

# Survey on Socio-Economic Characteristics and Catch Assessment of Fisheries Traditional of the Northwestern Part of Lake Tanganyika in Uvira, DR Congo

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**Abstract:-** This study was conducted at the 4 landing beaches of the fishing units (Kilomoni, Kasenga, Mulongwe and Kalundu) at Lake Tanganyika in Uvira between March and May 2019. It provides information on the socio-economic aspects and the monthly evolution of traditional fishing catches. Overall, 100 fishermen were interviewed about their socio-professional characteristics and fishing activities. The results of this survey show that 45% of the fishermen surveyed are members of fishing associations, 60% of the interviewees were young fishermen whose age group varies between 20 and 35 years, 60% of the interviewees only fish without other activities related to this profession, 68% of the fishermen surveyed had a secondary level, 38% of the fishermen surveyed stated that they practice fishing for survival. For the monthly evolution of the total weight of catches, the species *Stolothrissa tanganyicae* was more caught in May in Kilomoni beach with more than 8000 kg, followed by *Limnothrissa miodon* (6000 kg) in Kalundu beach in May and *Lates stappersii* has a small total number of weight (200 kg) in April in Mulongwe beach. The comparison of beaches ranked two by two according to the number of boats shows a significant difference between Kalundu-Kasenga ( $p=0.0007$ ), Kalundu-Kilomoni ( $p=0.0001$ ), Kalundu-Mulongwe ( $p=0.0001$ ), Kasenga-Kilomoni ( $p=0.0028$ ), Kilomoni-Mulongwe ( $p=0.0008$ ) beaches.

**Keywords:-** Beach, Variation, *Stolothrissa Tanganyicae*, *Limnothrissa Miodon*, *Lates Stappersii*.

## I. INTRODUCTION

Lake Tanganyika is a large lake with a length of 650 km and an average width of 50 km. It is the second deepest lake in the world with a maximum depth of 1,320 m in the northern basin, 1,470 m in the southern basin and its formation dates back about 9 to 12 million years [1],[2],[3],[4].

This lake is home to one of the largest inland fisheries in Africa, second only to Lake Victoria in terms of production volume[5],[6] and is of great socio-economic

importance and a major source of food and animal protein supply for more than 10 million people in the lake's watershed[7],[8],[9],[4],[10]. The ichthyological fauna of Lake Tanganyika and its tributaries is rich and contains several families of fish. The most prolific fish group including a very high endemism specifically in the Cichlidae family, 98% but also in the Non-Cichlidae family, 56%[11],[12],[13],[14],[15].

The pelagic community is composed mainly of six endemic species: two Clupeidae (Sardines), *Stolothrissa tanganyicae* (Regan, 1917) and *Limnothrissa miodon* (Boulenger, 1906) and four predatory fish of the genus *Lates* follow the movements of the sardines. These are *Lates stappersii* (Boulenger, 1914), *Lates microlepis* (Boulenger, 1898), *Lates mariae* (Steindachner, 1909) and *Lates angustifrons*[16].

The fisheries of Lake Tanganyika have been described in detail by a significant number of authors [17],[1],[18],[19],[20]. Traditional or substantial fishing is generally carried out along the coast during the day, but sometimes at night and mainly catches inshore fish and Clupeidae and Latidae fish. This fishing method, which is characterized by a relatively low-cost investment, consists of a non-motorized monoxyle (plank) pirogue about 3 to 5 m long and a limited number of fishermen depending on the method used and a variety of gears: Beach seine, Dead or encircling gillnet, Longlines, Hand line, Net (Lusenga) and nets[21],[22],[16].

Framework surveys and socio-economic studies have been carried out in Congolese, Burundian and Zambian waters by several authors [17], [21],[23], [24], [9], [25], [26], [27], [28], [29], [30].

The decreases in catches in this part of the lake have been mentioned and have precarious consequences on the socio-economic and food security situation of fishermen. Currently we are seeing a gradual increase in fishing units, in the number of fishermen and in the use of inappropriate fishing gear and methods (mosquito nets, beach seines, small mesh gillnets, etc.) in this basin of the lake. The objective of this study is to gather the necessary

information on the socio-economic aspects and catch assessment of traditional fishing in the northwestern part of Lake Tanganyika in Uvira.

