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## Contribution to the typology of artisanal fishing in the Mbissi River (Setté-Cama Ramsar site, Southwest Gabon).

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### ABSTRACT

*Objectives:* In order to describe the organization of the fishing community, activities and constraints related to fishing practiced in the Mbissi River, Setté-Cama Ramsar site (Ogooué-Maritime province), a socio-economic study was conducted on the fisheries of this aquatic ecosystem to propose sustainable management measures.

*Methodology and Results:* The data collection was done from November 2017 to May 2018. It consisted of administering semi-structured individual and group interviews to fishermen of the Mbissi River. A total of 32 randomly selected fishermen was interviewed. The results of this study showed that artisanal fishing is more common among young people between the ages of 21 and 30 (72%) and with primary education (71.9%). The average income per fisherman varies according to the climatic season, with an increase in the dry season (150,000 FCFA/fishing trip).

*Conclusions and application of findings:* This study made it possible to characterize the organization of the fishing actors in the Mbissi River. Fishing in the Mbissi River is essentially practiced by young people under 31 years of age who are almost all single and have a primary school education. The income from this fishery is only adequate for 3 months a year. The fishermen are subject to various socio-economic constraints, including the high cost of transporting the fish, and generally use gillnets. This knowledge is essential for the implementation of sustainable and concerted management measures in the Mbissi River and to contribute to the elaboration of the management plan of the Setté Cama Ramsar site.

## INTRODUCTION

Fishing is an important and vital sector for the world economy from a food, social and economic perspective. In terms of food, fishing is a means of livelihood for millions of people around the world as it provides fish which is the most accessible source of protein for people (Carvalho *et al.*, 2011). It remains an appreciable source of protein supply at the aquatic ecosystem level (Kien *et al.*, 2018). This activity also creates a significant number of jobs focused on fish processing and marketing (Kien *et al.*, 2017). However, inland aquatic resources are affected by human activities resulting from construction, modification or destruction of habitats, ecosystems and various sources of overexploitation (Michelet, 2017). In Gabon, the artisanal segment dominates the fishing sector in terms of catch and number of active fishers. It remains the main generator of employment with 6,020 fishermen counted in 2011 with 1772 maritime artisanal fishermen and 4257 continental artisanal fishermen (El Ayoubi and Failler, 2013). This fishery, which is practiced in two main types of ecosystems (maritime and continental), mainly targets coastal pelagic fish. It is on this group of species that most of the fishing effort is deployed, often leading to overexploitation of fishery resources in aquatic ecosystems such as rivers, lagoons, estuaries or river mouths (El Ayoubi and Failler, 2013). In the province of Ogooué-Maritime, the Mbissi River, which is part of the Setté-Cama Ramsar site, is also subject to these threats related to human activities. Indeed, the work of Dibonga

Moukeke (2010) and Houehounha (2015) carried out in the region of the Nyanga River and its tributaries, report overexploitation of fisheries resources and the presence of invasive fish species. Similarly, studies by Houehounha (2015) and Mbiapa Tchoumi (2019) have highlighted the socio-economic conditions (organization of the fishing activity, means of production, number of fishermen) in the fisheries of the Nyanga River region. However, the studies; presenting the socio-economic aspects of the Mbissi fishery is either obsolete (WWF, 2004), or rather general (lack of data on employability, remuneration of fishermen) (Kema, 2014). In addition, this aquatic ecosystem located in the Setté Cama Ramsar site does not benefit from a management plan (Biotope Afrique Centrale, 2018). Yet, the consideration of socio-economic information of fisheries is necessary for the development of management plans, co-management of its aquatic spaces and to improve the welfare of local communities (Colburn and Jepson, 2012; Himes-Cornell and Kasperski, 2015; Himes-Cornell and Kasperski, 2016). It is to address this lack of data that a study was undertaken on the socio-economic assessment of artisanal fishing in the Mbissi River (Setté-Cama Ramsar Site, Gabon). The general objective of this work is to describe the organization of the fishing community, the activities and constraints related to fishing activities in the Mbissi River in order to propose sustainable management measures.

