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(RESEARCH ARTICLE)

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Distribution and marketing channels and consumption levels for wild-caught and farmed fish in the Lacs and Haut-Sassandra regions

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Abstract

This study aims to analyse the distribution chain and consumption levels of wild-caught and farmed fish in the district of Yamoussoukro and the Guessabo sub-prefecture. To this end, the study will be based on documentary research, direct field observation and a questionnaire survey designed using KoboToolbox software. These questionnaires were administered to fishermen, fish farmers, restaurant owners and consumers in the aforementioned localities using Android mobile phones. The field survey was conducted over a period of five months, from September to January. The collected data was analysed using Excel and Word software to produce tables and graphs. The survey results reveal that, in Yamoussoukro and Guessabo, the most commonly produced and marketed fish species in fish farming is tilapia *(Oreochromis niloticus)*. In the natural environment, however, the two main species of fish produced are tilapia and Mâchoiron. Fishermen and fish farmers use three types of distribution channel to market their products: direct channels, short-cycle intermediate channels and long-cycle intermediate channels. Specifically, fishermen focus on long-cycle intermediate channels and direct and short-cycle intermediate channels. The products are partly marketed in the production areas, but also in other cities to increase turnover. Most consumers prefer wild-caught fish based on taste and freshness criteria. It should also be noted that there has been a decline in fish stocks due to poor fishing practices and the impact of human activities in the surrounding area, such as agriculture and gold mining.

Keywords: Fish; Fishing; Aquaculture; Distribution Channels; Consumption

1. Introduction

Poverty reduction and achieving food security are challenges that all nations face today [1]. To achieve this, action is required in several sectors, including fisheries and aquaculture [2]. According to [3], these sectors are of prime importance to populations in terms of income, livelihoods, food and nutrition. Fish play a fundamental role in human nutrition due to their nutritional qualities [4]. For many populations in Africa, fish is a valuable source of animal protein and essential micronutrients such as vitamins A, B, D and E, and minerals such as calcium, iodine, zinc, iron and selenium, as well as omega-3 polyunsaturated fatty acids [5]. In Côte d'Ivoire, for example, fish is the primary source of animal protein for consumers, even surpassing meat [6]. However, despite the country's extensive network of rivers and lakes, national production of around 110,000 tonnes is far from meeting the population's demand of 650,000 tonnes [7]. To compensate for this shortfall, the government has chosen to import fish and promote initiatives to enhance fishing methods and develop aquaculture. As part of these efforts, certain species such as *Oreochromis niloticus, Chrysichtys nigrodigitatus and Heterotis niloticus* have been introduced in several regions of the country [8]. This is evident in the lake region and the Haut-Sassandra region, which possess substantial water resources favourable not only to fishing activities, but also to fish farming. Indeed, Lakes Kossou and Guessabo, located on the Bandama and Sassandra rivers respectively, are the main areas of inland fishing activity [9]. Furthermore, fish products from these

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areas are highly prized by the population. Our study therefore aims to raise awareness of the role of locally caught and farmed fish, particularly tilapia, in the eating habits of the inhabitants of Yamoussoukro and Guessabo, while analysing the marketing chain.

2. Materials and methods

2.1. Study materials

This survey was conducted using a questionnaire designed with Kobotoolbox software.

2.1.1. Selection of study sites

The study was conducted in the Yamoussoukro district and Guessabo sub-prefecture between September 2024 and January 2025. These locations were selected due to their important river systems, which are key sources of fish stocks.

2.1.2. Location of study sites

Yamoussoukro is the political capital of Côte d'Ivoire. It is located in the Lacs region, in the centre of the country. To the north, it borders the Sakassou Department; to the east, the Dimbokro Department; to the west, the Bouaflé Department; and to the south, the Toumodi Department (Figure 1). The sub-prefecture of Guessabo is located in the central-western Haut-Sassandra region of Côte d'Ivoire. Administratively, it is part of the Zoukougbeu department. It is bordered to the north by the sub-prefectures of Domangbeu and Zoukougbeu; to the south, by the sub-prefecture of Iboghué; to the east, by the sub-prefecture of Gregbeu; and to the west, by the sub-prefecture of Guézon (Figure 2).

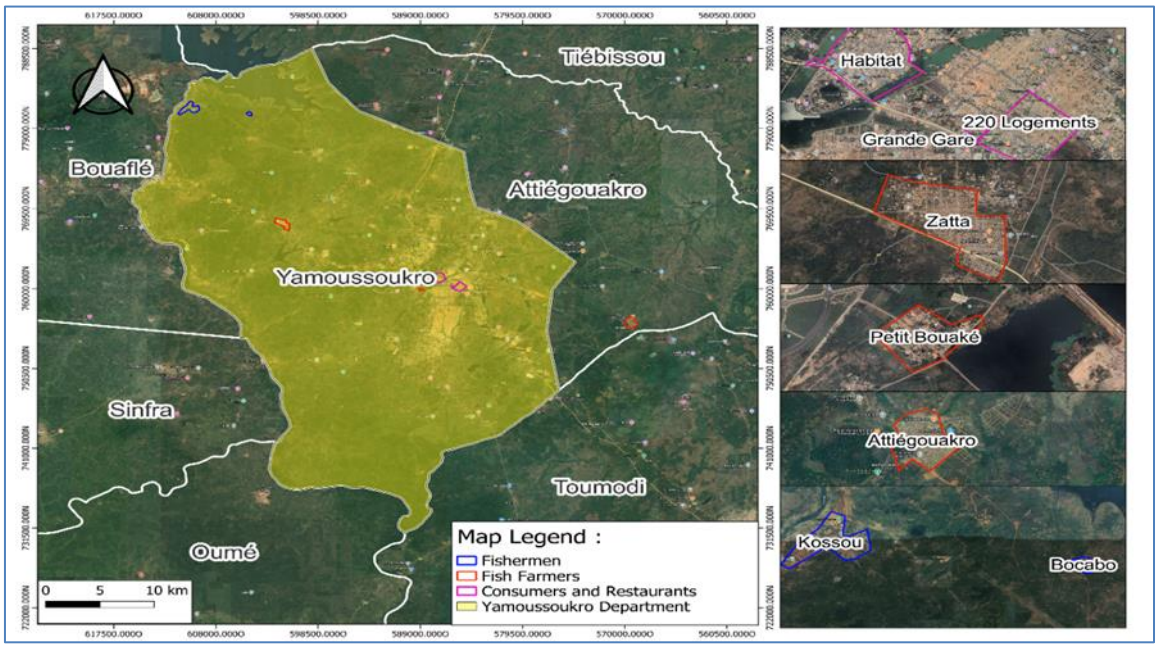

Figure 1 Map of the study area (Yamoussoukro)