**II. MATERIAL AND METHODS**

*A. Description of the Study Area*

The city of Uvira (former city of Uvira) is located in the southern hemisphere on the northwestern shore of Lake Tanganyika between 3° 21' and 3° 27' south latitude and between 29° 7' and 29° 12' east longitude [31].

Our survey was conducted in 4 main landing beaches of the fishing units. These are Kilimoni Beach (03° 20.810'S and 029°11.188' E), Kasenga Beach (03° 21.831'S and 029°09.050' E), Mulongwe Beach (03° 23.036'S and 029°08.720' E) and Kalundu Beach (03° 25.440'S and 029°07.980' E) (Figure 1).

The choice of these beaches is based on their accessibility and the availability of fishermen in these beaches. At each beach, women and girls sell tea, doughnuts, chappattis, beans and rice to fishermen. The city

of Uvira is crossed by several rivers with considerable ecosystem values for the surrounding populations. The most important are: Kavimvira, Mulongwe and Kalimabenge.

Most of these rivers originate in the Mitumba Mountains between 2400 and 1800 m above sea level and flow directly into the lake at 779 m, crossing steep, steep areas with steep slopes. It has a humid tropical climate characterized by an alternating double season. The main rainy season generally extends from February to May before the main dry season, which also extends from June to September [32]. Rainfall varies from year to year: it drops to 661 mm in 1929 and rises to 1070 mm in 1931[33]. The study of [32] shows that the average annual rainfall recorded was ± 800 mm. The average annual temperature is 24°C [33], [31]. Regular and permanent winds blow mainly in 2 main directions north - northwest to north - northeast - northeast and south - southeast to south [32]. The main food crops planted in this region are cassava, maize and beans and in small quantities sweet potatoes and groundnuts [34].

