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Study of the Supply and Marketing Circuit and the Level of Value of Fishery Products: The Case of Fishmongers in the Localities of Ouakam, Ngor, Yoff, Pikine, Parcelles Assainies, Guédiawaye and Rufisque (Dakar-Senegal)

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Abstract

This work on the study of the supply and marketing circuit and the level of value of fishery products was carried out in 7 distinct localities (Ouakam, Ngor, Yoff, Parcelles, Pikine, Rufisque, and Guédiawaye). As part of this research, surveys were carried out among fishmongering actors. This work has made it possible to know the supply chains of fishery products in fishmongers and to understand the marketing mechanisms as well as the valorization strategies in this sector. According to the results of these surveys, a strong male dominance (60%) in the fish sector is observed despite a significant contribution of women (4%). Most actors in this field are aged between 31 and 40 (54%) with a low representation of young people aged 20 to 30. In this activity, the majority ethnic groups are the Lébou (50%) and the Wolof (37%), although there is also a presence of foreigners (27%) in the area. These actors are often experienced with parallel commercial activities such as catering, decoration, trade, etc. Sales in fishmongers are mainly concentrated on fish (37%) and crustaceans (33%), with low demand for mollusks (20%) due to their perishability and the high cost of the commodity. In addition, in some fish shops, the actors sell various products, including vegetables and chickens. Fishmongers are facing major challenges such as high product costs (42%), stock availability (39%) but also logistical and transport constraints (19%). This study also revealed that most of the actors have no notion of hygiene (63%) and have never trained (71%) in this area, which is particularly worrying in this sector where quality and hygiene are essential to preserving the health of the consumer. The study found that fishmongers have a rapid sale of products (1 to 5 days) according to 75% of the respondents and the products are mainly intended for homes and restaurants. The inspections carried out on hygiene and sanitation in fishmongers during this study revealed deficiencies in hygiene (lighting, space, staff hygiene, etc.) with an overall level of satisfaction estimated at 43.88%.

Keywords: circuit, supply, marketing, valorization, fishmonger

1. Introduction

Fishery resources are defined as all populations of aquatic organisms living in marine or

freshwater waters, exploited by humans for their food, economic, or recreational value (Ndiaye, 2000). Fish occupies a prominent place in people's diets due to its ever-increasing demand (FAO, 2022). With a highly nutritious value, fish are a valuable supplement in diets low in protein, vitamins, and minerals. Senegal is one of the countries in Africa with the best resources for fisheries. The phenomenon of upwelling contributes favorably to the fishery richness of the Senegalese coast. This is why fishing is a major economic and social activity, alongside the tourism and agriculture sectors. However, fisheries occupy a prominent place in public policy for job creation. In 2020, marine fisheries landings amounted to 490,438 tons for an estimated commercial value (MCV) of 218.247 billion CFA francs against 566,692 tons in 2019 for a value of 263.208 billion CFA francs, marine fishery represents 1.4% of real GDP. These exports reached 188,692 tons in 2015 (202 billion CFA francs), or 10.7% of national export earnings, which represent the largest item in value of total exports (ANSD, 2018). Despite these figures, the fisheries sector is experiencing a serious socio-economic crisis which seems to be the result of the overexploitation of fishery resources. For decades production from this sector has stagnated or declined due to the degradation of fisheries, including the overexploitation of the main stocks of economic interest, climate change, and water pollution. So, this situation is the main consequence of a deficiency in the system of regulation of access to fishery resources that have become scarce, access to which is difficult for the population. With this in mind, the fishmonger's business is growing in several localities to facilitate access to fish products with varied choices. However, this activity remains very little studied despite the potential it abounds and the challenges encountered by the actors in this field are little known. The objective of this study is to provide useful information describing the functioning of fishmongers in some localities of the Senegalese capital: Ouakam, Ngor, Yoff, Pikine, Parcelles, Guédiawaye and Rufisque.

2. Material and Methods

1) Sampling And Surveys

The field surveys were carried out among thirty-five (35) fishmongers' managers. Before carrying out the actual surveys, assessments/investigations were carried out beforehand to get an idea of the number of fishmongers existing in the localities. Of these, it emerged that it is difficult to find more than 5 fishmongers in some localities. Thus, the number 5 was chosen for the aspect of sampling equity and feasibility for the study.

To carry out the surveys, a questionnaire was administered to each actor (owner of fishmongers). Interviews with stakeholders were conducted in all targeted fish markets. Moreover, during his interviews, several recommendations were raised by the actors in order to improve the activity. Regarding the survey protocol, the questionnaires were administered in person to the owners of the fish markets. Each market was visited unexpectedly to allow for a more accurate inspection of the operational structure. The survey always begins with an introduction of the stakeholders (the interviewer and the respondent), followed by an explanation of the study's objectives and significance. This approach helps to motivate respondents, making them more receptive and open in their responses. The information gathered is then recorded on the survey sheets for future use and analysis.

2) Data processing

The information collected was entered by the Word software. For data processing, Excel and R Studio software were used. The R Studio software was used to perform univariate descriptive statistical analysis to examine the distribution of each variable individually for this fish research. It was also utilized for bivariate descriptive statistical analysis to explore the relationships between variables, including sociodemographic factors. These treatments made it possible to illustrate the information obtained by tables and graphs.

3. Results

3.1 Socio-demographic aspects of the actors: Gender, Age, Ethnicity, Profession and Seniority

❖ **Level of gender involvement in the activity**

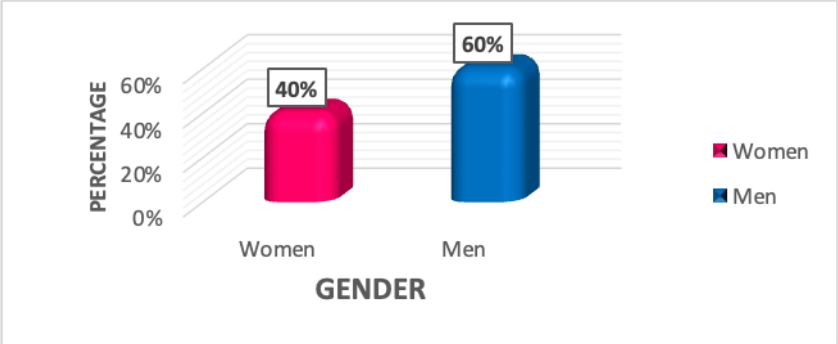


Figure 1. Proportion of men and women in fishmonger's activity

Figure 1 shows that the majority of people involved in the fishmonger's activity are men, representing 60% of the workforce. In addition, women represent a minority in this activity with 40% of the workforce. Thus, there is an unequal gender distribution in the fishmonger's activity with male dominance.