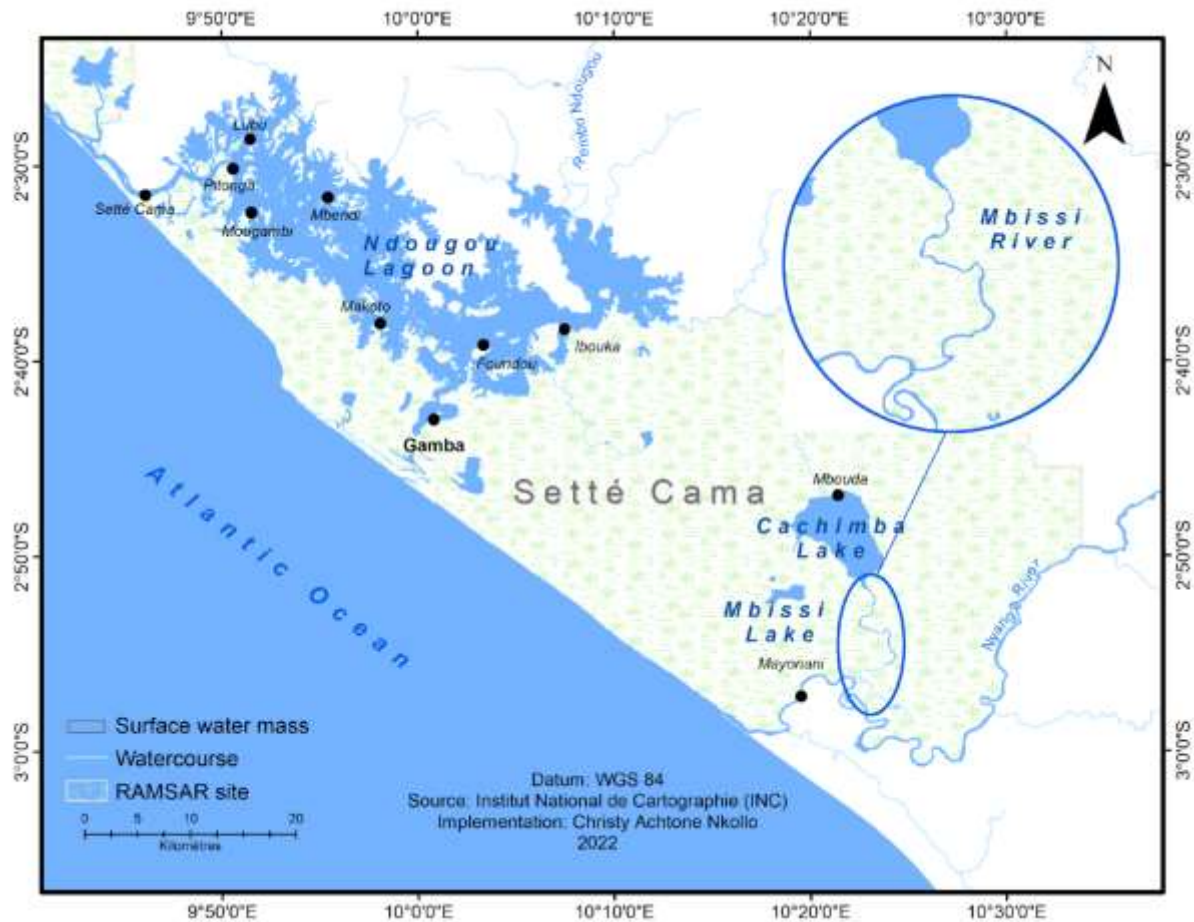
## MATERIALS AND METHODS

**Study area:** The present study was conducted at the Mbissi River in the Setté-Cama Ramsar site, located in southwestern Gabon (Figure 1). Geographically, the study area extends between the southern latitudes 2°56'06.89" and 2°51'25.47" and the eastern longitudes 10°21'44" and 10°22'40.50". This hydrological

unit is located near the village of Mbissi in the Basse Nyanga canton. The village of Mbissi and the Basse Nyanga canton have 25 inhabitants (Thibault, 2001) and 451 inhabitants (Direction Générale de la Statistique, 2015) respectively. The choice of this area is justified on the one hand, by the

lack of data on fishing activities practiced in this river and on the other hand, by the fact that the largest quantity of fish marketed in the

Ndougou Department (Setté Cama Ramsar site) comes from this river (Kema, 2014; Dibonga Moukeke, 2009).



