

Full Length Research Paper

Diversity of selective and non-selective fishing gear and their impact on the White Nile River, Khartoum State, Sudan

M. O. Mohammed^{1*} and M. E. Ali²

¹Environment and Natural Resources Research Institute, National Centre for Research, Khartoum, Sudan.

²Fisheries Research Centre, Animal Resources Research Corporation, Khartoum, Sudan.

Accepted 21 April, 2019

This survey was conducted in Al-Kalakla Fishery (KF) and Jabel Awlia Dam Fishery (JADF) in the White Nile River, Khartoum state to identify the selective and non-selective fishing gear. The results showed the selective fishing gear represented by gill-nets and seine nets (beach nets) in both fisheries with clear variation in use. In KF, fixed nets were dominant (56%) in fishing and followed by drift net (33%), while cast nets were absent in this fishery. In JADF, fixed nets were dominant (63%) in use and followed by cast nets (14%). The average net length was 150 m with width 1.5 m. Non-selective fishing gear was luring gear represented by long-lines (Sareema and Jago). Average length of long-lines was 200 m with 200 hooks in both KF and JADF. Results showed selective tendency of particular mesh sizes of gill-nets in both KF and JADF towards some fish species as: Nile Perch (*Lates niloticus* L. 1758), Bayad (*Bagrus bayad*, Forskal, 1775), Kabarous (*Bagrus docmak*, Forskal, 1775), and large sizes of Dabis (*Labeo niloticus*, Forskal, 1775) were caught by fixed nets. Bulti (Tilapias), small sizes of Dabis (*Labeo niloticus*) and Gargur (*Synodontis schall*, Bloch and Schneider, 1801) were caught mostly by drift nets around breeding grounds and cast nets. Kas (*Hydrocynus forskalii*, Cuvier 1819), Kawara (*Alestes dentex* L. 1758) and Shilba (*Schilbe intermedius*, Ruppel, 1832) were caught by seine nets.

Key words: Fishing gear, gill nets, seine nets, cast nets, long-lines.

INTRODUCTION

The continuous increase in population, justifies the increased demand for fish products and subsequently the increase in fish price. Khartoum state is considered as the main fish consumption centre in the Sudan (FD, 2003).

Khartoum state has limited natural fisheries scattered on the Blue and White Nile River: Fiteihab, Azozab, Al-Kalakla and Jabel Awlia Dam in the White Nile and Al-Gereif and Soba in the Blue Nile and Al-Mourada in the Main Nile (Mohammed, 2004). The White Nile River Fisheries contribute about more than half of total fish marketed in the state, which was estimated to be at around 12.5% (FD, 2003). Thus, increasing tendency in exploitation of its fish products has led to negative

effect on their fish stocks and continuous yield as reduction in fish composition of each fishery (Kawai, 1994).

Few studies conducted on fishing gear that used in the White Nile River, showed that gill-nets and seine nets are dominant, whereas long lines are seasonal in use. Jabel Awlia Dam Reservoir suffered much from using fixed nets (nylon nets) with different mesh sizes especially along its northern part. For this reason, gill-nets selectivity has affected negatively fish population (Ali, 1977). Fishing operations used in the White Nile River include drift way, fixed, per-suit and luring type. Fixed method is utilized broadly by fisheries of the White Nile River (Hamza, 1981; Mohammed, 2004).

Fishing nets used in offshore areas in the White Nile River are floating gill-nets with mesh sizes ranging from 16 to 20 cm or more, while the seine nets are used around breeding grounds in the inlets and shallow beaches.

*Corresponding author. E-mail: moh.9808@gmail.com.