❖ **Proportions of men and women in each locality**

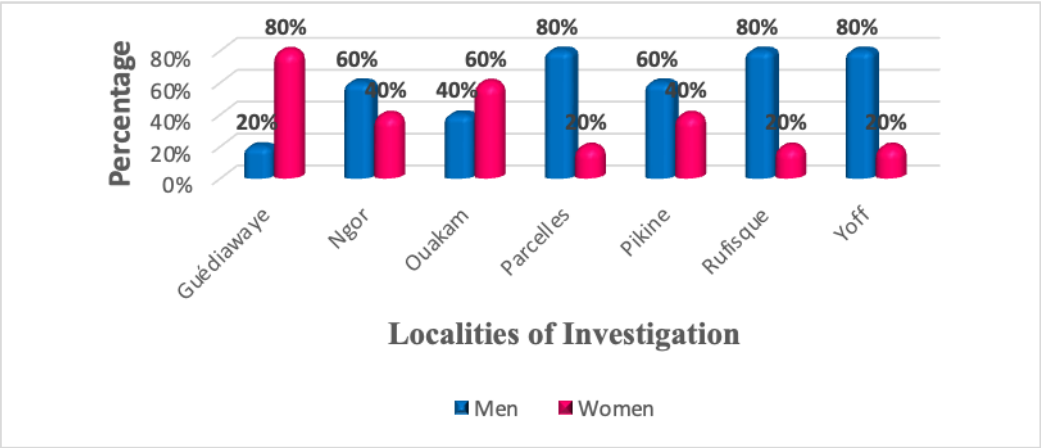


Figure 2. Proportions of men and women by location

Figure 2 shows that women dominate the fishmonger's activity in only two of the seven localities. These localities where women are predominant are Guédiawaye and Ouakam with 80% and 60% respectively. Regarding male predominance, it is present in five localities: Ngor (60%), Parcelles (80%), Pikine (60%), Rufisque (80%), and Yoff (80%).

In addition to this information, the analysis of Figure 2 also shows a similarity in the proportion of men and women between Ngor and Pikine, although men are in the majority with proportions of 60% compared to 40% for women.

❖ **Age of the actors**

Table I below describes the age groups of the actors working in the field of fishmongers.

Tableau I. Proportions of the age group of actors in each locality

Ages(years)	Guédiawaye	Ngor	Ouakam	Parcelles	Pikine	Rufisque	Yoff
>50	0	0.2	0	0.2	0.2	0.2	0.2
20-30	0	0	0.2	0	0	0.2	0
31-40	0.6	0.2	0.6	0.8	0.6	0.4	0.6
41-50	0.4	0.6	0.2	0	0.2	0.2	0.2

The analysis of Table I shows that in Guédiawaye, people between the ages of 31 and 40 are most active in this work. That's the same for the localities of Ouakam, Parcelles, Pikine, Rufisque, and Yoff. However, for the locality of Ngor, it is the 41-50 age group that is most active.

The key information that emerges from the analysis of this table is that, overall, it is the 31-40 age group that is most active (54% of players) in the activity related to fishmongers, unlike the 20-30 age group that is less active (6% of players) in this field.

❖ **Ethnic distribution of actors according to localities**

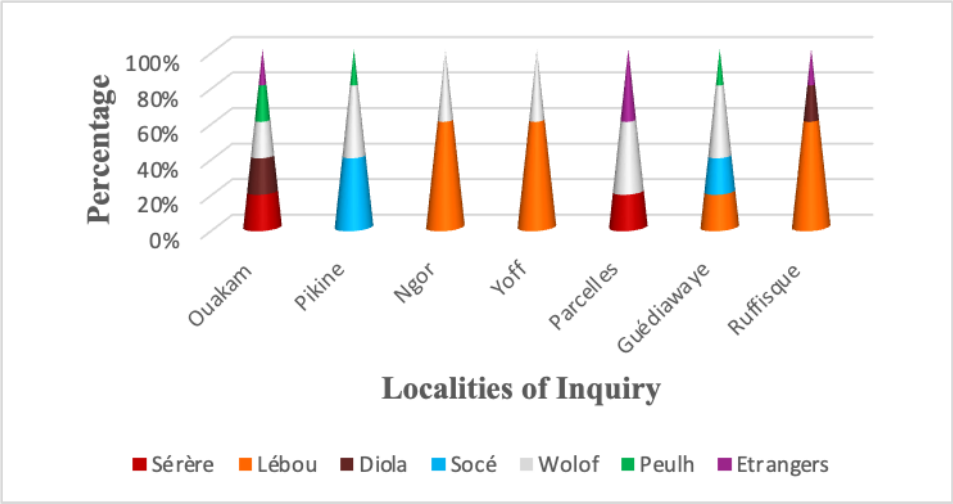


Figure 3. Distribution of Ethnic Groups by Locality

Figure 3 shows the disparity and the proportion of ethnic groups that are active in the field of fishmongers in the targeted localities. These results show that Wolof is dominant in Guédiawaye and Parcelles and lebous have the largest percentage in Ngor, Rufisque, and Yoff. As for the Sereres, they are present in a small proportion in Ouakam and Parcelles Assainies. The Diolas, are present in two localities, Ouakam and Rufisque, with almost small proportions. This figure also shows that foreigners are involved in this activity and are in Parcelles where they occupy a large part (40%) and in Ouakam and Rufisque with the same proportions (20%). The Peulhs are present in three areas (Guédiawaye, Ouakam, and Pikine) with the same proportions (20%). Finally, there are also the Socés who devote themselves to this work, especially in the locality of Guédiawaye with a percentage of 20%, and in Pikine with a large proportion of 40%.

An overview of these results shows that Wolof and Lebou are more representative in this activity.

❖ **Profession of actors**

Figure 4. Share of actors' professions

In this graph, it was found that the owners of the fishmongers are traders in most localities (71% of localities). They are traders with large proportions (Ngor (60%), Ouakam (80%), Parcelles (80%), Pikine (80%) and Rufisque (60%)) compared to the other functions.

In addition, the presence of actors such as fish and shellfish wholesalers on the part of the professions is only present in Ngor (20%) and Yoff (60%). In Guédiawaye, the other category of the profession (farmer, electrician, and entrepreneur) represents 60%, which is a significant proportion. Also, in Rufisque, this category, which represents 40%, includes drivers and entrepreneurs.

In short, traders dominate in several localities, but there is a presence of fish and shellfish wholesalers and other professions in certain areas.

❖ **Seniority of the players in the fishmonger's activity**

A study on the years of experience (length of service) of the actors for each locality was carried out. The data are shown in Table II below.

Table 2. Seniority of the actors in the field

Ages(years)	Guédiawaye	Ngor	Ouakam	Parcelles	Pikine	Rufisque	Yoff
<1	0	0	0.2	0	0.2	0	0
>10	0.2	1	0.2	0	0.4	0	1
01 to 05	0.6	0	0.4	0.8	0.2	0.8	0
06 to 10	0.2	0	0.2	0.2	0.2	0.2	0

The analysis of Table II shows that in the localities of Guédiawaye, Ouakam, Parcelles, and Rufisque, the majority of the actors have professional experience (length of service) ranging from 1 to 5 years, with an overall rate of 28%. However, those with more than 10 years of experience are present in all localities except Parcelles and Rufisque. The results of this table also show that in Ngor and Yoff all the actors have more than 10 years' experience. The proportion of actors who have more than 10 years of experience is also 28%.