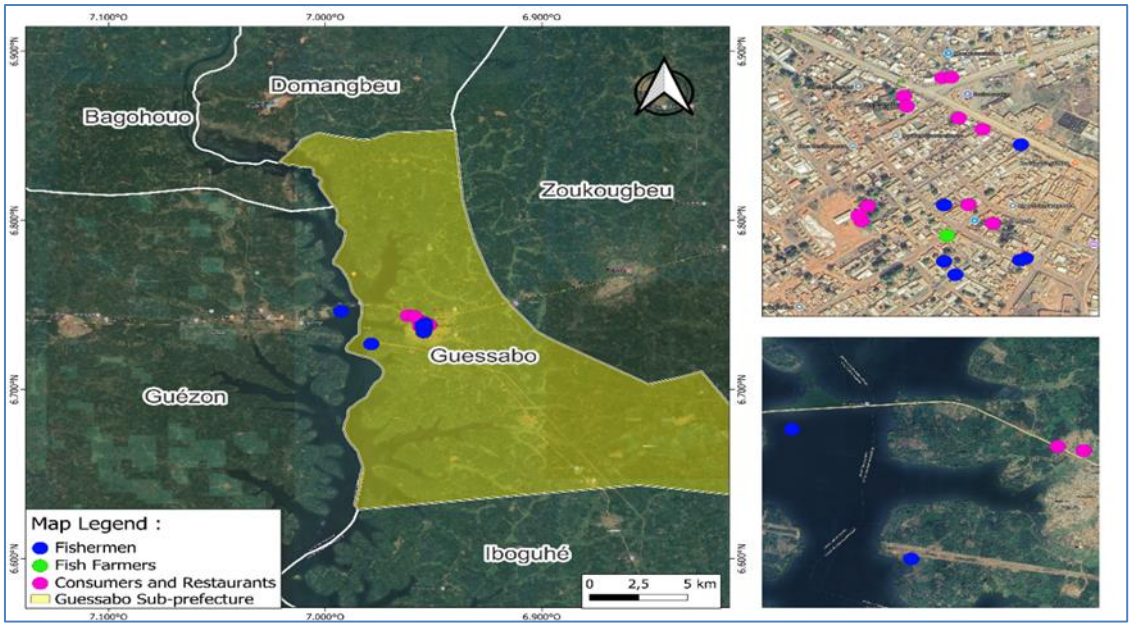

Figure 2 Map of the study area (Guessabo).

2.2. Methodological approach

2.2.1. Field survey

The methodological approach used in this study follows that of [10] and [11], combining several techniques namely: documentary research, questionnaire surveys, interviews, and direct observation in the field.

- Documentary analysis: This stage involved consulting scientific publications related to the topic in order to better guide us in our data collection.
- Questionnaire and interview survey: this was conducted at various fishing and fish farming sites, as well as among restaurant owners and consumers. In order to facilitate the work in the field, we were assisted by the Regional Directorate of Animal and Fisheries Resources and the Directorate of Aquaculture and Fisheries in the localities concerned. Interviews were also conducted with government officials and fishmongers.
- Direct observation in the field: this stage enabled us to gather additional information useful for conducting this study, to verify certain information collected during our interviews, and to immerse ourselves in certain realities in the field.

To assess the production, distribution and consumption of fishery products in the district of Yamoussoukro and the Guessabo sub-prefecture, semi-structured interviews were conducted with fishermen, fish farmers, restaurant owners and consumers. As there was no database of restaurant owners and consumers, it was decided to survey as many of them as possible who were willing to participate in the study. Regarding fishermen and fish farmers, the collected data focused on socio-demographic characteristics, the most commonly caught or farmed fish species, sales techniques, distribution channels, potential customers, product destinations, constraints related to the activity and other human activities in the vicinity of the production sites. For restaurants and consumers, information was sought on socio-demographic characteristics, fish species sold and consumed, sales techniques, suppliers, consumption frequency, different consumption methods and perceptions of fish quality.

2.2.2. Data processing

The collected data was processed using Microsoft Office Excel 2016 software to produce tables and graphs after the questionnaires had been analyzed. The survey yielded the following results.

3. Results

3.1. Distribution of sampled actors according to study areas

The distribution of actors across the different study areas is shown in Table 1.

Table 1 Distribution of sampled actors

Actors	Guessabo	Yamoussoukro	Total
Fishermen	40	20	60
Fish farmers	2	5	7
Restaurants	8	10	18
Consumers	58	91	149

3.2. Socio-demographic characteristics of fishermen

The sociodemographic characteristics of fishermen are shown in Table 2

Table 2 Summary of the sociodemographic characteristics of fishermen

sociodemographic characteristics	Modality	Proportions	
		Guessabo	Yamoussoukro
Nationality (%)	Ivoirian	50	65
	Malian	50	35
Level of education (%)	Not enrolled in school	45	35
	Koranic school	12.5	20
	Primary	20	10
	Secondary	22.5	35
Gender (%)	Male	100	100
	Feminine	-	-
Marital status (%)	Single	10	20
	Cohabitation	30	20
	Married	60	60
Age group (%)	18-30 Years	17.5	25
	31-40 Years	35	30
	41-50 Years	35	15
	51-60 Years	5	30
	>60 Years	7.5	-

3.2.1. Breakdown by gender, age group, and marital status

With regard to gender, the results reveal that all of the fishermen surveyed are male. In terms of age, 70% of fishermen in Guessabo are adults aged 30 or over. In Yamoussoukro, 75% of the fishermen surveyed are aged 30 or over. In terms of marital status, more than half of the fishermen are married in both Guessabo and Yamoussoukro, with proportions of 60%.