**Fig.1:** Map of study area in the Ramsar site of Setté Cama (blue circle indicates the site of investigation)

**Data collection:** Data collection was conducted from November 2017 to May 2018. It consisted of conducting surveys among resource persons and fishermen in the study area. In practice, three methods were used to collect data, namely literature review, direct field observation and interviews with people. The literature review is an empirical method based on documentary research related to the research topic. It allowed us to circumscribe the theme of the study and to collect information on the study area. As for direct observation, it allowed us to see the fishing actors at work, the techniques used by the

fishermen in the study area and to clarify certain fishing realities that were not captured during the organized interviews. Semi-structured individual and focus group interviews were realized with fishermen and resource persons in order to collect qualitative socio-economic data. The focus group interviews with fishermen allowed for the collection of general information on the activities of this sector. On the other hand, the semi-structured individual interviews made it possible to obtain qualitative information on resource persons with a particular status, such as fishermen with a great deal of experience or

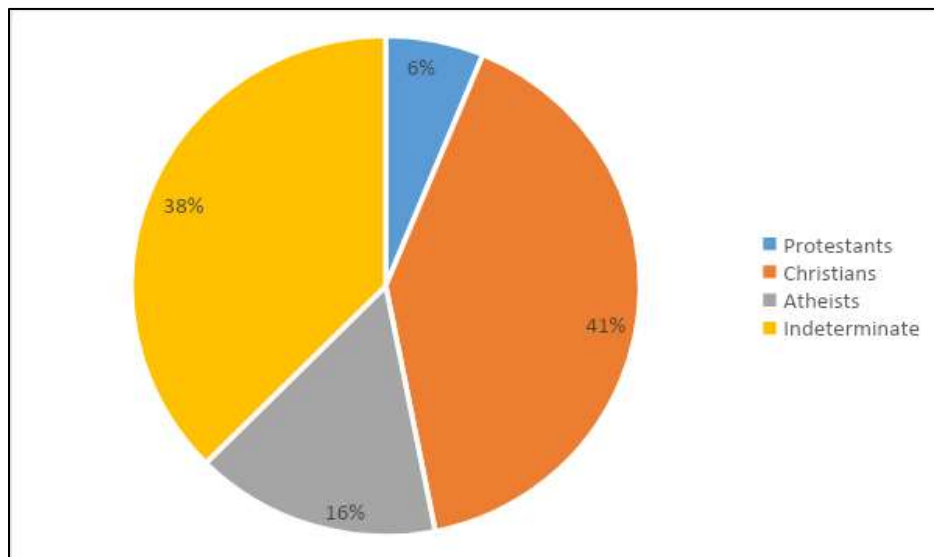
fishermen's owners (owners of fishing equipment). Out of a population of 37 active people in the Mbissi River area, 32 people who fish were randomly selected for semi-structured interviews.

## RESULTS AND DISCUSSION

**Structure of fishing stakeholders according to religion:** A total of 32 fishing stakeholders was interviewed during this study. Of these people, 41% of the fishermen were Christians; 16% were atheists, and 6% were Protestants (Figure 2). This result coincides with the work of Vithursha Tharmakokilam *et al.* (2017) who studied the fishing communities in Allaipiddy village in Jaffna district, Sri Lanka. They showed that the Christian group includes the majority of fishermen engaged in fishing in

**Statistical analysis:** All data collected were entered and organized in Microsoft Excel (version 2013). Data summary tables, calculations of averages and frequencies, and the creation of graphs were also done using the Microsoft Excel application (version 2013).

Jaffna district. As Ragavan *et al.* (2016) point out, the strong presence of religion in fisheries implies that fishermen organize themselves to dedicate a day to religious activities. The people of Mbissi village have certainly become aware of the value of fishing as a professional activity. These results corroborate those obtained by Hossain *et al.* (2014) for Jelepara fishermen in the Paratholi area of Chittagong district in Bangladesh.