The table also shows that actors with less than a year of experience, they have a rate of 4% and are present in only two localities, namely Ouakam and Pikine. In addition to this, the table illustrates that actors who have an experience of between 6 and 10 years are not present in Ngor and Yoff but in all other localities proportionally with a rate of 10% in total.

3.2 Results of the Investigations Relating to the Product Sold in Fish Markets

- **Part of the product types sold by fishmongers**

To better understand the diversification of the types of products sold and their proportions in these fish shops, a questionnaire was submitted to the stakeholders.

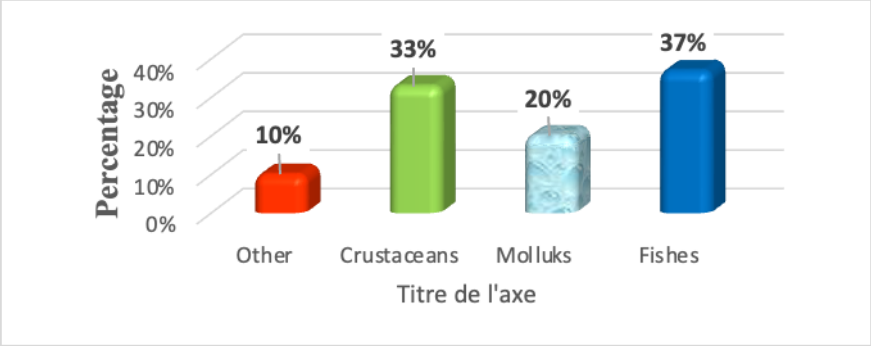


Figure 5. Percentage of types of product sold in fishmonger's shops

Figure 5 shows that fish represent the bulk of sales in fishmongers they have the largest share of products sold with a proportion of 37%. Shellfish-are also very popular with a large rate of 33%. Mollusks follow with a significant part of 20% of sales. Other products do not fall into

the three main categories, including fruits, eggs, vegetables, dried fish products, and chickens have a marginal percentage of 10% of sales.

❖ **Problems with the supply of these products**

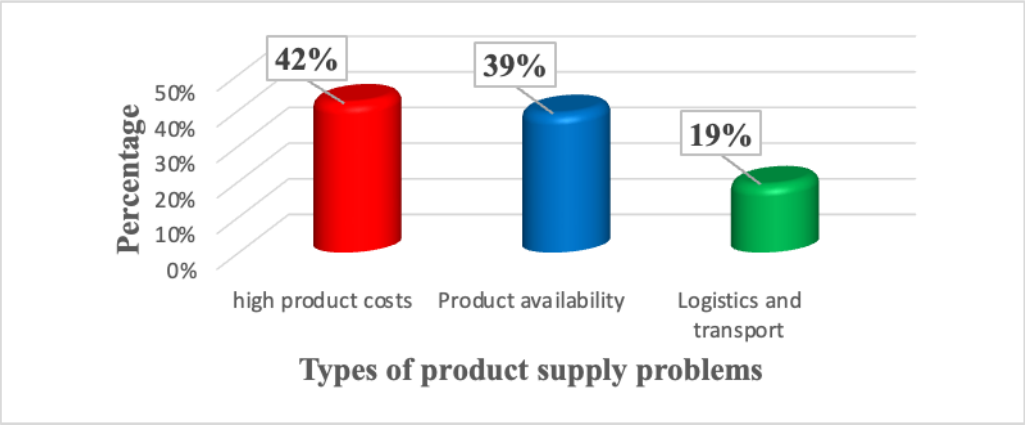


Figure 6. Proportion of problems encountered in product supply

Through figure 6, the main problem encountered by the actors is the high cost of products, which represents a large part of the study with 42% of the problems cited. Product availability is the second most common problem, cited at a proportion of 39% of cases. Although this is the least frequent problem, the difficulty of logistics and transport in the supply of fish products should not be neglected according to its proportion of 19%.

❖ **Types of species sold in fish markets**

- **the best-selling species:** the seabream, which is the best-selling species, alone represents a significant proportion of 16.09%. It is closely followed by the Barracuda, which is the second best-selling species with a rate of 13.22%. The Courbine (*Argynosomus regius*) and the White Shrimp are two species that occupy third place with a proportion of 9.77% each.
- **Moderately sold species:** white grouper and red mullet, which are quite popular species, each represent a proportion of 7.47%. There is also the White Carp which has a good presence in the level of sales with a rate of 6.90%.
- **The less sold species:** lobsters and red African snapper each have a small portion of 3.45% and 4.02% respectively. In addition, in this category, there are Mussels with a small proportion of (2.87%). Also in this category, the Badeche (*Epinephelus costae*), Grouper, and the Mixed Carp show equal reduced sales rates of 2.30% each.
- **Species rarely sold:** species such as cuttlefish, sardinella, octopus, mullet, damselfish, squid, and horse mackerel have low and identical sales proportions of 1.72%. In this group, there are also other species that are less sold, such as the Bronze Grayling (1.15%). There is also the Coryphene, dolphin and the amberjack which are two species that are also less sold with a similar sales rate equal to 0.57%.

❖ **Product sourcing methods**

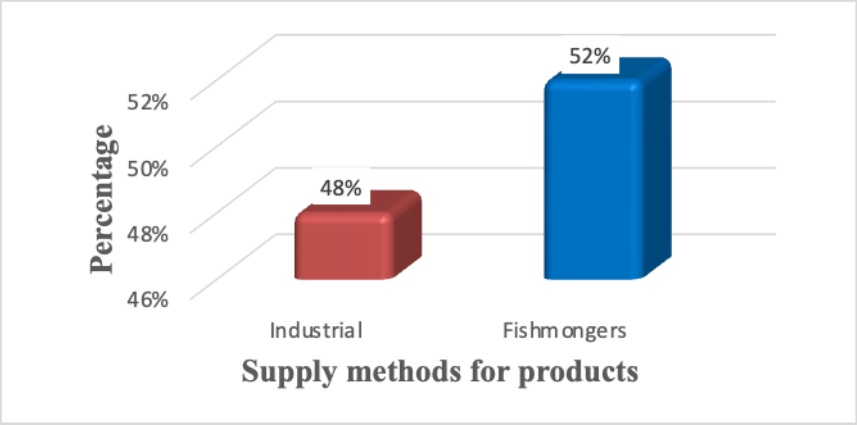


Figure 7. Proportion of product sourcing methods

Figure 7 shows the proportion of product supply methods in fishmongers, divided between industrial sources and fish and shellfish wholesalers. Fishmongers get 48% of their supplies from industrial companies and 52% from fish and shellfish wholesalers. Overall, the remark is that the players have a slight preference for the local source rather than the industrial one.