3.2.2. Composition of the fishing population by nationality and level of education

Fishing on Lakes Kossou and Guessabo is carried out not only by Ivorians but also by foreigners. At Lake Kossou, more than half of the fishermen (65%) are Ivorians and consist of indigenous people (Baoulé), non-indigenous people (Attié and Senoufo) and foreigners (Malians represented by the Bozo and Bambara). As for Lake Guessabo, the results indicate the presence of Malian fishermen represented by the Bozo, Bambara, and Maraka, as well as Ivorian fishermen represented by the Niaboua (indigenous), Baoulé, and Malinké (non-indigenous). Furthermore, almost all of the allogeneic fishermen have not attended school, either in Guessabo or in Yamoussoukro. The various fishing camps and fishing sites visited in Guessabo are: Laminedanga, La Scierie, Pont Niaboua, Grand pont, Petit pont and, in Yamoussoukro: Bocabo, Bananikro, Pont Marina.

3.2.3. Distribution of fishermen by socio-professional category and community organization

At Lake Guessabo, as at Lake Kossou, two types of fishermen were recorded: professional and semi-professional fishermen. At Lake Guessabo, the majority are professionals (65%), followed by semi-professionals (35%). At Lake Kossou, more than half are professionals (55%). Most of them are fishermen by trade. Furthermore, at Lake Guessabo, just over half of the fishermen (52.5%) fish exclusively, unlike at Lake Kossou (25%), where they also engage in alternative activities such as agriculture, fishing net making, transportation, and livestock farming (Table 3). With regard to the organization of fishing communities, it has been noted that each community is represented by a single organization headed by a leader who acts as a liaison with traditional and administrative authorities. However, it should be noted that some fishermen operate individually in the informal sector.

Table 3 Socio-professional distribution of fishermen

Characteristics	Guessabo	Kossou
Professional fishermen (%)	65	55
Semi-professional fishermen (%)	35	45
Fishermen with alternative activities (%)	47.5	25
Fishermen without alternative activities (%)	52.5	75

3.3. Fishing techniques

Figure 3 a) Papolo-type fish trap; b) Canister trap; c) motorized canoe; d) thread

The Figure 3 shows some of the gear used on the different lakes. Most fishermen use motorized wooden canoes to get around. Eight main types of fishing gear were identified, including gillnets, which are used by the majority of fishermen in both locations, i.e., 100% of those surveyed on Lake Kossou and 70% on Lake Guessabo. Next come papolo-type traps, hooks, seine nets, wire nets, bamboo or palm trunk traps, and canister traps.

3.4. Exploited fishery production and impact of surrounding activities

Both sites are important sources of fish production. However, during our interviews with state officials responsible for fisheries management, fishermen, and fishmongers in various localities, it became clear that yields have been declining steadily over the past few decades. According to them, this decline is the result of several factors, including climate change affecting production seasons, human activities such as gold panning around the lakes, and the use of bays for agricultural purposes such as market gardening, causing pollution of fishing sites and even the death of fish. It is also worth noting the presence of aquatic plants that hinder fishing activity, not to mention poor fishing practices (use of small-mesh nets and non-recommended gear) that can compromise the sustainability of species (Figure 4).

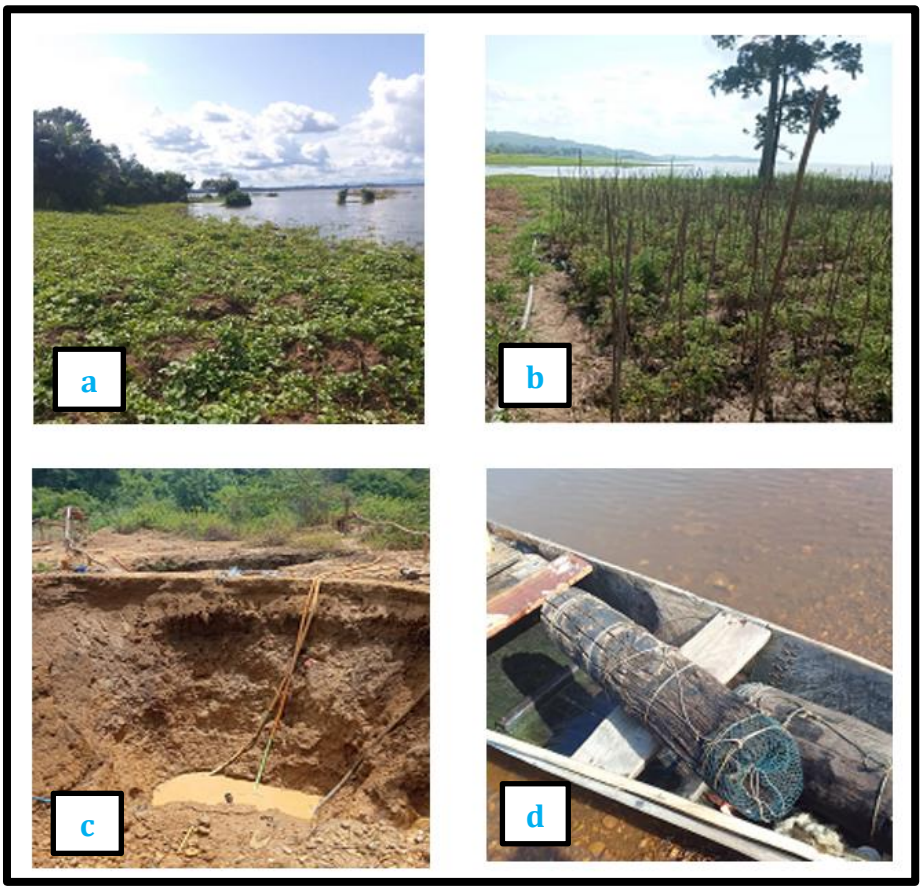

Figure 4 a) Potato field; b) Tomato field; c) gold mining site; d) bamboo fish trap

3.5. Fish species represented in the majority

Using identification sheets, ten (10) fish species belonging to five (5) families were identified as the most commonly represented (Table 4). These are the *Cichildae* family (5 species), *Claridae* (2 species), *Claroteidae* (1 species), *Centropomidae* (1 species), and *Osteoglossidae* (1 species).

Table 4 The main fish species caught in Lake Guessabo and Kossou in 2024

Family	Abundant species (Guessabo and Yamoussokro)
Cichildae	*Oreochromis niloticus*
	Tilapia guineensis
	Sarotherodon melanotheron
	Tilapia zilli
	Hemichromis fasciatus
Claridae	*Heterobranchus longifilus*
	Clarias gariepinus
Claroteidae	*Chrysichthys nigrodigitatus*
Centropomidae	*Lates niloticus*
Osteoglissidae	*Heterotis niloticus*

3.6. Distribution of fish by species

The figure 5 illustrates the most commonly caught fish species. The distribution of catches shows a predominance of tilapia (*Oreochromis niloticus*) and black-fingered cichlid (*Chrysychtys nigrodigitatus*), accounting for 73% and 61% of catches respectively in both locations.