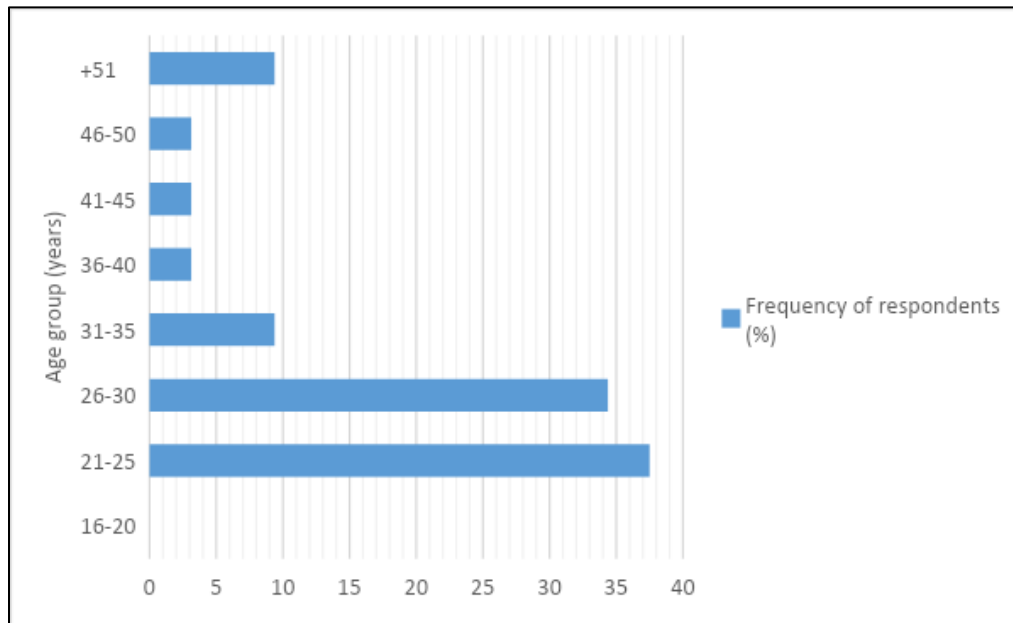
**Fig.2:** Frequency of respondents by religion in the Mbissi river fishery

**Structure of the fishermen according to age:** Among fishermen in the Mbissi area, fishing is carried out by those between the ages of 21 and 80 (Figure 3). However, young people between the ages of 21 and 30 constitute the fringe of the population that fishes the most in the Mbissi River. These young people represent 72% of the sample analysed, while fishermen over 30 years of age are in the minority (28%).

These results would be related to the fact that fishing is a harsh and arduous activity and is therefore more suitable for young people than for the very old. This study observations corroborate those obtained by Rabbani (2007) and Kostori (2012). These authors showed that fishermen in Chalan Beel (Bangladesh) and those in Karatao River (Bangladesh) are young and distributed between the age groups of 20-

30 and 25-50 years respectively. In the case of the latter, it is not possible to determine the extent to which they are motivated to engage in this fishery. The same observation was made by Bignoumba (2011) on artisanal maritime fishing in Gabon. In addition, the strong

presence of young people in the Mbissi fishery can be justified by Law 015/2005 on the fisheries and aquaculture code in the Gabonese Republic, which prohibits foreigners from fishing in inland waters, including the Mbissi River.



**Fig. 3:** Distribution of fishermen interviewed on the Mbissi River according to age ranges

**Structure of the fishing community according to marital status:** The fishing community of the Mbissi River has two marital statuses: single and married. We note that single fishermen are predominant (97%) in the fishery of the study area. Only 3% of the fishermen surveyed are married. The low proportion of fishermen who are married in civil status is linked to the existence of marriage sub-status not recognized by the State. In fact, informal discussions with the respondents emphasized the presence of fishermen living in concubinage (cohabitation of persons not legally married) and married according to tradition (the union of a man and a woman according to the customary principles of the two families in order to organize their life together and create a family). In addition, the low proportion of fishermen who are

officially married could be explained by the fact that local communities have insufficient financial resources to meet the charges and expenses related to civil marriage. Also, a part of the fishermen remain in celibacy, because they do not want to assume marital responsibilities. These results are contrary to those obtained by Hasan and Mahamud (2002), and Reza *et al.* (2015) conducted among the communities of Kalaipara village and Atrai and Kankra rivers in Bangladesh, respectively. These authors revealed that these human communities are composed of about 80% of the married fishermen against 20% of the single fishermen. On the other hand, Blahoua *et al.* (2018) showed that at the Ayame 2 dam lake in Côte d'Ivoire, married fishery actors outnumber single fishermen.