❖ **Product sales tools**

Figure 8. Types of sales tools and their proportions

The analysis of Figure 8 shows the dominance of the word-of-mouth method as the most used sales technique with a proportion of 49%, while social networks present a significant share of sales tools at 32%.

The lowest proportion is that of posters and advertising with a rate of 18%. Given this analysis, it should be noted that the players prefer word-of-mouth and social networks more than posters and advertisements.

❖ **Product sales techniques**

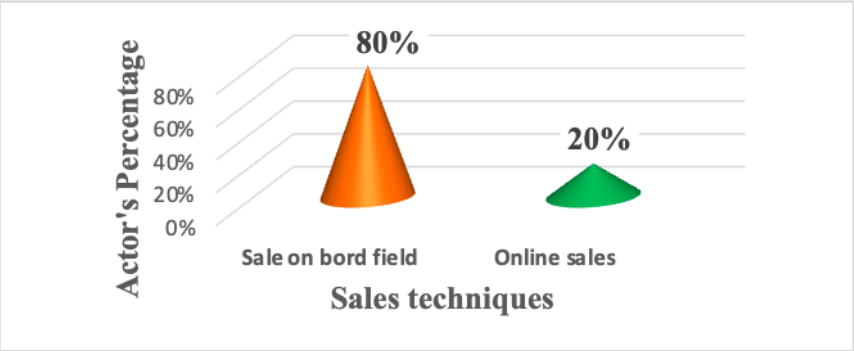


Figure 9. Breakdown of the sales techniques that bring in the most revenue

Given Figure 9, it can be seen that sales on the field side largely dominate with a proportion of 80%, which allows us to affirm that customers prefer to buy their seafood products directly from fish shops.

Although online sales account for only 20%, this rate may mean that there is a segment of customers who value the convenience of buying online.

❖ **Hygiene and quality concepts**

In order to better understand the aspect of hygiene and quality concepts for stakeholders, a question in this regard was asked during the study, and the answers are presented in Figure 10 below.

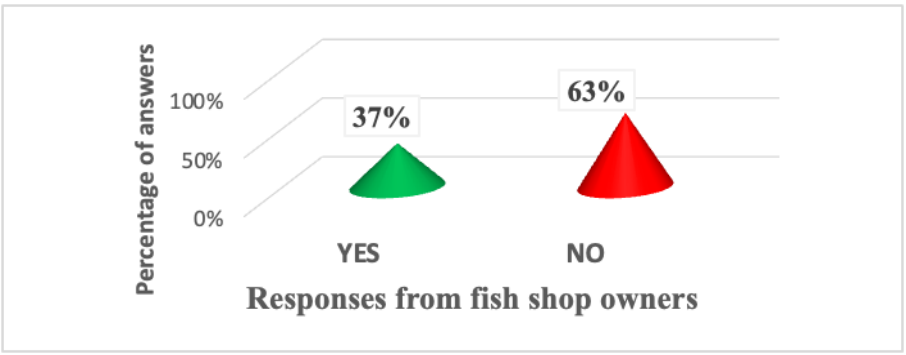


Figure 10. Proportions of the existence or absence of notions on Quality and hygiene for the actors

Figure 10 shows the proportions of actors that have or do not have notions of hygiene and quality. These results show that 37% of the actors confirm that they have notions about these aspects compared to 63% who don't. In short, these results indicate a lack of knowledge among stakeholders on food safety and product quality standards, which could pose a real danger to the consumer.

❖ **The proportion of actors who have undergone training in hygiene and quality and those who have not**

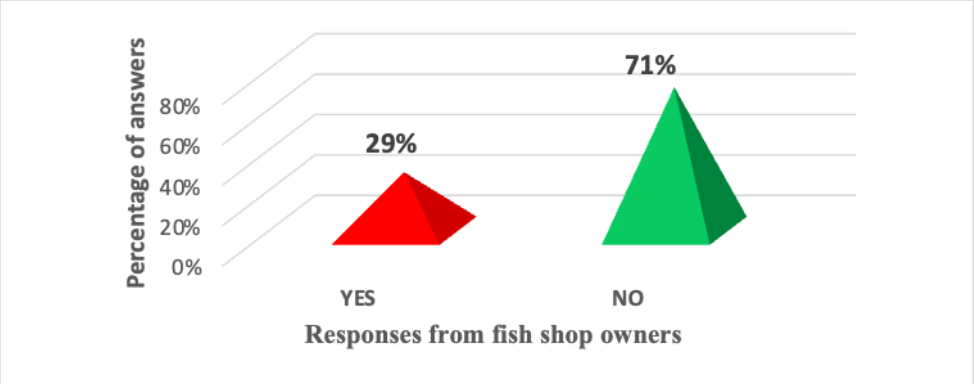


Figure 11. Proportion of actors who have completed training in Quality and Hygiene

Figure 11 shows a limited rate of 29% of actors who have already undergone training and a majority who have not been trained in quality and hygiene, with a significant proportion of 71%. Therefore, these results show an urgent need for training in quality and hygiene for the sustainability of this sector of activity and participation in consumer health safety.

❖ **Assessment of the commercial profitability of fishmongers**

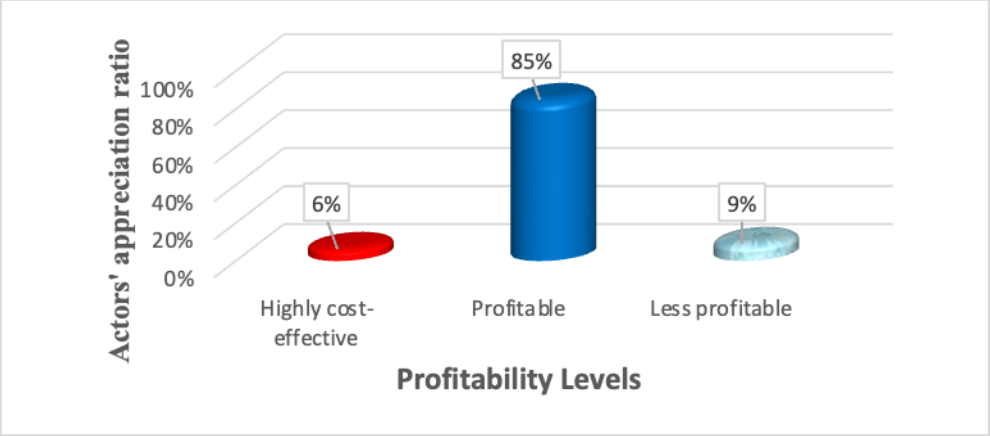


Figure 12. Assessment of the commercial profitability of fishmongers

Figure 12 illustrates the appreciation of the commercial profitability of fishmongers. The results show that 85% of actors consider that the fishmonger's activity is profitable and promotes good economic stability. A small proportion of 9% of actors stipulate that the activity is less profitable and a small rate of 6% consider the activity to be very profitable.

