the Perciformes (27.65%), followed by Cypriniformes (20.21%), Siluriformes (21.28%) Clupeiformes (7.45%) Mastacembeliformes (4.26%) and Channiformes (4.26%). But Cypriniformes appear in second place with a very high percentage (20.21%). This is a significant value. On the Kamikingi River, for example, the Ciprinidea family alone accounts for 79.4% (See Table 1). This bears a striking resemblance to the Andharmanik River in Bangladesh. Indeed, Bangladesh is an Asian country located north of the Bay of Bengal, almost landlocked in India, sharing a small border with Burma, and stretching 440 km from east to west and 760 km from northwest to southeast. Bangladesh's climate is tropical, with mild winters from October to March, hot and humid summers from March to June, and monsoons from June to October. However, it should be pointed out that Bangladesh is a country regularly hit by natural disasters, such as floods, tropical cyclones, tornadoes and tsunamis. This vulnerability to the effects of climate change is due to a combination of geographical factors, such as the presence of plains, low altitude and exposure to deltas, as well as various socio-economic factors, such as high population density, high poverty rates and dependence on agriculture. In trying to understand this ichthyological similarity, i.e., the dominance of Ciprinidae in the Kamikingi river in Beni territory (DRC) and the Andharmanik river in Bangladesh, it is likely that this fish species adapts easily to the tropical climate. Climate seems to be the only ecological condition that is identical in these two biotopes.

In addition, the Table 2 clearly shows that among our sampling sites (stations), the Vuhumbi site exceeds the other sites (stations) in terms of numbers (178 individuals), i.e., 28.2%. This diversity is likely due to the presence of flora (specifically carex). Once decomposed, these carexes are a direct source of food for the fish. This site is also less polluted than other sites. The Vuhumbi site is the most diversified in terms of numbers of individuals and species, followed by the Katsehya site (134 individuals) or 21.2%, and the Katamba site with 111 individuals or 17.6%. It should be noted that this station (site) was populated by specimens of unidentified fish. However, after observation and analysis, this site was found to be the most polluted of all the sites we visited because (a) sand is mined here, and (b) there is a lot of traffic (trucks, motorcycles) here, releasing carbon monoxide and other gases dissolved in the water. It is therefore possible that these species adapt easily to this pollution.

According to Radinger et al. [24], favourable breeding and feeding conditions favour the abundance of certain fish species in an aquatic ecosystem. At the SÔ River in Burkina Faso, Ngalanza et al. [25] noted that specific abundance was a function of the ecological conditions of the aquatic ecosystem of the environment. Shannon index values between 1,013 and 1,571 showed that the fauna of the Kamikingi River is rich and diverse. The equitability index values between 0.8559 and 0.9759 are close to 1 and, testify that the fish species composing the ichthyological population of these six stations of the Kamikingi River live in equilibrium, these observations are supported by the Fischer-alpha indices as well as the Jaccard similarity index applied to the data of the ichthyological fauna inventoried in the Kamikingi River. According to Ngalanza et al. [25], these two indices showed that the fish species that coexist in this river live uniformly, with the same richness within this ecosystem.

5. CONCLUSIONS

Today, fish is one of the world's most precious and widely consumed natural resources, in both developed and developing countries. What's more, for as long as man has existed on Earth, food has been one of his main preoccupations. Thanks to its rich protein content, fish is becoming an increasingly important part of our diet. That's why, through this study, we identify the species of fish living in the Kamikingi River and classify them into different families.

To achieve this, a documentation-based approach via fieldwork was used for data collection and interpretation. These methods were supported by various techniques such as the capture technique (using tools such as Traps, Hooks, and Nets), the specimen preservation technique (using formalin as an anti-oxidant), and the specimen identification technique (using fish species identification keys such as those of Lévêque, Paugy, and Poll) to compare fish species present in the Kamikingi River). To facilitate the presentation and/or interpretation of these field results, a number of indices were calculated. These are Jaccard's similarity index, relative abundance, Shannon-weaver diversity index (H), equitability index and Dominance index.

As a result, 495 specimens were identified in the Kamikingi River. Represented by two families: Cyprinidae and Claridae. These families were represented by the following two genera: Barbus and Clarias. All the fish species identified in the Kamikingi river can be divided into 6 species: Barbus stigmatopygus, Clarias gariepinus, Barbus gourmansis, Barbus chlorotaenia, Barbus thys and Barbus sublineatus. Furthermore, the classification proposed by Jaccard's similarity index classifies these species into three groups, with a certain similarity between these groups in terms of the number of species per site. The first is the group formed by Barbus sublineatus and Barbus thys, the second by Clarias gariepinus, Barbus gourmansis and Barbus stigmatopygus, and the third by Barbus chlorotaenia.

Thanks to this study, we have made available to the Bubolese population a number of fish species that were long unknown. These species are edible and pose no threat to human life. In view of the very small size and number of these species in the Kamikingi River, we reserve the right to encourage the fishing of these fish in this river for conservation reasons.

Finally, as the title of this article indicates, this study is a contribution to the inventory of fish species in the Kamikingi River. It has identified and classified the few fish species observed at the various sampling sites. However, given our very limited resources and the unavailability of field equipment such as cameras, physico-chemical measurement kits, etc., some parameters were not determined in this study. We therefore recommend caution in the use of our results, and encourage future researchers to consider these undetermined parameters in their studies.

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