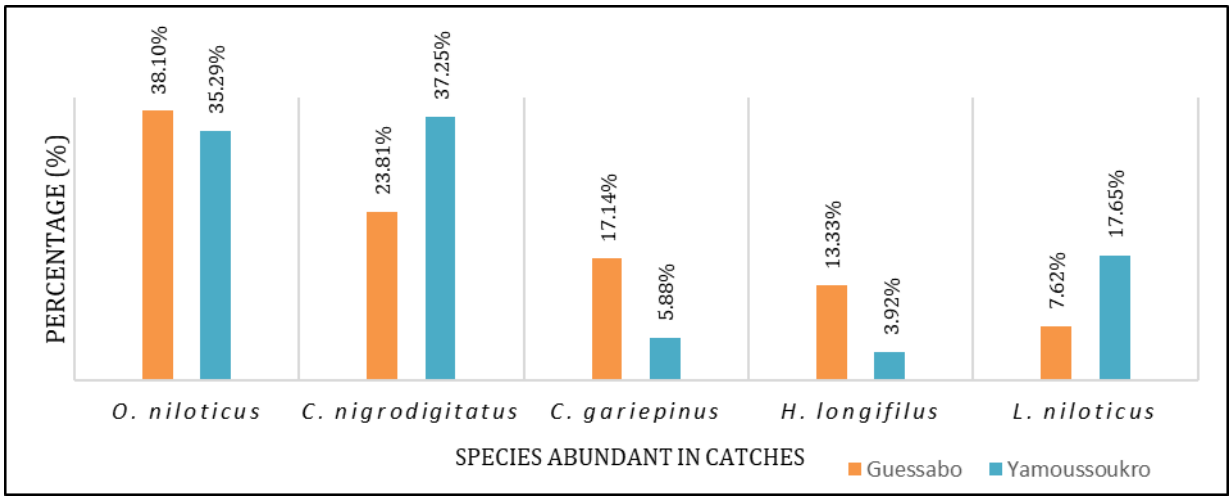

Figure 5 Distribution of the most abundant species in catches by region

3.7. Fish marketing

3.7.1. Selling techniques

The study revealed that the majority of fishermen surveyed sell their catch at landing sites to fishmongers (potential customers), who are a key link in the distribution chain. Specifically, 81.62% of fishermen in Guessabo and 63.33% in Kossou sell their catch in this way. Apart from sales at landing sites, some fishermen use market sales techniques (8.70% in Guessabo compared to 16.67% in Kossou), delivery-to-order techniques (2.17% in Guessabo compared to 20% in Kossou) and street vending techniques, which were only practised by fishermen in Guessabo (Figure 6). Apart from sales at landing sites, some fishermen use market sales techniques (8.70% in Guessabo compared to 16.67% in Kossou), delivery-to-order techniques (2.17% in Guessabo compared to 20% in Kossou) and street vending techniques (practised only by fishermen in Guessabo).

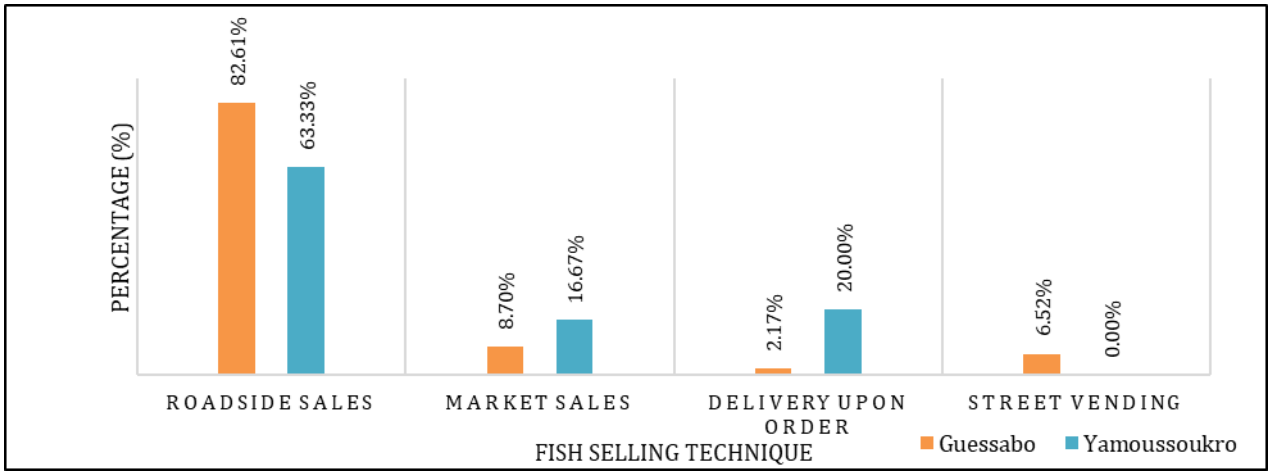

Figure 6 Fish selling technique by region

3.7.2. Marketing channels

The distribution of fresh peaches begins at the landing stages with wholesale traders : fishermen and fishmongers. The fishmongers then deliver the products to retailers, such as market traders, street vendors and home-based sellers, who in turn supply markets, restaurants and households. This organisation has enabled us to identify three types of distribution channel: direct channels (DC), short-cycle intermediate channels, and long-cycle intermediate channels (Figure 7).