Overall, the results show that selling products in fish markets is a profitable activity, so it is important to know which species are more profitable to sell compared to others.

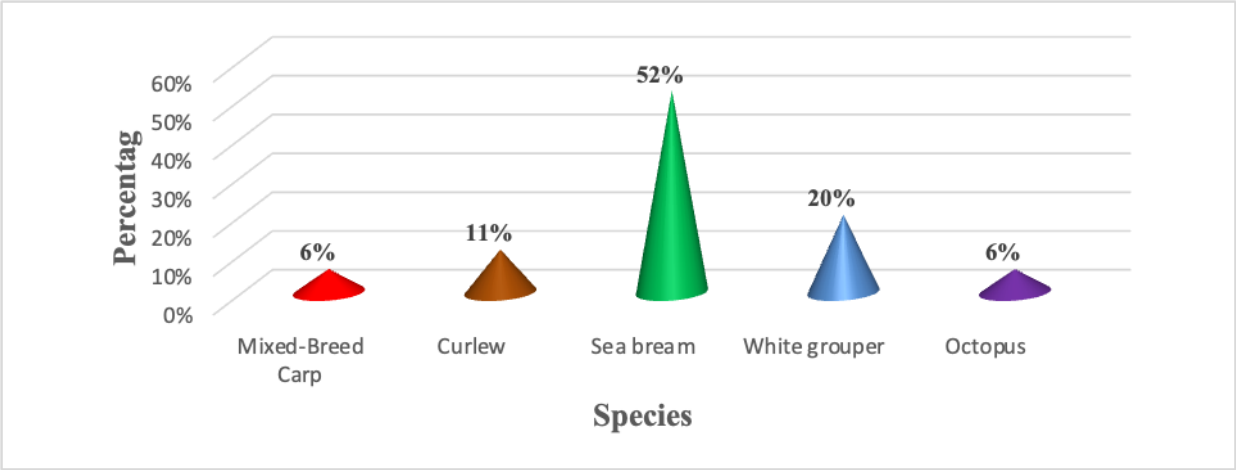


Figure 12. Share of species considered most profitable by respondents

The analysis of Figure 13 reveals that the seabream is considered to be the most profitable species in fishmongers according to 57% of the stakeholders. The second species considered to be the most profitable is the white grouper with a rate of 20%, followed by the Courbine (*Argynosomus regius*) which represents 11%. Finally, there are the Mixed-breed carp and the Octopus with egalitarian proportions of a low value of 6%. The other important piece of information that emerges from these results is that no crustacean is mentioned among the species considered to be among the most profitable.

❖ **Problems related to the marketing of species in fish markets**

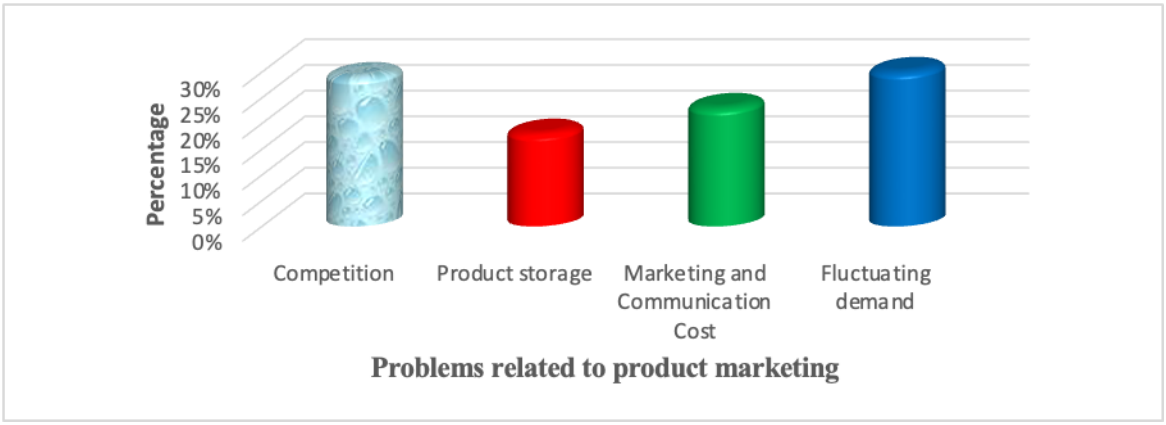


Figure 13. Proportion of problems related to product marketing

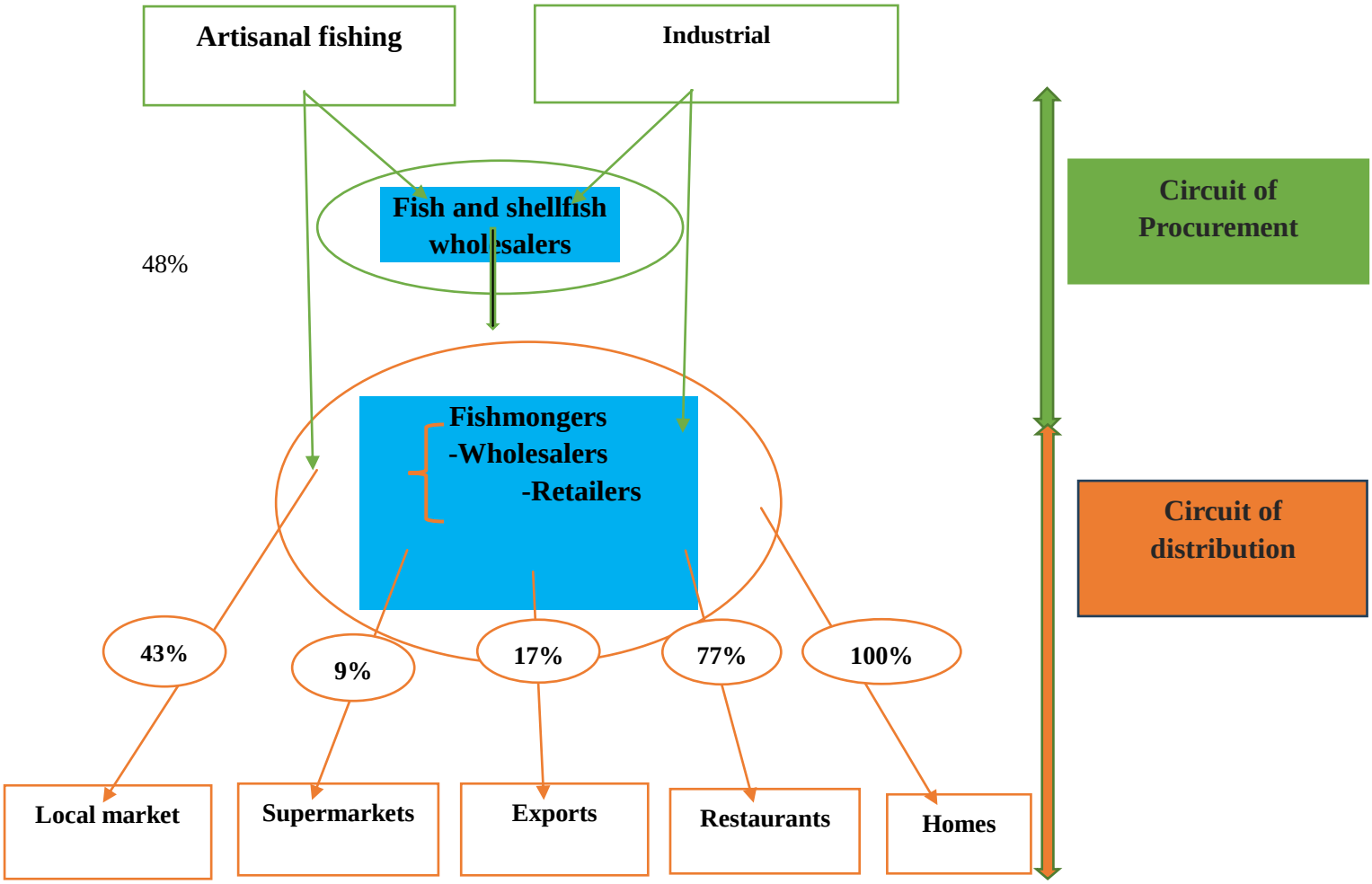
The main problem with the marketing of products in fish markets is the fluctuating demand which accounts for a significant rate of 30%. Competition is the second major concern in the business with a proportion of 29%. Although the problem of marketing and communication costs shows a fairly significant rate of 23%, the difficulty of preserving products is also noted in some fishmongers and represents 18% of the workforce.