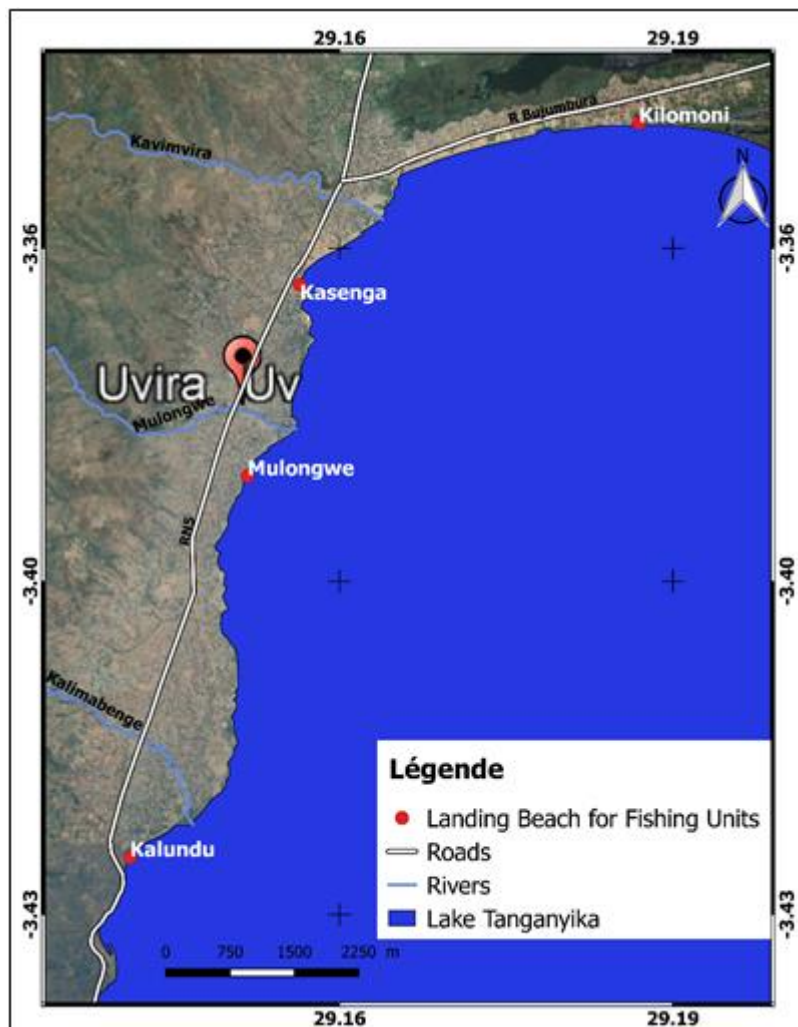


Fig 1:- Landing Beach for Fishing Units at Lake Tanganyika in Uvira

### B. Data Collection Methods

Our investigation covered a period of 3 months, from March 1 to May 3, 2019. Spatially, the survey was carried out in these 4 landing beaches of the north-western basin of Lake Tanganyika. The sample considered in our survey was composed of 100 fishermen. To achieve the objectives set, a survey questionnaire was submitted to fishermen, the following parameters of which were taken into account: distribution of fishermen according to their affiliation with fishermen's associations, their age, level of education, marital status, profession and opinions regarding their fishing activities, such as reasons for fishing and major problems faced by fishermen. Fishing statistics for sardine fish and their predator, *Lates stappersii*, were taken daily from each beach, with the following elements of interest: the frequency of fishing boats, the number of nets, fishermen and the estimated weight of the species caught in kilograms.

### C. Data Analysis Method

The data were analyzed using STATISTICA software (version 6). Descriptive statistics and analysis of variance (ANOVA) were performed for beach comparisons based on the number of boats.

## III. RESULTS

### A. Socio-Economic Characteristics and Fishermen's Opinions of the Fishing Activities

Based on interviews conducted on the socio-professional aspects of fishermen in each landing range, it was observed that traditional fishermen are affiliated with fishing associations. Table 1 shows that 45% of the fishermen interviewed belong to the MUPALTA association and 24% of fishermen without associations. Significant differences were found by comparing the beaches of Kalundu-Kasenga, Kalundu-Kilomoni, Kalundu-Mulongwe, Kasenga-Kilomoni and Kilomoni, Mulongwe according to the number of fishing boats.

However, there was no significant difference between the beaches of Kasenga and Mulongwe (Table 2).

Figure 2 shows that 60% of fishermen are between 20 and 35 years old and half of this age group is between 20 and 25 years old. This is the class made up of young fishermen with more strength to fish. The least represented age groups (9%) are older fishermen between 46 and 75 years of age. In relation to the educational level of fishermen, 47% of our respondents have a secondary level. However, 32% did not study and no academic was found among the 100 fishermen interviewed in Uvira (Figure 3).

The results in Figure 4 show that 64% of our respondents are married men who fish and 36% of our respondents are single. Out of 100 respondents, 60% of them have no other occupations outside fishing while the other 40% are engaged in other activities as shown in Figure 5. These are fishermen who also engage in gainful activities related to agriculture, trade, masonry, and even education etc. Farmers and students make up more than 25% of fishermen.

With regard to the major problems of fishermen, we note that from Figure 6 onwards, 38% of our respondents have as a problem the loss of fishing equipment and human life caused by the wind and 29% of our respondents have the problems of theft of fishing equipment. On the other hand, 17% of our respondents have problems with lack of catch and 16% of our respondents are subject to numerous military harassment and harassment from the Environment and Agriculture, Fisheries and Livestock Department. According to the results of Figure 7, we find that 38% of fishermen fish to fight against survival (hunger), 35% of fishermen fish for lack of other jobs in the city of Uvira i.e. because of unemployment. 14% of fishermen fish to ensure the survival of their families and 9% of fishermen fish to find money for their studies and only 4% of fishermen fish because it is a legacy left by their parents.