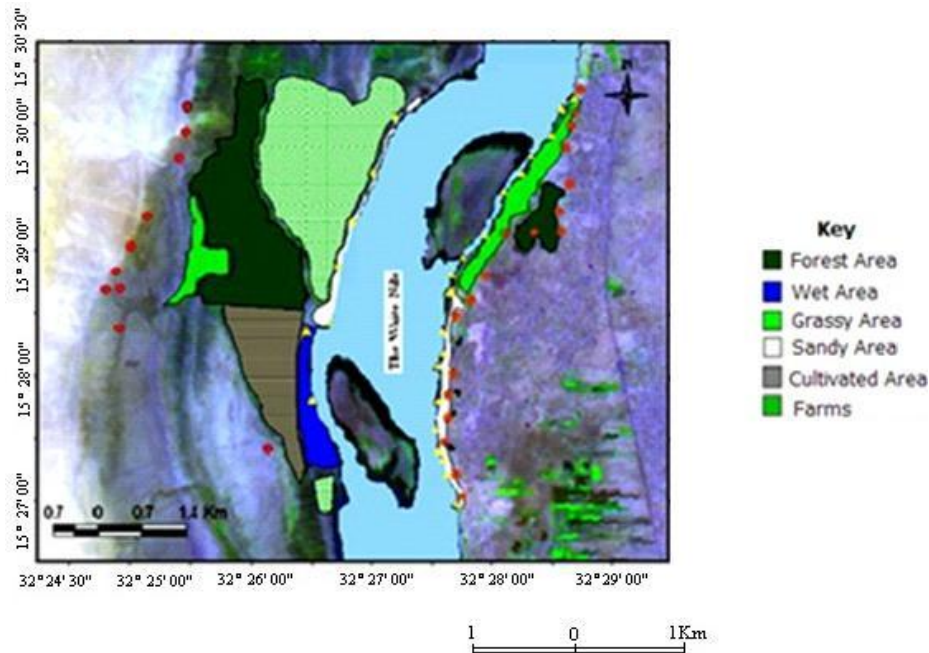


Figure 1. Depicts Al-Kalakla fishery in the White Nile, Khartoum State (cited by Mohammed, 2006).

Small-sized gill-nets (2 to 8 cm) made of fine twine are used only to catch *Alestes dentex* and *Hydrocynus forskalii* for preparing salted fish products (Ali, 1984). Long-lines which known locally as Sareema and Jago gear are used in the White Nile River as non-selective fishing gear during flood (Kawai, 1994; FD, 2003; Mohammed, 2006).

Aims of this survey were to record and identify fishing gear used in fisheries of the White Nile within Khartoum state (KF and JADF) and to restrict and determine effect of selective and non-selective fishing gear on fish composition of these fisheries.

MATERIALS AND METHODS

The survey data were collected throughout whole year (2005 to 2006) by using a questionnaire form directed to eleven fishermen representing 5% of total fishermen number who perform fishing activity in Al-Kalakla Fishery (KF) and Jabel Awlia Dam Fisheries - represented by reservoir and downstream which extends up to 5 km from dam's barrier- (JADF) in the White Nile River within Khartoum state (Figures 1 and 2). A questionnaire was carried out randomly for one day of each months of whole year as described by Mohammed (2006). For analysis data, it was used microsoft office excel (2003) to treat the raw data collected by a questionnaire.

RESULTS

Fishing nets

It was recorded that gill-nets (fixed nets and drift nets)

and seine nets (Bibi nets and Um Surra nets) were used widely with clear variation in use during all seasons of whole year in both KF and JADF. Luring gear was used in limited way in KF more than in JADF, while cast nets were used only in JADF (Tables 1 and 2).

Mesh sizes of gill-nets used commonly were 6, 8, 12 and 15 cm, while 2 and 4 cm mesh sizes of seine nets were dominant in use. Most of fishing nets extended one meter and half in depth and 100 m up to 150 m length (Table 1).

Results showed that Rami nets were dominant in fishing in both fisheries, but they were used in JADF more than KF. In contrary, Um Kubuk net was dominant in KF more than in JADF. Use of drift nets followed fixed nets in both fisheries, but JADF showed the highest percentages. Fishermen in JADF used cast nets, while those in KF did not (Table 3).

Targeted fishes

Results of the survey showed that gill-nets had selectivity towards specific fish species according to their mesh sizes and also showed targeted fishes of non-selective gear (Table 4).

Results showed that fishing by Rami nets and Kar nets depends on the depth of fishery and fish stock sizes. Depth of fishery affects fish distribution and use of different types of fishing nets. This is clear in both KF and JADF, where gill-nets made of 1.5 m width and mesh sizes ranged between 4 and 15 cm, were mostly used