❖ **From the distribution to the marketing of fish products**

Fish products come from artisanal or industrial fishery. Artisanal fishery products can be consumed by fishers or sold to fishmongers or fish processing plant representatives. On the other hand, those from the industrial fishery are mostly marketed to fish processing plants. But some fishmongers also get their supplies from industries at the port of Dakar.

From the capture to the marketing of fishery products, several actors get involved. The typology of these players from distribution to marketing in fish markets concerns:

- **Fishermen:** they catch fish either in the river, ponds, or sea to sell them to traders. They are the first link in the chain.
- **Fishmongers:** they are the fishermen's buyers of fish. They are the first intermediaries between fishermen and end consumers. At their level, there is no processing or handling of the fresh product. In addition, fish merchants must have a card, pay a license and be registered in the trade register. They occupy an important place in the distribution circuit of products.
- **Transporters:** they transport fishery products from landing docks to markets and points of sale.
- **Fishmongers:** They can be classified into two categories:
  - **Wholesale fishmongers:** they have large storage facilities, including cold storage or several freezers. They are the second intermediaries between fishermen and consumers. They sell fish both in large and retail terms. Indeed, some wholesalers are supplied with fish by fishmongers at their point of sale, while others provide the supply and transport themselves.
  - **Retail fishmongers:** these are small fishmongers that do not sell certain quantities due to a lack of adequate means of preservation. They usually have one or two freezers; they are the last intermediaries between producers and consumers.
- **Consumers:** Consumers are considered to be the end actors. They buy fish products for direct consumption.



Supply and distribution of products in fish markets

❖ **Level of value added to fish products in fishmongers.**

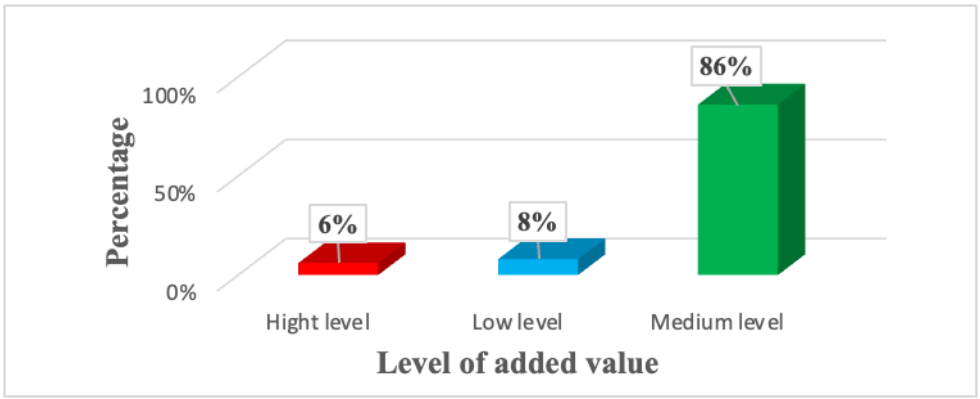


Figure 14. Levels of value added to fish products in fish markets

Figure 15 indicates that 86% of the actors say that the level of value added to the products is average. The other actors, who represent a small proportion of 8%, think that the level of product valuation is low. Paradoxically, a minority of 6% of actors express that the level of

product value is high.

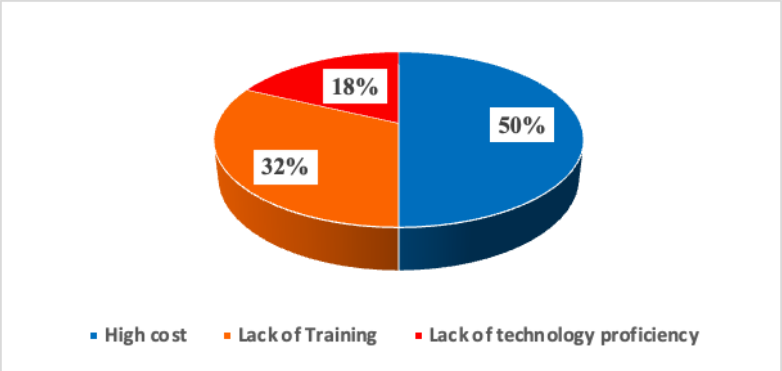


Figure 15. Types de problèmes liés à la valorisation et leurs proportions

Figure 17 reveals that half of the players (50%) encounter problem related to the high cost of valorization. In this context, the lack of training is the second main problem of the actors in the promotion of products with a proportion of 32% of the workforce of targeted actors. The concern of not mastering technology is cited, although the proportion is low (18%) compared to the other obstacles.

- **Selling times of products sold by fishmongers**

Tableau II. Product Selling Times

Duration (days)	Staff	Proportion
1 to 5	60	0.759
6 to 10	17	0.215
11 to 15	2	0.025

Table III shows that a large proportion of fishmongers have a shelf life of fish products varying from 1 to 5 days, with a high rate of 76%. The table also shows that there is a moderately low proportion (21.5%) of fishmongers that have a product sell-by time of between 6 and 10 days. Finally, the results show a category of fishmongers with a product shelf life of 11 to 15 days, with a very low rate of 2.5%. So, the majority of fishmongers keep their stock for a maximum of 5 days, which proves a very strong purchasing power of consumers for fish products.