Fishermen's associations	Number of employee	Pourcentage
MUPALTA	45	45
ACODS	5	5
APPETAKI	4	4
PECHEURS INDEPENDANTS	24	24
COOPEFIMA	6	6
ADDIPELTA	9	9
APDS	7	7
Total	100	100

Table 1:- Percentage Distribution of Fishers by Association

Beaches	Mean Diff	Crit. Diff	P-Value
Kalundu, Kasenga	-1.424	0.823	<b>0.0007</b>
Kalundu, Kilomoni	-2.643	0.756	<b>0.0001</b>
Kalundu, Mulongwe	-1.446	0.727	<b>0.0001</b>
Kasenga, Kilomoni	-1.219	0.789	<b>0.0028</b>
Kasenga, Mulongwe	-0.022	0.771	0.9558
Kilomoni, Mulongwe	1.198	0.698	<b>0.0008</b>

Table 2:- Comparison of Beaches Ranked Two by Two According to the Number of Boats

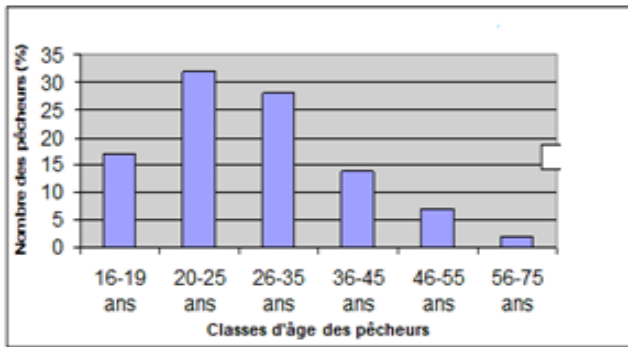


Fig 2:- Distribution of Fishers by Age

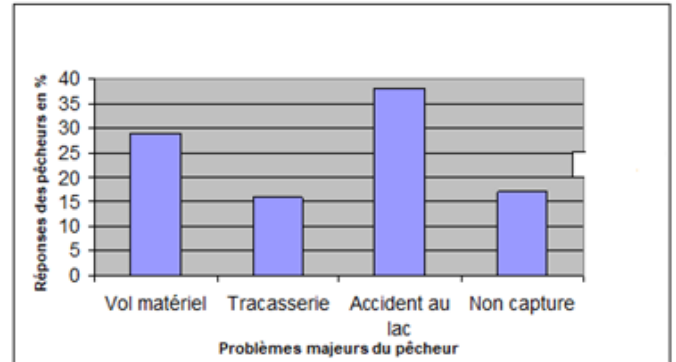


Fig 6:- Distribution of Fishers by Major

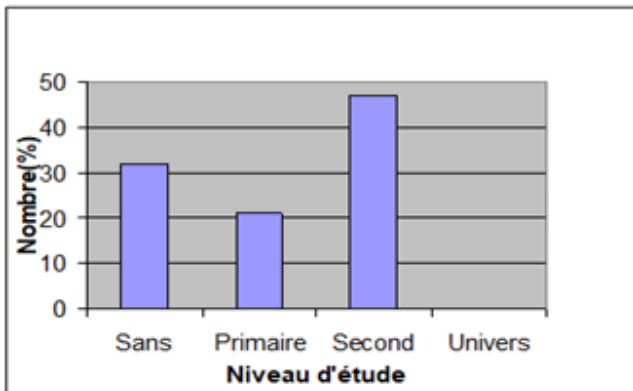


Fig 3:- Distribution of Fishers by Level Study

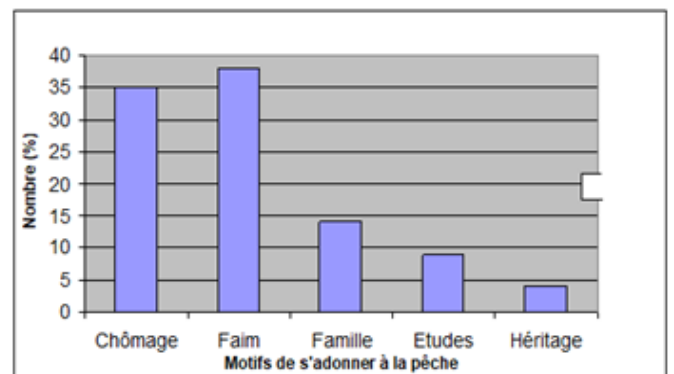


Fig 7:- Distribution of Fishers by Reason of Fishing Problems in Fishing

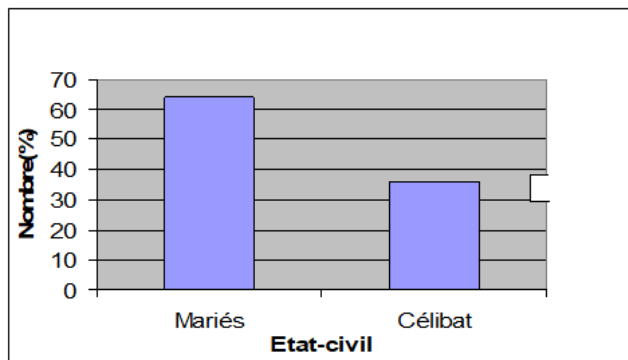


Fig 4:- Distribution of Fishers by Civil Status

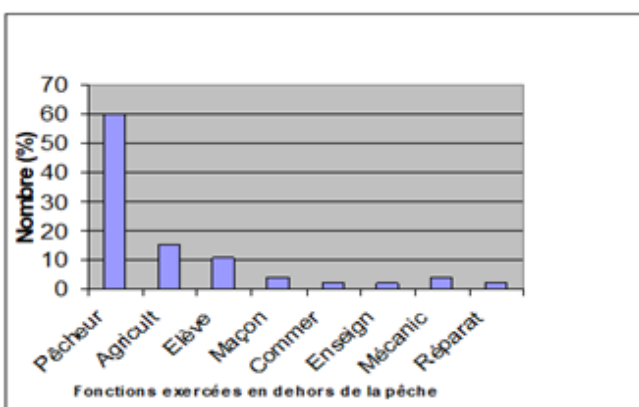


Fig 5:- Distribution of Fishers by Occupation

**B. Monthly Trends in Fishing Activities and Catches in Landing Beaches**

Data on the number of boats, nets, fishers and species weights were collected at each landing beach. Figure 8 shows that May recorded a large number of fishing boats at Mulongwe beach compared to the other months. April saw an increase in fishing boats at Kilomoni Beach compared to other beaches. Figure 9 shows that Mulongwe beach recorded more fishing nets between May and April than other beaches. During the study period, we note that the highest number of fishermen were observed on Mulongwe beach during the month of May. April and March had a low number of fishermen in all other beaches (Figure 10).

Through figures 11 A, B, C and D, we notice that Kilomoni beach recorded the highest production of *Stolothrissa tanganicae* in May. Kasenga beach is the second most important for this species in March. At Kalundu beach, the species *Limnothrissa miodon* was more captured in May. The same observations were noted for Mulongwe beach where *Limnothrissa miodon* beats record in May.