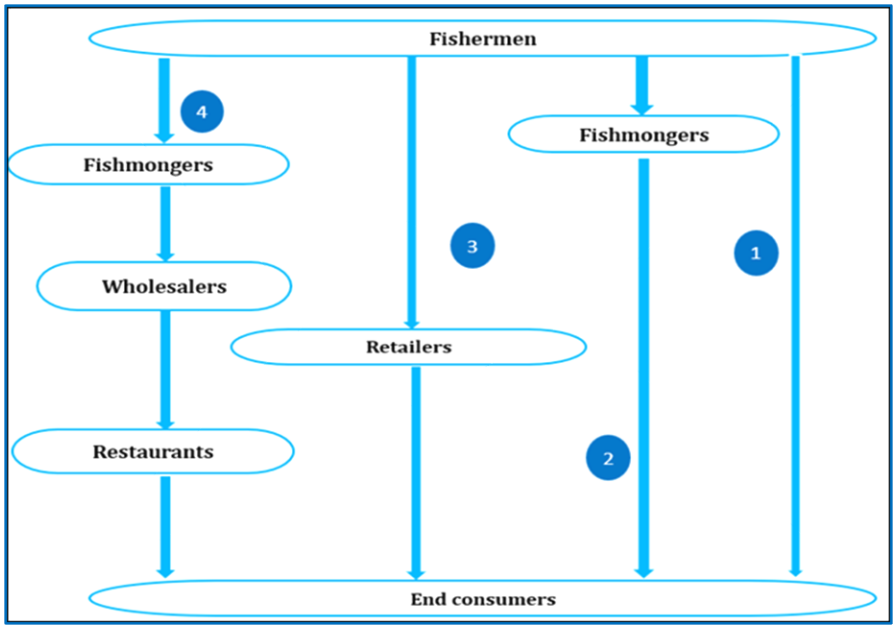

Figure 7 Fish distribution circuit

• **1 :** Direct distribution (DD) : In this distribution channel, fish are distributed directly from fishermen to consumers, bypassing all intermediaries.
• **2** and **3** : Short supply chain (SSC) : this chain involves an intermediary between the producer and the consumer ;
• **4** : Long-circuit intermediate channel (CICL) : this circuit includes at least two operators in addition to the wholesaler and the consumer.

3.7.3. Storage of catches and destination of products

Our observations in the field showed that most fishermen lack adequate storage facilities, such as refrigerators or freezers, for their catches. They therefore use ice packs to preserve their catch (Figure 8). Fishmongers store fresh fish in plastic bags in basins containing ice. Before loading, the catch is covered with ice again. The products are transported

to urban centres by motorcycle or motorcycle taxi. However, some traders opt for smoking in order to minimise losses. To increase their turnover, most traders sell their products in cities outside the region, where demand for freshwater fish is high. Fish from Lake Guessabo are mainly sold to large urban centres such as Duekoué, Daloa, Man and Issia, and are then transported to Bouaflé, Yamoussoukro, San-Pedro and Abidjan. Unlike in Kossou, most of the fish is sold locally.

Figure 8 Fish storage by a fishmonger.

3.7.4. Constraints related to fish production and marketing

Based on interviews and observations conducted in the field, it seems that the fishing sector could boost the economy and ensure food security for local populations. However, various constraints could affect yields. These include a lack of rehabilitation of state structures (e.g. tools, scales and transport), poor road conditions leading to certain production sites, a lack of supervision of fishermen, a lack of modern conservation methods, the presence of aquatic plants that hinder movement, hippopotamuses and theft. In addition to these constraints, using riverbanks for agriculture and gold panning impacts water quality due to contamination by pesticide residues and heavy metals.

3.8. Socio-demographic and professional characteristics of fish farmers

Table 5 Sociodemographic and professional characteristics of fish farmers

sociodemographic characteristics	**Modality**	**Proportions**	
		Guessabo	Yamoussoukro
Nationality (%)	Ivoirian	100	100
	Foreign	-	-
Level of education (%)	Secondary	100	-
	Superior	-	100
Gender (%)	Male	100	100
	Feminine	-	-
Marital status (%)	Single	-	20
	Cohabitation	-	20
	Married	100	60
Age group (%)	31-40 Years	-	40

	41-50 Years	50	40
	51-60 Years	50	20
Years of experience (%)	1-5 Years	50	60
	6-10 Years	50	20
	11-15 Years	-	-
	16-20 Years	-	20

Table 5 shows the sociodemographic characteristics of fish farmers in the two localities. All of the farmers interviewed were male and of Ivorian nationality. In contrast to the situation in the Yamoussoukro District, all of the fish farmers interviewed in the Guessabo sub-prefecture were married. Those surveyed in Guessabo were grouped into two age categories: 41–50 and 51–60, both of which were equally represented (50%). In the Yamoussoukro district, the most common age groups were 31–40 and 41–50, both accounting for 40% of the sample, and 51–60, accounting for 20%. In terms of educational attainment, all of the fish farmers interviewed in the Guessabo sub-prefecture had completed secondary education. By contrast, in the district of Yamoussoukro, all of the respondents had a higher education. As for seniority, fish farmers in the sub-prefecture of Guessabo have between one and ten years of experience. In the Yamoussoukro district, seniority in the industry ranges from one to 20 years.

3.9. Mainly produced fish species

The results showed that the most commonly farmed species in both locations was Oreochromis niloticus (Figure 9), accounting for 71.4% of production in Yamoussoukro and 75% in Guessabo. Other species are farmed less frequently and include Heterotis niloticus and Chrysichthys nigrodigitatus. The survey reveals that the quantity of fish products produced is higher in the Yamoussoukro District (3 to 60 tonnes) than in Guessabo town (180 to 200 kg).

Figure 9 Photograph of the species *O. niloticus*

3.10. Main activities surrounding the production sites

These activities have revealed that certain practices are employed around production sites to maximise profit. These include rice cultivation and market gardening, as well as poultry, pig and sheep farming.

3.11. Sales techniques, distribution channels, and destination of fish products

The fish produced are mainly sold on farms by all of the surveyed fish farmers. However, in addition to selling on farms, 50% of fish farmers in Guessabo deliver to order. In Yamoussoukro, meanwhile, 80% of stakeholders sell to order, 40% sell at markets and 20% supply large retailers. The study also revealed variability in selling prices per kilogram of fish among stakeholders (between 2,500 and 3,500 CFA francs). Analysis of the distribution channels reveals that the short channel (direct from fish farmer to consumer) and semi-long channel (short channel with an intermediate step) are the

most widely used. As for the destination of fish products, fish farmers in the Yamoussoukro district sell their products in the city itself and in other cities, including Toumodi, Bouaké, Bouaflé and Abidjan. Large-scale producers export most of their production from large production sites outside the country. Unlike in Guessabo, fish farmers in Yamoussoukro sell their products to the local population.