- **Product destination**

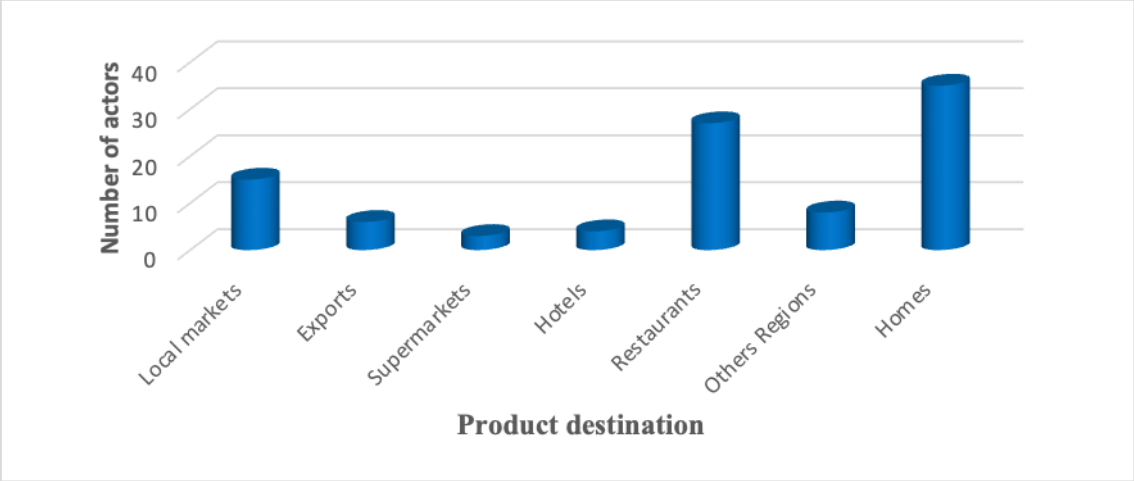


Figure 16. Main product destinations

Most of the fishery products in this activity are destined mainly for households and restaurants. A small proportion of the actors supply the products to the local market and in the regions. Marginal proportions are assessed for exports, supermarkets, and hotels.

❖ **Fishmongers's Hygiene Inspection Results**

Table VI. Level of compliance with hygiene and sanitation in fishmongers Parameters Compliance level Overall level of compliance

Parameters	Compliance level	The overall level of compliance
Environmental cleanliness	55%	**43.88%**
Gloves	70%	
Headwear	30%	
Masks	50%	
Availability of dustbins	30%	
Availability of clean toilets	40%	
Cleaning and disinfection	70%	
Pest elimination	15%	
Cleanliness of storage equipment	35%	

The analysis of Table IV on the evaluation of some hygiene and sanitation parameters in fish markets revealed a compliance rate of 43.88%. This rate indicates that there are many deficiencies in hygiene and sanitation practices in fish markets. These include in particular personal protective equipment (gloves, masks, headgear), waste management, and cleanliness of the environment and equipment.

4. Discussion

4.1 Characteristics of the Actors

Gender inequality, largely dominated by men with a significant contribution of women, is

noted. Similarly, for the gender distribution of the targeted localities, men are in the majority everywhere except in Guediawaye and Ouakam. Moreover, these studies are similar to those of Tsamo (2016) who also states that during surveys the fishmonger's sector in the city of Yaoundé was largely dominated by men. Conversely, the study done by Souleymane and al. (2021) showed that the sale of fishery products in Abéché (Chad) is dominated by women. However, understanding this distribution is crucial for formulating strategies that will promote gender equality and women's empowerment in this activity. The majority of the actors who are active in the fishmonger's activity are between 31-40 years old. This may indicate that this age group has the experience, financial stability, and skills to run a fish shop. Young people (20-30 years old) are less represented, which can be explained by the fact that during this age most young people are studying on the one hand and building their professional careers on the other. Older age groups (>50 years) have limited participation, probably due to retirement. In addition, different ethnic groups are present in this activity but largely dominated by the Lebous and the Wolofs. Among these ethnic classes is the category of foreigners (Cape Verdean, Guinean, and Korean) who are active in this fishmonger's activity. Contrary to the work of Mbaye (2005) cited by Keneme (2024), which showed that foreigners generally only work in products not consumed by the Senegalese. However, the majority of the actors are traders who are active in other activities parallel to the fishmongers' such as cooks, decorators, accountants, electricians, agronomists, etc. Thus, the sale of fishery products is mostly carried out by individuals with commercial experience. However, some localities stand out for the presence of very experienced actors, while others show a growing sector with many new entrants in the activity. These dynamics could be explained by factors such as the ease of access to resources for some or the heredity of this activity for others.

4.2 Supply of Fish Products in Fishmongers

The marketing of fish products in its localities is characterized by a composite circuit mobilizing various actors, which confirms the results of Mahamat *and al.* (2021) in its study. Indeed, they show that: in Abéché, the transport of fish from their areas of origin to consumers involves various actors. These are wholesalers, retailers, and consumers. According to the report of FAO (2023), fish and seafood are part of Senegal's diet, with an average consumption of 24kg of fish per capita per year. With this in mind, fishmongers offer various types of fish products, but some are combined with non-fish products. Thus, most fish shops focus mainly on the sale of fish and crustaceans, but many actors are not enthusiastic about the sale of mollusks. The latter, although available, are not too popular with consumers for various reasons: low local demand, rapid perishability, and ignorance of the nutritional value of this product. These results corroborate those of Diouf *and al.* (2018) who indicate in their studies that Senegalese are unaware of the nutritional benefits of mollusks, which reduces their consumption. Nevertheless, fishmongers face major challenges in their supply chain that were cited by stakeholders during the surveys. This is the case with the high cost of products, their availability, but also logistics and transport. These three factors together can impact the profitability and sustainability of fish shops. According to this study, the high cost of the product and its availability are largely due to the scarcity of species.

Moreover, these results are supported by Brajeul (2017) who showed in his study that the weakening of stocks affects the availability of fish but also its purchasing power. The transport of the product is also one of the constraints. Only a small number of fishmongers, about 1/10, have a means of transporting the product, in this sense the cost price increases. In this context, these results are in agreement with those of Oumarou (2014) who argued that it is more profitable to have a personal means of transport in the exercise of this commercial activity for large quantities than to pay for it. In addition, several varieties of species are sold in fish shops, but with very different levels of popularity.