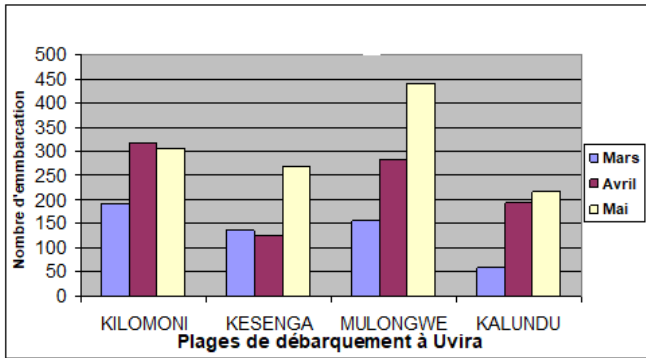


Fig 8:- Change in the Number of Boat

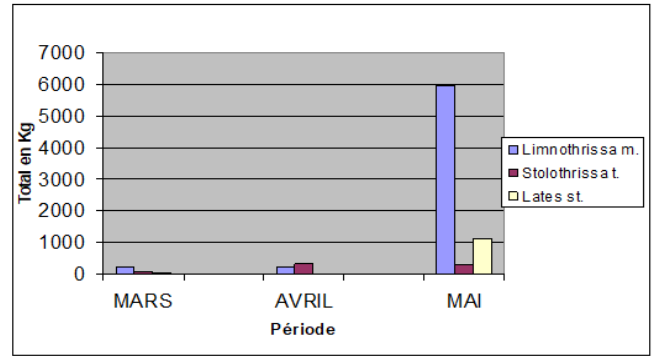


Fig 11(B):- Monthly Variation in the Range Kasenga

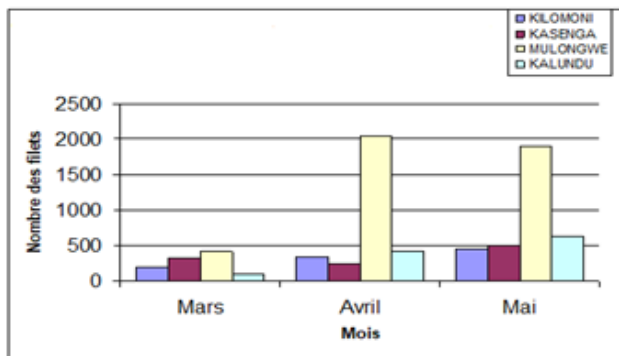


Fig 9:- Change in the Number of Nets

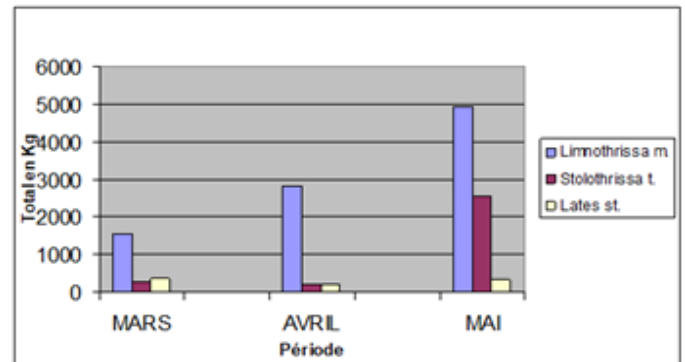


Fig 11(C):- Monthly Variation in the Range Mulongwe

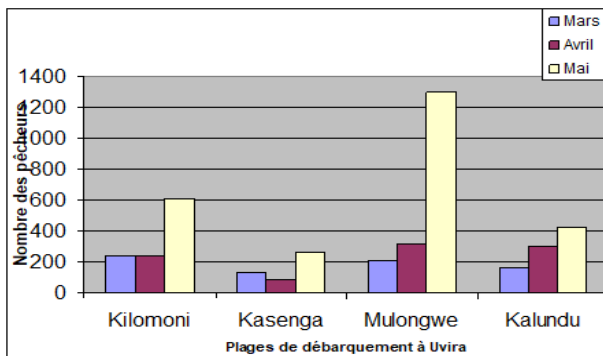


Fig 10:- Change in the Number of Fishermen

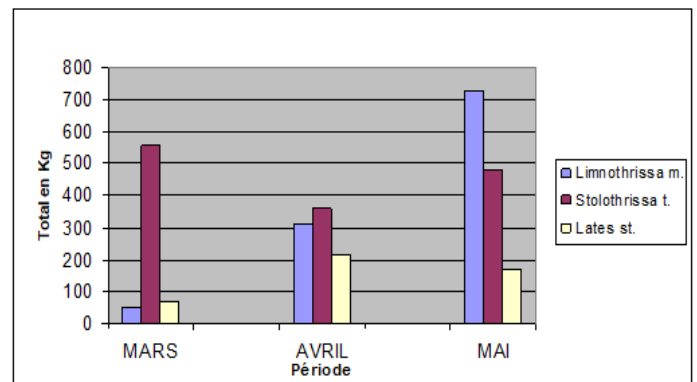


Fig 11(D):- Monthly Variation in the Range Kalundu

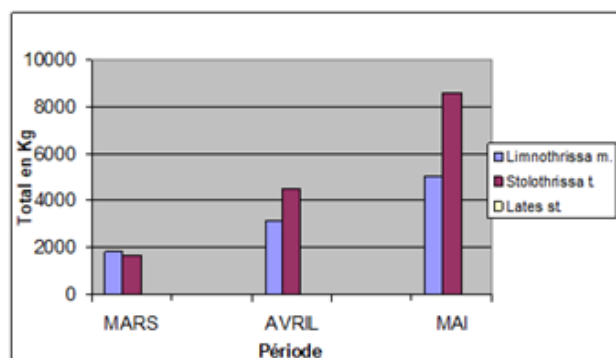


Fig 11 (A):- Monthly Variation in the Range of Kilomoni

#### IV. DISCUSSION

In the fishing sector of the north-western basin of Lake Tanganyika, we find a fishermen's organization within the fishing associations. Our results show that 45% of the fishermen surveyed are members of the MUPALTA association. This higher percentage compared to self-employed fishermen is explained by the fact that this fishermen's association is one of the first associations to have been created in Uvira. There is also a kind of professionalism in the gender distribution of fishermen, with secondary fishing activities such as the marketing and processing of fish being mostly reserved for women. This is probably due to the heavy work involved in this activity and including the permanent dangers in the lake environment. This is why 60% of the respondents were young fishermen with more strength to fish whose age group varies between 20 and 35 years.

