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Research Article

Fish Diversity Assessment in Khartoum Central Local Fish Market During the Post-war Period

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Abstract

Freshwater fisheries play a vital role in food security, employment generation, and livelihood support in Sudan; however, the recent armed conflict severely disrupted fish production, transportation networks, market operations, and consumer access to fish products. This study assessed fish species diversity, market conditions, and indicators of post-war recovery in the Khartoum Central Local Fish Market, one of the most important fish trading centers in Sudan. A descriptive field-based approach was employed, combining direct market observations with structured interviews involving fish vendors, fishermen, and consumers. Information on fish species composition, supply sources, market activity, fish prices, and product quality was collected and compared with conditions reported during the conflict period. The findings revealed moderate to high fish species diversity within the market, with species of the genus *Oreochromis* being the most abundant, followed by *Clarias* spp. and *Lates niloticus*. Market observations indicated increased fish availability and consumer attendance compared with wartime conditions, while fish prices showed a moderate decline, suggesting gradual stabilization of market dynamics and improved supply. The White Nile and Jebel Aulia Reservoir were identified as the primary post-war sources of fish supply, and sensory quality assessments demonstrated generally acceptable freshness of marketed fish. Despite these positive developments, several challenges remain, particularly unreliable electricity supply, inadequate cold-storage facilities, and limitations in market infrastructure. Overall, the results indicate that the Khartoum Central Local Fish Market is exhibiting clear signs of ecological and commercial recovery following the conflict; however, sustained recovery of the fisheries sector will require targeted investments in infrastructure, cold-chain development, and market support systems to enhance resilience and ensure long-term sustainability in post-conflict urban environments.

Keywords

Fish Diversity, Post-war Recovery, Local Fish Market, Khartoum, Sudan

1. Introduction

Fish resources are essential for food security, livelihoods, & environmental sustainability, particularly in countries with extensive inl& water system such as Sudan [7]. Sudan's inl& waters—primarily the Nile & its tributaries—support significant artisanal fisheries that supply local markets & contribute to household nutrition [7]. Fish are a highly nutritious & economically important food source, providing high-quality protein, essential amino acids, long-chain omega-3 fatty acids, & critical micronutrients that contribute significantly to food & nutrition security, particularly in low-income & crisis-affected

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regions [6, 8]. In Sudan, freshwater fish play a central role in urban diets due to their relative affordability compared to other animal-source foods. Fish market dynamics are closely linked to economic conditions, as changes in species diversity, availability, & prices reflect household purchasing power, supply chain functionality, & post-conflict recovery processes [5, 9]. Previous research in Sudan has demonstrated that commonly marketed freshwater fish species possess high nutritional value, reinforcing the importance of local fish markets in supporting both dietary quality & livelihoods [1]. Therefore, monitoring fish diversity & market performance provides an integrated indicator of ecological resilience & economic recovery in post-war urban settings. Local fish markets play a crucial role as intermediaries between capture fisheries & urban consumers, reflecting both ecological conditions & socio-economic stability. In recent years, the Khartoum local fish market has experienced substantial transformations due to prolonged armed conflict, which disrupted supply chains, displaced fishing communities, & degraded infrastructure, thereby affecting fish availability, species composition, pricing, & market functionality [9, 12]. War & instability are known to weaken fisheries governance, reduce fishing effort in some areas, intensify pressure in others, & alter market structures, often amplifying resource scarcity & price volatility [4, 10]. The diversity & distribution of ichthyofauna highlight the ecological richness of Sudan's freshwater systems, yet stressors such as environmental change & socio-political instability pose challenges to sustainability [2]. Monitoring fish diversity & market indicators provides valuable insight into both environmental resilience & post-conflict economic recovery. This study therefore documents current fish diversity in the Khartoum local fish market in the post-war period & evaluates changes in availability, market conditions, & supply sources compared to pre-war conditions. The aim is to inform strategies for sustainable recovery & management of the fisheries sector. ost-conflict environments are frequently characterized by damaged infrastructure, weakened resource management systems, and environmental disturbances that can affect fisheries and food security [13].