**Structure of fishermen in the Mbissi River according to level of education:** Table 1 presents the fishing community in the Mbissi River according to level of education. Overall, in the Mbissi fishery, the level of education of the fishermen is very low. The majority of these fishermen have attended elementary school (71.9%; n=23). They have received the rudiments necessary to learn to read and write.

On the other hand, 15.6% (n=5) of the fishermen have secondary education, and 9.4% (n=3) of the fishermen have no schooling at all. No respondent has attended university (n=0); this state of affairs reveals that the community of the Mbissi River fishery does not seem to consider fishing as a promising professional activity, but rather as an activity by default for the disadvantaged or poor.

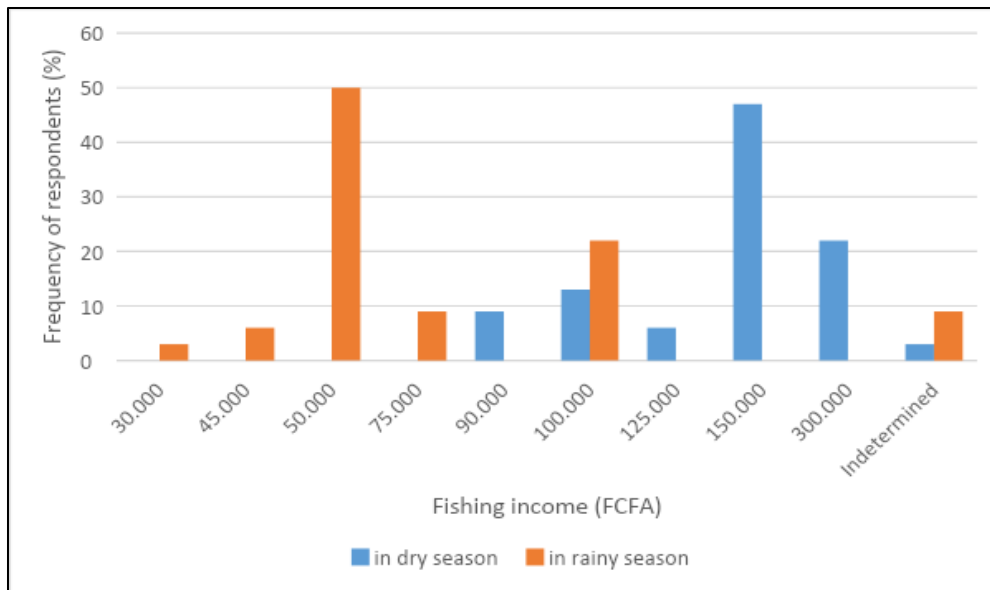
**Table 1:** Distribution of fishermen on the Mbissi River by level of study

Level of education	Number(N)	Percentage (%)
Primary	23	71.9
Secondary	5	15.6
University	0	0
Not in school	3	9.4
Undetermined	1	3.1
Total	32	100.0

Source: Data from fieldwork, 2017

**Average income per fisherman in the study area:** The remuneration of fishermen is very marked according to the seasons (Figure 4). Indeed, interviews with fishermen in the Mbissi River revealed that in the rainy season, the majority of these people earn an average of 50,000 CFA francs (82.44 USD) per fishing trip for an average duration of 7 days. In the dry season, the average remuneration per

fisherman is increased to 150,000 CFA francs (247, 32 USD) for a 2-day fishing trip. Thus, only the average remuneration in the dry season per fishing trip corresponds to the Guaranteed Minimum Interprofessional Wage (SMIG) in the Gabonese Republic set at 150,000Fcfa according to Decree n°12/PR/METPS of 23 April 2010 (DIG, 2015).