The study of [29] also shows that a maximum intensity of fishermen who fish is made up of young people in the 20-29 age group, because fishing activities are also hard work.

Concerning alternative activities outside or together with fishing activities, 60% of the interviewees have no other activities than fishing. This shows that in Uvira, there are not many alternatives in other activities other than fishing, especially since the Kiliba Sugar Company, which employed 5000 workers, had closed its doors because of repeated wars. However, our surveys show that 40% of fishermen are also involved in fisheries-related activities such as trade, livestock, agriculture, etc. Surveys conducted by [9] also show that 74.4% of households surveyed are interested in fishing. Our results do not differ from those found by [29] for fishing related activities. These authors also prove that 54% of fishermen work in agriculture and livestock farming. The study conducted by [25] also showed that 82.8% of bosses and sinners do agriculture, 53.8% of bosses and workers also do business.

In relation to the educational level of fishermen, only 32% are illiterate while 68% have a secondary level. This shows that fishing is not an activity of people who do not have any qualifications because no academic was found among the 100 fishermen surveyed. On the other hand, the study of [29] found that the percentage of fishermen with primary education was high at 47.5%.

Singles (36%) were less numerous among fishermen compared to heads of households (64%). This may mean that this activity is considered to be revenue-generating and supportive for the family despite 76.7% of the most common and worrying problems for fisheries such as bad weather, theft of fishing equipment, loss of human life, insecurity [9]. The results found by [25] show that people working in the fishing sector are mostly responsible for families, 92.7% of employers and 87.5% of fishing workers are married. While single employers and workers accounted for 5.5% and 12.1%.

With regard to the variation in the number of boats on the beaches of Uvira, we note that May saw a large number of fishing boats on Mulongwe beach compared to the other months. April saw an increase in fishing boats at Kilomoni Beach compared to other beaches. This increase in the number of fishing boats would probably be due to the movements of fishermen who come to fish on this beach where there is a large local market for marketing fresh fish and other products. The number of traditional fishing units in Burundi has also increased, from 1515 in 2011 to 2188 in 2015, an increase of 42% [27]. The results of the framework survey conducted by [23] recorded 9,439 active fishing units. Among these units, about 54.3% are composed of board canoes and are mostly found, about 47.6% in the Moba area. This predominance is particular to this area, which uses to a large extent certain techniques appropriate for fishing that appear to be less costly, very simple and more economical. The previous results of the Lake Tanganyika framework survey [26] then show that

monoxyl canoes are numerous on the Congolese coast, of which 3,585 are active and constitute 13% of the total.

For the variation in the number of nets per month at Uvira beaches, we note that Mulongwe beach recorded more fishing nets between May and April than other beaches. This shows that there is more activity

## V. CONCLUSION

This study provides necessary information on the socio-economic aspects and the evaluation of the monthly catches of traditional fishing in the landing beaches of Lake Tanganyika in Uvira. The results of this study show that traditional local fishermen, operating in Congolese waters of Lake Tanganyika in Uvira, are affiliated with fishermen's associations recognised by the fisheries administration. Fishing in this area is a primary occupation for survival and is carried out all year round by young people with a low level of education. Fishermen face certain categories of problems in the exercise of their profession. These are accidents at the lake due to strong wind movements that cause death and breakage of fishing equipment, harassment by armed, military and administrative thieves, low catches, etc.

In this lake, there is no system for monitoring, control and regular surveillance of fishing. Some administrative authorities have also been demotivated by the lack of financial and logistical resources. Their carelessness leads to inappropriate fishing practices in spawning grounds and they are now responsible for low fish production.

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