3.12. Potential customers

Figure 10 shows that potential customers of fish products in Guessabo are evenly split between wholesalers and restaurants (50% each). In the district of Yamoussoukro, however, the main consumers are households, followed by wholesalers and restaurants, with respective proportions of 50%, 37.5% and 12.5%.

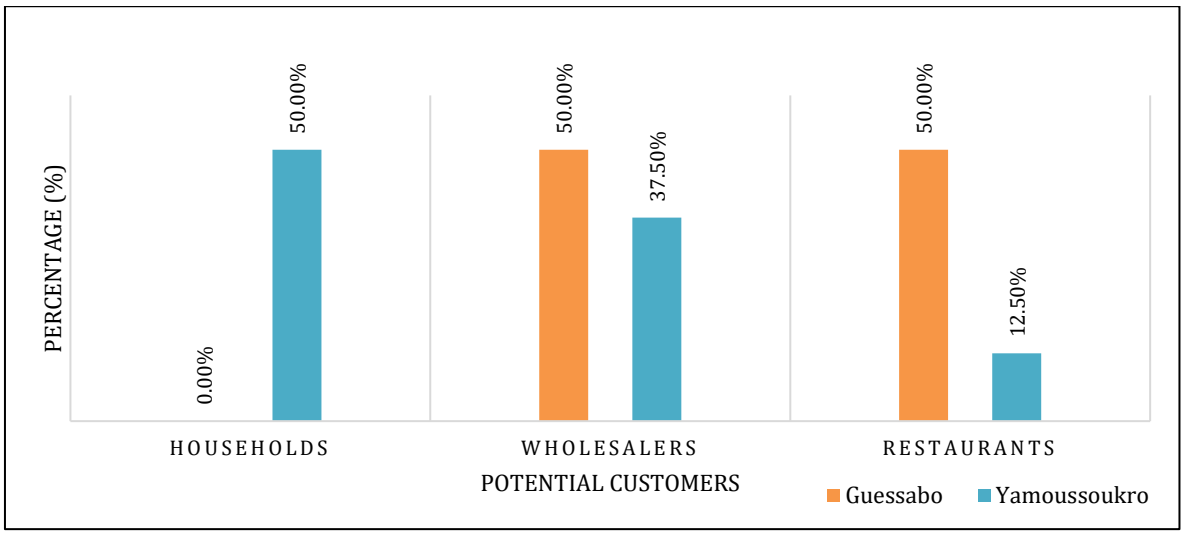

Figure 10 Potential customers for fish products

3.13. Constraints related to the production and marketing of farmed fish

The fish farming sector in Yamoussoukro and Guessabo faces several challenges. The most frequently cited of these are: insufficient technical support; food shortages and high food costs; difficulty accessing high-quality feed; difficulty obtaining fry; climatic hazards; and repeated theft of fish from production sites.

3.14. Characteristics of the processing and consumption of tilapia fish (*Oreochromis niloticus*)

3.14.1. Restaurant owners

Regarding processors (i.e. restaurants and grillers), all of the respondents in Guessabo were women, unlike in Yamoussoukro where the restaurant industry is equally represented by women (60%) and men (40%). The survey showed that the vast majority of restaurants in both cities regularly sell tilapia (Oreochromis niloticus). Some of these restaurants specialise in freshwater fish sourced from fishing. They source their fish from fishermen, suppliers, fishmongers and retailers (see Figure 11). However, in the event of a shortage of locally caught fish, they turn to locally farmed or imported fish. Others, on the other hand, opt for imported fish directly because of its availability and relatively low cost (13,000 to 20,000 CFA francs).

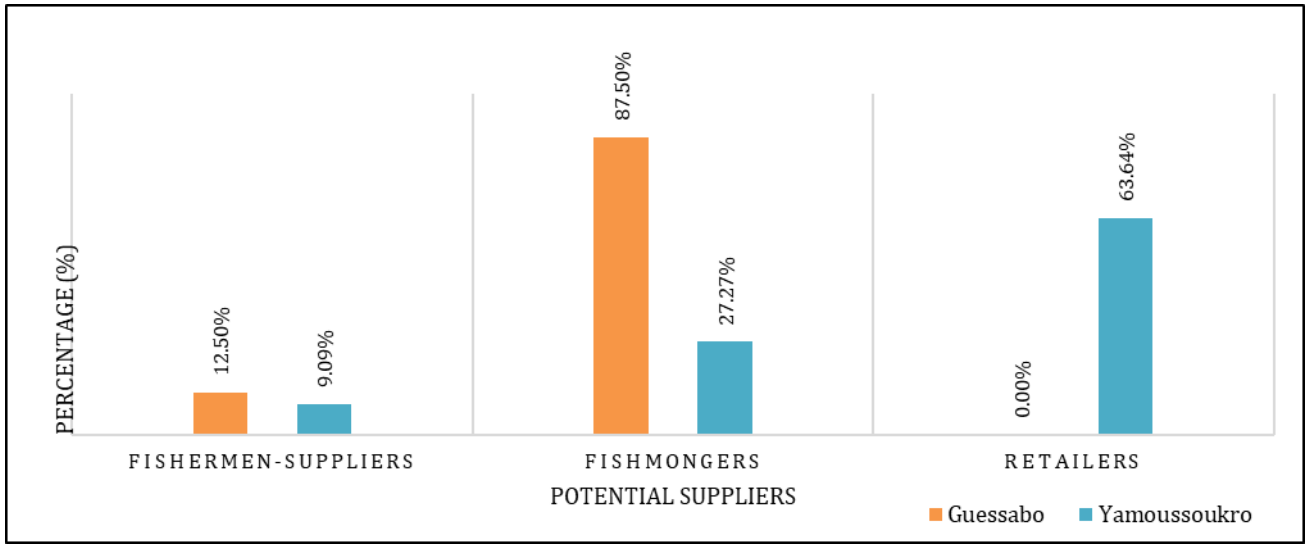

Figure 11 Potential suppliers of fish products

3.14.2. Sociodemographic characteristics of consumers

The sociodemographic characteristics of consumers are shown in Table 6.