**Fig. 4:** Distribution of income per fisherman working in the fishery and by season

**Catching gear and techniques, types of use in the Mbissi River fishery:** The interviews carried out with the fishermen of the Mbissi River have made it possible to identify two (2) types of capture gear, including the gillnet and a variant of the harpoon. The gillnets are rectangular in shape with meshes of less than 60 mm knot to knot. They are less than 100 m in length with a maximum drop height of 3m (Blahoua *et al.*, 2018). The harpoon variant is a 6-8 mm iron bar used in masonry. One end has been tapered to sink into the fish when thrown. This fishing gear is used by hand and close to the banks of the water body (Blahoua

*et al.*, 2018). Generally speaking, survey respondents identified four (4) fishing techniques. These catching techniques are mainly the standing gillnet locally called the standing net, the drift gillnet locally called the troll, the encircling gillnet locally called the "tapé-tapé", and the harpoon locally called the piquet. Seck (1980), Bousso (1994) and Niang (2009) revealed the existence of these different fishing gears in the Senegalese coastal fisheries. As for jobs, they are not very diversified, with the jobs of fishermen (65.31%) and artisanal fish processing: salting of fish and smoking of fish (34.69%) (Table 2).

**Table 2:** Types of jobs in the Mbissi River fishery

Type of direct employment	Number of respondents	Proportion (%)
Activity of fishing	32	65.31
Artisanal processing	17	34.69
Milling	0	0
Mechanical repair and carpentry	0	0
Transport of fishermen and fishing products	0	0
Production of ice for fish conservation	0	0
Total	49	100

Source: Data from fieldwork (2017)