2. Materials & Methods

2.1. Study Area

The study was conducted at the fish market in New Souq Six, Mayo area, Khartoum State. This market emerged as an alternative to the former central market, which was severely affected by war & population displacement.

2.2. Research Design

A descriptive analytical field methodology was adopted to assess the current status of fish diversity & market conditions. Both qualitative & simple quantitative approaches were applied.

2.3. Data Collection Tools

Data were collected using:

1) *Field interviews:* Conducted with fish vendors (n = 20), fishermen (n = 12), & consumers (n = 32).
2) *Direct observation:* Documentation of fish species, market conditions, storage facilities, & electricity availability.
3) *Audio & written records:* Interviews were recorded, transcribed, & analyzed thematically.

2.4. Sampling Method

A purposive sampling technique was used to capture different stakeholder perspectives within the market. Although the sample size was limited, it provided representative insights into market dynamics.

3. Data Analysis

1) *Qualitative analysis:* Content analysis of interview responses, categorized into themes such as diversity, challenges, prices, & recovery indicators.
2) *Quantitative description:* Simple tabulation of fish species availability & approximate proportions.

Study Limitations

The study was limited to one market & conducted on a seven days (in June 2025). Results therefore reflect indicative trends rather than generalized conclusions for all Khartoum markets.

4. Results

4.1. Fish Species Availability

As shown in Table 1, the Khartoum local fish market during the post-war period exhibited moderate to high fish species diversity. Tilapia (Oreochromis spp.) was the most abundant fish species, that reflecting its ecological resilience. The continued presence of Nile perch & catfish indicates partial recovery of supply chains, while less abundant species demonstrate that fish biodiversity has not been completely lost despite wartime disruptions.

Table 1. Relative abundance, availability, and supply sources of major fish species in white nile andjebel aulia reservoir, sudan.

Fish species	Scientific name	Availability	Relative abundance (%)	Pre-war presence	Main source
Tilapia	*Oreochromis* spp.	High	35	Yes	White Nile, Jebel Aulia
Nile perch	*Lates niloticus*	Moderate	20	Yes	White Nile, South Sudan
Catfish	*Clarias* spp.	Moderate	18	Yes	White Nile, Kosti
Bagrus	*Bagrus* spp.	Low	10	Yes	White Nile
Synodontis	*Synodontis* spp.	Low	9	Yes	White Nile
Labeo	*Labeo* spp.	Rare	8	Yes	White Nile

4.2. Fish Supply Sources

Table 2 summarizes the main fish supply sources & changes observed after the war. The White Nile & Jebel Aulia Reservoir remain the primary suppliers, showing clear improvement compared to wartime conditions. More distant sources have partially recovered, though transportation & security challenges persist.

Table 2. Major fish supply sources and their status during and after war.

Supply source	Approx. distance (km)	Main species	Status during war	Status post-war
White Nile	30–50	Tilapia, Catfish	Disrupted	Improved
Jebel Aulia	40	Tilapia, Nile perch	Limited	Improved
Wad Medani	180	Labeo, Tilapia	Interrupted	Partially restored
Kosti	350	Catfish, Bagrus	Restricted	Improved
South Sudan	>500	Nile perch	Unavailable	Unavailable

4.3. Fish Quality Assessment

According to the sensory assessment presented in Table 3, fish quality in the market ranged from moderate to high. Tilapia & Nile perch achieved the highest scores, indicating acceptable freshness despite limited cold storage facilities.

Table 3. Sensory Quality Assessment of major fish species marketed in the study area.

Fish species	Color (1–5)	Odor (1–5)	Texture (1–5)	Overall quality
Oreochromis spp.	4.5	4.3	4.4	High
Lates niloticus	4.2	4.0	4.1	High
Clarias spp.	4.0	3.8	3.9	Moderate–High
Bagrus spp.	3.7	3.5	3.6	Moderate
Synodontis spp.	3.6	3.4	3.5	Moderate
Labeo spp.	3.5	3.3	3.4	Moderate

4.4. Body Weight Composition

Table 4 presents the approximate body weight composition of major fish species. Muscle yield represented about half of total body weight, highlighting their nutritional & economic value.