Table 6 Sociodemographic characteristics of fish consumers

sociodemographic characteristics	**Modality**	**Proportions**	
		Guessabo	Yamoussoukro
Nationality (%)	Ivoirian	84.48	87.91
	Foreign	15.52	12.09
Professional status (%)	Pupil/Student	37.93	8.79
	Civil servant	29.31	43.96
	Liberal profession	27.59	36.26
	Other	5.17	10.99
Gender (%)	Male	68.97	78.02
	Feminine	31.03	21.98
Marital status (%)	Single	65.52	42.86
	Cohabitation	18.97	17.58
	Married	15.52	39.56
Age group (%)	<18 Years	13.79	-
	18-30 Years	37.93	24.18
	31-40 Years	36.21	35.16
	41-50 Years	8.62	34.07
	>50 Years	3.45	6.59

3.15. Actual consumption of tilapia fish

3.15.1. Consumption frequency

Surveys have revealed that tilapia is a popular type of fish among consumers. Therefore, the data was analysed based on the frequency with which respondents consume fish. Firstly, regular consumers are characterised by consuming tilapia more than twice a week. Next are moderate consumers, who consume tilapia twice a week. Finally, there are irregular consumers, who consume tilapia rarely (Figure 12).

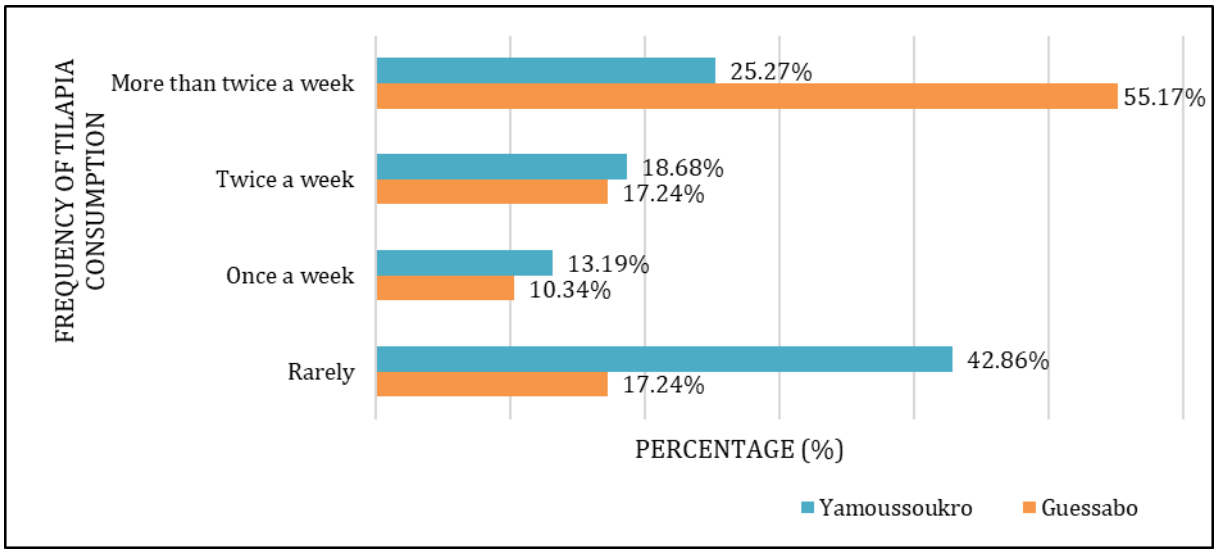

Figure 12 Frequency of Tilapia fish consumption by region

3.15.2. Consumption preferences by fish category

Most consumers prefer freshwater fish, with 60.44% of consumers in Yamoussoukro and 77.59% in Guessabo choosing it as their first preference, followed by locally farmed fish and then imported fish. However, some consumers say they have no preference. We also asked consumers whether they could tell the difference between the three categories of fish. In Yamoussoukro, 57 people (62.64%) said they could not distinguish between the three categories, compared to 22 people (37.93%) in Guessabo. Tilapia is also the most commonly consumed fish during ordinary meals (Figure 13).

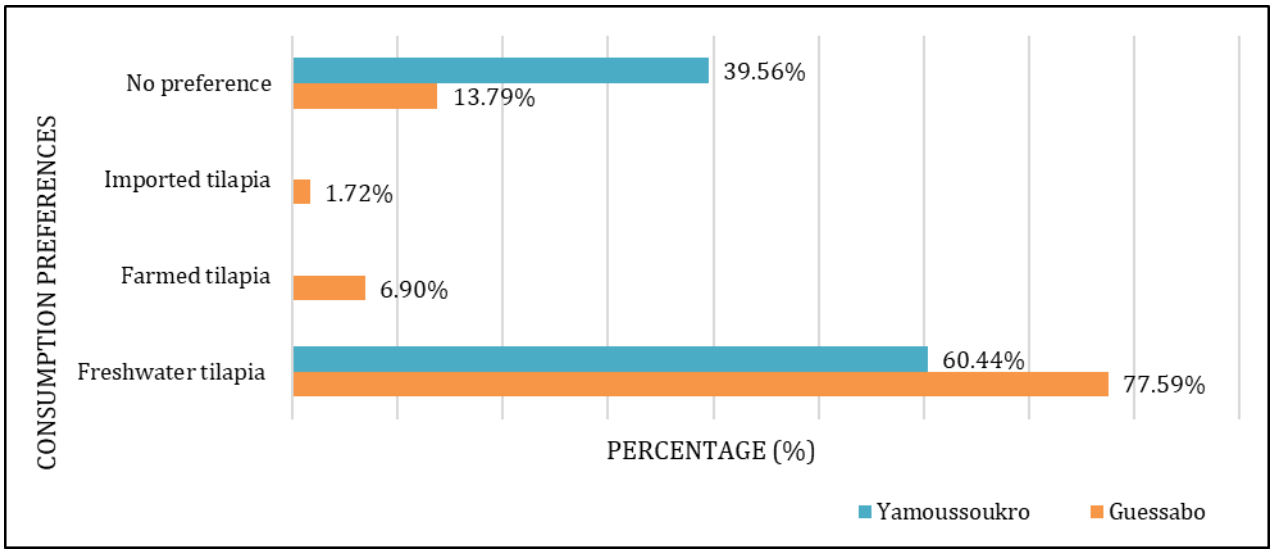

Figure 13 Frequency of consumption by fish category

3.15.3. Criteria for purchasing fish

When buying fish, consumers consider socio-economic, sensory, and hygiene criteria, such as availability, price, taste, freshness, and cleanliness.

3.15.4. Different forms of consumption

Regarding the different forms of consumption, the survey showed that fish is consumed in various ways: as soup, braised, grilled or smoked.