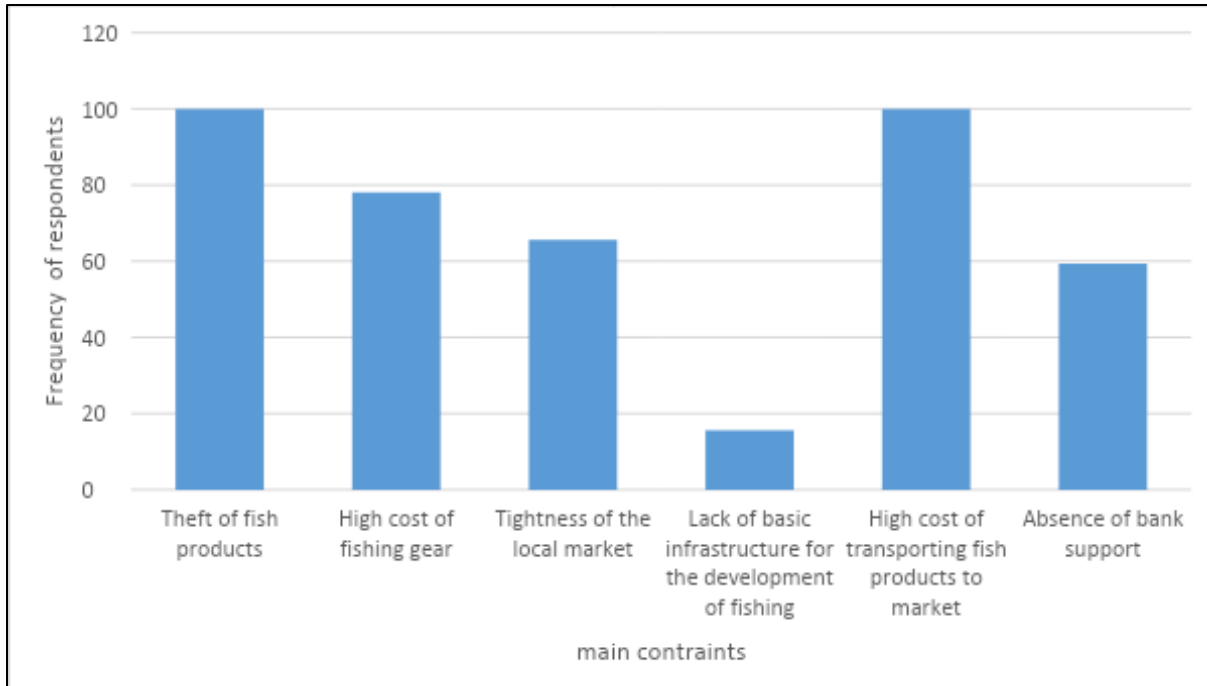


Apart from these two types of trades, there are no other activities in the Mbissi River fishery. Despite the range of trades associated with a fishery, the Mbissi River fishery is relatively small (Table 2). This can probably be explained by the non-existence of trades related to mechanical repair and carpentry, fish trade, transportation of fishers and fish, or production of freezer ice. The fish trade is practiced sporadically by fishermen. The trade of transporting fishery products and fishermen for marketing in Gamba does not exist at the level of the local community of the Mbissi fishery. The only existing transporters are external to the local communities of the Mbissi River fishery. Similarly, the production of ice for preserving fish is held by foreign (West African) communities established in the village of Mayonami and in the town of Gamba. Overall, the employability of the Mbissi River fishery is very low in the entire Lower Nyanga Canton. The crew per fishing unit varies according to the different fishing practices recorded in the river fishery. For any fishing practice used, the fishing crew varies between 1 and 3 persons. For three of the four fishing techniques used, the fishing crew is a maximum of 3 persons. On the other hand, the fishing practice "piquet" is carried out by 1 person and, at the most, 2 persons, in case of use of a pirogue.

**Processing and marketing of fishery products:** The analysis of the results of the surveys showed that the fish caught are sold in three forms: fresh, salted or smoked. In total, 53.13% of the fishermen market their fish only in the fresh state, while 40.62% of the fishermen sell their fish in the fresh and

smoked form. On the other hand, 6.25% of the fishermen sell their fish only in the salted form. The predominance of the sale of fresh fish could be explained by the fact that the fish processing process requires effort and time. However, young people, who are the most numerous in the fishing community, are not very patient; they prefer to save time and energy by selling their fish directly in its fresh state.

**Socio-economic constraints at the level of the fishing community:** Figure 5 presents the main constraints faced by the fishing community in the Mbissi River. The most important problems reported by those interviewed are the theft of fishing products (100% of respondents) and the high cost of transporting fishing products (100% of respondents) for their marketing in the town of Gamba. In addition to these problems, which are very disabling for the actors in this fishery, there is the high cost of fishing equipment (78% of respondents), the narrowness of the local market (66% of respondents) and the lack of bank support (59% of respondents). The lack of basic infrastructure appears to be the least important for the fishermen interviewed (16% of respondents). All of the above constraints would appear to be partly related to the socio-economic difficulties experienced by the country and the oil crisis. Most of the constraints identified in our study area were also recorded in local communities in the southwestern region of Bangladesh (Mridula *et al.*, 2015), Atrai and Kankra rivers (Reza *et al.*, 2015) and Lake Tanganyika (Mukabo Okito *et al.*, 2017).



**Fig. 5:** Constraints related to the fishing activity in the Mbissi River fishery

**CONCLUSION AND APPLICATIONS OF RESULTS**

The results of this study have made it possible to characterize the organization of the fishing community in the Mbissi area. Artisanal fishing is mostly practiced by young people under 31 years of age, single and having attended elementary school. Moreover, this activity does not contribute greatly to the improvement of the living conditions of the population of the Mbissi River. The remuneration of the fishermen reaches the SMIG in Gabon only during 3 months out of a year. The creation of employment in the fishery of the Mbissi River is not very diversified with the presence only of fishermen and processors. The low level of education, accountability and socio-economic constraints

(lack of infrastructure, high cost of fishing equipment, small local market, etc.) are factors contributing to the poor management of the fishery resource in the Mbissi River. It would be important that the various state actors and NGOs involved in fishing activities put in place in the future

- adequate structures for financing fishermen
- adequate infrastructures in the landing sites;
- a training system for local communities in the different fishing professions;
- the participation of local communities and socio-professional fishermen's organizations in the design, execution, control and monitoring of their fishing activities.

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