Table 4. *Body weight composition of the studied fish species.*

Fish species	Head (%)	Viscera (%)	Skin & fins (%)	Muscle (%)
Oreochromis spp.	28	12	10	50
Lates niloticus	30	10	10	50
Clarias spp.	26	14	10	50
Bagrus spp.	29	13	9	49
Synodontis spp.	27	15	10	48
Labeo spp.	28	14	10	48

4.5. Indicators of Post-war Market Recovery

As summarized in Table 5, several indicators point to gradual recovery of the Khartoum local fish market. While availability & diversity improved, infrastructure constraints remain a limiting factor.

Table 5. *Comparison of Key Market Indicators During and After the War in the Khartoum Local Fish Market.*

Indicator	During war	Post-war	Trend
Species diversity	Low	Moderate–High	Increasing
Fish availability	Limited	Improved	Increasing
Fish prices	High	Moderate	Decreasing
Consumer attendance	Low	Increased	Increasing
Cold storage	Poor	Poor–Moderate	Slight improvement
Electricity	Unreliable	Unreliable	No change

5. Discussion

The present study provides valuable insights into the status of fish species diversity & market functionality in the Khartoum central local fish market during the post-war period. The findings indicate a gradual but noticeable recovery in fish availability, species diversity, & market activity compared to conditions reported during the conflict period. This recovery reflects both ecological resilience of Sudanese inl& fisheries & partial restoration of fish supply chains following the cessation of major hostilities. [12], noted the Nile system's capacity for natural recovery under improved security conditions. The dominance of *Oreochromis* spp. (tilapia) observed in the market is consistent with previous studies on Sudanese inl& fisheries, which have highlighted tilapia as the most resilient & adaptable freshwater fish group under environmental & anthropogenic stress [2, 15]. Tilapia's tolerance to fluctuating water quality, high reproductive capacity, & strong consumer preference contribute to its continued abundance, even during periods of instability. Similar patterns have been documented in other post-conflict African fisheries, where resilient species tend to dominate early recovery phases [14]. However, infrastructural constraints—particularly electricity & cold storage—remain critical barriers to market efficiency & fish quality. Similar post-conflict challenges have been reported in South Sudan fish markets [3, 11]. Fish diversity in the market serves as a useful indicator of both ecological stability & economic recovery. The dominance of tilapia aligns with previous studies identifying it as the most abundant & commercially important species in Sudanese markets [15].

Strengthening fisheries governance, improving infrastructure, & supporting small-scale actors are therefore essential to ensure that the observed recovery in Khartoum's fish market translates into long-term sustainability & food security.

6. Conclusions

The study concludes that:

1) Fish diversity in the Khartoum local market has shown signs of recovery after the war.
2) Key freshwater species remain available, with tilapia being the most abundant.
3) Market conditions, prices, & consumer attendance have improved compared to wartime conditions.
4) Infrastructure limitations continue to constrain full recovery.

7. Recommendations

1) Improve electricity supply & cold storage facilities in fish markets.
2) Strengthen market infrastructure.
3) Support fishermen & vendors with extension services & market information.
4) Encourage sustainable management of inl& water fisheries.
5) Exp& future studies to include multiple markets & longer monitoring periods.

Abbreviations

FAO	Food & Agriculture Organization of the United Nations
HLPE	High Level Panel of Experts on Food Security & Nutrition
IFPRI	International Food Policy Research Institute
UNEP	United Nations Environment Programme
spp.	Multiple Species Within a Genus

Author Contributions

Haram Hassan Abbas Bakhiet: Conceptualization, Data curation, Formal Analysis, Methodology, Writing – review & editing

Rasheda Ibrahim: Data curation, Investigation, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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