4. Discussion

4.1. Fishermen

Surveys conducted in the fishing communities of Kossou and Guessabo show that fishermen are exclusively adult men aged 30 and over. This finding is consistent with observations of fishing communities made by several authors, notably [12], [13] and [9]. This could reflect the physical effort and level of experience required for this activity, as well as the financial resources needed to acquire fishing equipment. Furthermore, the strong involvement of local populations in fishing could be explained by the fact that many of their ancestors sold their land to foreigners, leaving their descendants with limited arable land. As agriculture is one of the main activities of the local population, the land shortage will lead Ivorians to switch to fishing. Conversely, the low number of foreign fishermen encountered can be explained by their migration to more favourable fishing sites during biological rest periods. Our findings contradict those of authors [10] and [14], who reported low levels of local population involvement (15% and 28.57%, respectively) in the Guessabo sub-prefecture and on the Bandama River. The most common fish species in both locations are tilapia (genus Oreochromis) and jawfish (genus Chrysichthys). Our results are supported by those of references [10] and [7], who conducted studies on Lakes Guessabo and Kossou, respectively. In addition, [9] states that fishing for these species is a livelihood for many local communities and contributes to food security. However, our field interviews revealed that production has declined in these localities in recent years. Indeed, fishing is mostly carried out informally using traditional methods. [15] suggests in his work that the use of poison for fishing is one of the causes of the decline of certain species. [7] condemns poor fishing practices that contribute to the destruction of fish stocks. These include the use of prohibited gear, such as bamboo, palm and cane traps used to catch pregnant fish. Other practices include drive fishing, disturbing the water, and using non-regulated mesh nets. [16] denounces the failure to comply with biological rest periods in the Hambol region — a measure that prohibits fishing for a specified period of time to ensure sustainable fishing practices. Our field surveys in the Guessabo sub-prefecture have also confirmed this fact. Unfortunately, these practices affect both the level and quality of production. These observations could be linked to the level of education of these individuals. Indeed, it emerged that the majority of fishermen surveyed had not attended school. The government must therefore raise awareness and supervise fishermen more effectively. Furthermore, in order to increase turnover, most of the catch from Lake Guessabo is sold in urban centres. These findings are consistent with those of references [12] and [17]. Meanwhile, at Lake Kossou, sales are limited to the local market and certain nearby towns. According to reference [7], this limitation of the fish trade is the result of a considerable decline in fish production in the lake. Although fishing is profitable (with an average daily income of 5,000 to 60,000 CFA francs), those involved face several difficulties, including hippopotamus attacks, repeated theft of catches and fishing equipment, and windy conditions that make navigation difficult. Enhanced security measures must be implemented to promote peaceful fishing conditions. Additionally, the poor working conditions of the authorities responsible for managing the lakes in these localities, as highlighted by [10] and [7], hinder effective control and monitoring of fishing activities. These conditions include unrenovated premises, defective equipment and difficult access routes.

4.2. Fish farmers

A survey of fish farmers revealed that adult males are involved in this activity. Our work is consistent with that of references [18] and [11]. This can be explained by the fact that fish farming requires land and capital resources, or access to financing, to get started. Furthermore, the absence of women in fish farming may be culturally related to their involvement in household tasks, as described by [19]. Nevertheless, women are involved in marketing as wholesalers, retailers or fish scalers. Our results indicate that the most commonly farmed species in both locations is Nile tilapia (*Oreochromis niloticus*). [20] also states in their work that aquaculture in Côte d'Ivoire is dominated by the farming of this species. Indeed, Nile tilapia is a hardy species with a relatively low-protein diet and rapid growth, providing an economic advantage for fish farmers [21]. Regarding the commercial route for farmed fish, we consider the direct channel and the short-cycle intermediate channel. According to references [22] and [23], these marketing channels enable producers to sell their products quickly and allow consumers to purchase fresh fish at a lower cost than from retailers.

4.3. Restaurants and consumers

Regarding tilapia consumption, the survey results showed that consumers preferred freshwater fish to locally farmed and imported varieties. A similar finding was made in Abidjan, where 83% of surveyed households preferred wild-caught tilapia to imported tilapia.[20] In Turkey, 70.3% of respondents indicated a preference for wild fish. Studies have shown that consumers generally prefer fresh fish to frozen fish [25]. [26] indicate in their work that consumers are sensitive to the consumption of locally caught freshwater fish and seek freshness and taste. Another point to consider, according to [27], is the buyer's perception of the product. According to their work, farmed fish is perceived as an industrial product because it is fed chemicals. However, according to another study, some consumers believe that farmed fish offers added value due to its feeding methods compared to wild fish. Nevertheless, the integration of farmed and imported tilapia into the eating habits of local populations cannot be ignored due to its cost and availability on the market. Furthermore, a decline in fish production has been recorded in recent years. This is partly due to poor fishing practices, such as the use of Acadja traps (clusters of branches planted in the water), bamboo traps, palm-trunk traps and unregulated mesh nets [29]. Another noteworthy practice is the use of toxic plants (Raphia sp. and Tephrosia sp.) and synthetic pesticides (gammaline, dieldrin, sodium cyanide, rotenone, quinaldine, antimycin (Fintrol-5), endosulfan and thiodan), as detailed in [30]. These practices mainly destroy fry, which could contribute to the depletion of fish stocks. Additionally, according to [7], the contamination of water resources by pollutants from human activities such as the misuse of plant protection products in agriculture and illegal gold mining could drive species extinction. Beyond species extinction, these practices could negatively impact the quality of fish intended for human consumption, as described in [31] and [9].

5. Conclusion

The study revealed that the species most commonly produced in the wild and on farms in the Guessabo and Yamoussoukro localities is tilapia (*Oreochromis niloticus*). It should be noted that fish farming supports wild production. However, production still fails to meet the needs of the local population. At the same time, the survey revealed that the majority of people in Guessabo and Yamoussoukro prefer wild-caught fish to farmed fish. Products from Lakes Kossou and Guessabo are sold not only in these localities, but also in surrounding towns. While fish is rich in protein and essential micronutrients, depending on the production site and surrounding activities, it can also pose a contamination risk. This poses a health risk to consumers. Therefore, it is still necessary for decision-makers to develop strategies for the sustainable management of water resources.

Compliance with ethical standards

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Disclosure of Conflict of interest

The authors declare no conflict of interest.

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