4.3 Marketing of Fish Products in Fish Markets

Fish such as seabream, barracuda, and white shrimp dominate sales, reflecting strong demand. These results contradicted those of Mahamat (2021) who, in a similar study in Tchad, showed that salmon, shrimp, and cod are considered to be the best-selling species. The difference in these results is linked to the eating habits of the countries concerned. Conversely, some species are much less in demand, either because of their rarity, because of preferences, or because of the high price of the product. Actors have a slight preference for local sources because according to them they are fresher and of better quality, while industrial sources are less fresh and may have an alteration in taste. Thus, a large part of the fishmongers actors source their fish products from the country's local fisheries. This statement is contrary to that of Njifonjou (2002) who states that Cameroon is supplied with fishery resources by a variety of countries such as Mauritania, Senegal, Holland, Argentina, Spain, and Namibia. However, the majority of fish markets are migrating to a transition to more modern sales methods (social networks, posters, advertising), while maintaining the effectiveness of traditional methods such as word-of-mouth. The latter method brings much more income to all the fish markets where the surveys were conducted. Moreover, a study by Mesnildrey (2009) showed that the media can have an impact on consumers' purchases. The fishmonger's activity in the localities studied is considered profitable by the actors, which is a positive sign for the sector and could be a source of motivation for investors. This study correlates with that of Keneme (2024) who had argued that the exploitation of fishery products in his study is considered quite profitable. Nevertheless, there is a small percentage of sellers who face profitability challenges, including competition or poor management. Regarding the problems related to the marketing of fish products in fish shops, the fluctuating demand for the price of products has been mentioned several times, these fluctuations can be caused by different factors, such as the seasons, changes in consumer preferences, or during events. Moreover, this work is confirmed by Keita (2001) who maintains that fish products are characterized by the fluctuation of their prices both locally and internationally. In addition to the constraints cited, competition, marketing, and communication costs but also the preservation of products.

4.4 Valorization of Fish Products in Fishmongers

According to Semlali (2017), adding value to fishery products promotes the diversification of products on the market and the attraction of customers. In this wake, the level of value added to fish products was assessed as average by the majority of stakeholders in this study. This may reveal that its actors don’t have the necessary means or do not master the era of new

technologies. Other major constraints were cited by the majority of fishmongers, such as the high cost of the product when it is recycled. One of the reasons why recycling in fish markets is expensive is the high price of equipment. The lack of training for valorization is also a constraint for the actors.

4.5 Aspects Related to the Hygiene and Quality of Fish Products in Fishmongers

Hygiene and product quality, especially in sensitive sectors such as food, are crucial for the protection of public health. In the targeted fishmongers, most of the actors have no notion of hygiene and have never received training on hygiene and sanitation. These results are in perfect agreement with those of Tsamo (2016), which also found during its surveys of fishmongers in Yaoundé that the majority of actors have never undergone training on hygiene and quality. These findings suggest urgent corrective action as this could lead to food safety issues for the consumer, which is of particular concern in the seafood sector where quality and hygiene are paramount. To acquire some knowledge, stakeholders can use the guide to good hygiene practices of the Directorate of Fisheries Processing Industries in Senegal (2011, code of practice for fish and fishery products). Overall, the inspection of the environment reveals that the majority of the actors are not wearing adequate clothing, gloves, or headdresses. In this wake, health inspection reports such as those of the National Agency for Health Security (ANSSA, 2020) have also highlighted a lack of personal protective equipment in fish markets in Bamako. Also, the intensity of the light is insufficient, as is the surface area of the environment in most fish shops. Most fishmongers are well-cleaned but the presence of flies is noted, which would be a sign of a lack of good disinfection. On this, the result of the overall compliance rate is 43.88%. This result is far more satisfactory compared to that of Diouf (2022) who obtained an overall compliance level of 97.12% during this work to control the hygiene and sanitation of the fishing industry. This result of the present study is also much less satisfactory than those of Keneme (2021) and Kande (2023) who, in their work to assess the level of compliance of hygiene and sanitation in the processing and export industries of fishery products in Senegal, successively had overall compliance levels of 99.4% and 99.2%. The difference in these results is explained by the fact that processing companies are often subject to stricter rules and regular inspections. They are therefore required to comply with the standards of applying quality management systems such as HACCP (Hazard Analysis Critical Control Point), especially if the products are exported to the international market, which requires these companies to comply with duly established regulations. On the other hand, the majority of fish shops do not receive inspections because few fishmongers target the international market.

Although this study has provided several insights into the organization of fish markets, the socio-demographic characteristics of the participants, the species of fish sold, the profitability of the activity, and other related aspects, it is important to acknowledge its limitations. One limitation is the sample size, as not all survey locations have the same number of fish markets, and some areas have fewer than five fish shops. This suggests the potential for extending this research to other locations with a larger number of sites in the future. Additionally, the fact that the study focused solely on the Senegalese capital is another limitation, highlighting the need for similar research in other regions of Senegal to gain a more comprehensive

understanding.

Apart from these limitations, the study also faced several constraints, such as the low educational level of some participants, which made data collection challenging. The significant distance between fishmongers also required considerable walking, which was physically demanding. Furthermore, some participants were reluctant to cooperate, viewing the researcher as a threat to their operations due to concerns about not meeting hygiene standards.

5. Conclusion

As Senegal is one of the African countries with the richest coasts in fish resources, fish is the main source of animal protein. To this end, the fishmonger's activity is currently very popular because it is a source of jobs and income. This activity is a crucial link in the fisheries sector as it contributes to economic development and food security. Despite the economic opportunities that this activity represents, it remains understudied, which limits the understanding of the challenges faced by the actors in this sector. In this sense, this research highlights the study of the supply, marketing, and valorization circuit of fishery products in the fishmongers of the localities of Ouakam, Ngor, Yoff, Parcelles, Pikine, Guédiawaye and Rufisque in the Senegalese capital. This study allowed us to identify the different sources of supply and the intermediaries involved in the supply (fishermen, fishmongers, transporters). It also permitted us to understand the marketing mechanisms in fish markets, to evaluate hygiene and sanitation, and to know the strategies for the valorization of fishery products in fish markets.

This study could serve as a crucial resource for Senegalese decision-makers in developing solutions to better organize the sector, enabling it to become a true socio-economic lever for the population. Additionally, the findings of this study can inspire all stakeholders in the fisheries sector to improve the exploitation and management of the activity. Through this research, an important message is being sent to Senegalese policy makers, urging them to establish standards and regulations that ensure the hygiene, health, and safety of the fish sold by these vendors, in order to protect the health of consumers.

In light of these findings, it would be beneficial for fishmongers to receive training in quality control and hygiene practices to better safeguard the health and safety of their customers. Furthermore, it is essential for the state of Senegal to take steps to organize and regulate the fish mongering business, benefiting all aspects of society, including social welfare, public health, and the economy.

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Authors' contributions

This work is based on an observation on the emergence of fish markets in Senegal and taking into account the health safety of consumers, the authors of this article met to program the research. Everyone contributed both in reflection and in dedication to the work. Sitor DIOUF and Seynabou SOW designed the protocol and the survey sheet corrected and approved by all the other researchers (Abdoulaye DIOUF, Jean FALL and Diégane NDONG). All the members coordinated together on the tasks to be carried out, including the methodology, the processing of the data, the drafting of the document which is also read and corrected by everyone. In short, this work is the result of a perfect collaboration of all the authors.

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