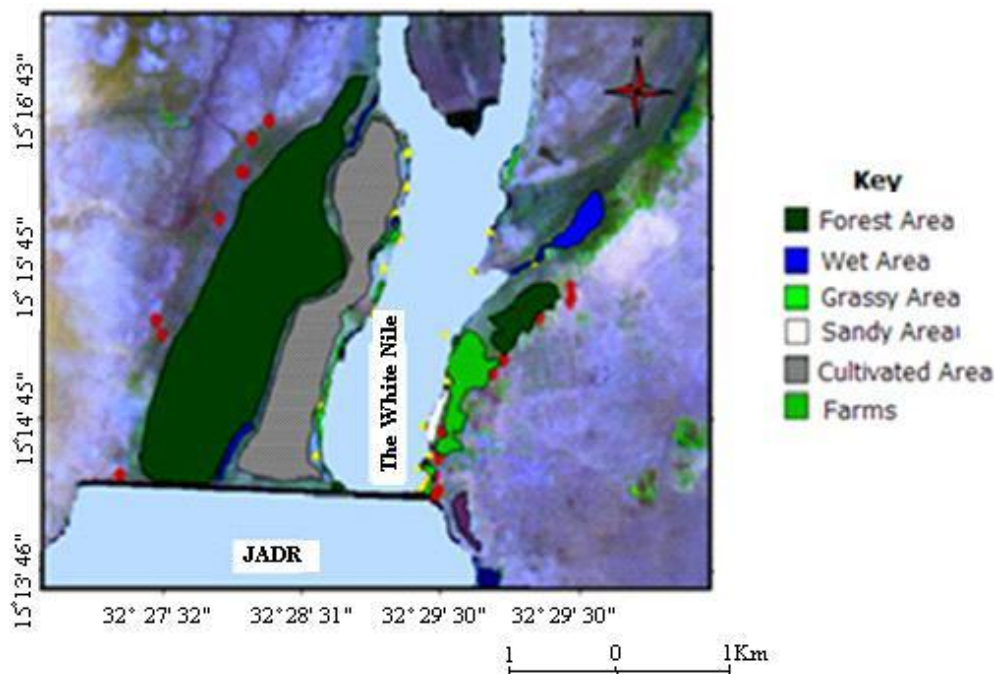


Figure 2. Depicts Jabel Awlia Dam Fisheries in the White Nile, Khartoum State (cited by Mohammed, 2006).

Table 1. Fishing nets used in Al-Kalakla Fishery (KF) and Jabel Awlia Dam Fisheries (JADF), in the White Nile River, Khartoum State (2005/2006).

Type of fishing net	Local name	Twine	Mesh size (cm)	Operation period	Area of practice
Gill-net					
Fixed net	<i>Rami</i>	Multifilament	6 up to 12	Day+ Night	Deep water
	<i>Um Kubuk</i>	Multifilament	64 up to 90	Day+ Night	Deep water
Trammel net	<i>Mowashasha</i>	Monofilament	12 up to 18	Day+ Night	Deep water
Drift net	<i>Al-Kar</i>	Monofilament	6 up to 10	Day+ Night	Near shore area
Surrounding net					
Beach seine net					
Seine net	<i>Bibi</i>	Monofilament	2 and 4	Day+ Night	Near shore area
Seine net					
Seine net	<i>Um Surra</i>	Multifilament	1 and 2	Night	Near shore area
Seine net	Jarrara	Multifilament	2 and 4	Night	Near shore area
Per-suit net					
Cast net	Tarraha	Multifilament	2 up to 10	Day	Dam's barrier

Table 2. Luring gear used in Al-Kalakla fishery (KF) and Jabel Awlia Dam Fisheries (JADF), in the White Nile River, Khartoum State (2005/2006).

Local type of long-line gear	Twine	Hook no.	Operation period	Area of practice
Sareema	Multifilament	150 to 300	Day + Night	Deep water
Jago	Multifilament	50	Day + Night	Deep water

Table 3. Percentages of fishing-nets types (with their local names) used in Al-Kalakla fishery (KF) and Jabel Awlia Dam Fisheries (JADF), in the White Nile River, Khartoum State (2005/2006).

Fishery	Net type						
	Fixed nets (%)		Drift nets (%)		Beach nets (%)		Cast nets (%)
	Rami	UmKubuk	Trammel		Bibi	Um Surrah	
KF	46.32	8.42	1.05	33.16	10.53	0.53	0.0
JADF	54.72	5.97	2.52	9.75	12.58	0.0	14.47

Table 4. Targeted-fishes according to effect of mesh sizes used in Al-Kalakla fishery (KF) and Jabel Awlia Dam Fisheries (JADF), in the White Nile River, Khartoum State (2005/2006).

Fishing net	Fish	
	Local name	Scientific name
Selective net		
Gill-net		
Um Kubuk	Ijle	<i>Lates niloticus</i>
	Bayad	<i>Bagrus bayad</i>
	Kabarous	<i>Bagrus docmak</i>
	Bini	<i>Barbus bynni</i>
Rami	Kharsha	<i>Distichodus niloticus</i>
	Surta	<i>Heterobranchus bidorsalis</i>
	Bulti	Tilapias
	Bulti	Tilapias
Al-Kar	Dabis	<i>Labeo niloticus</i>
	Khashum Banat	<i>Mormyrus inloticus</i>
Surrounding net		
	Kas	<i>Hydrocynus forskalii</i>
	Abu-riala	<i>Chrysichthys auratus</i>
	Shilba	<i>Schilbe Intermedius</i>
	Gargor	<i>Synodontis spp.</i>
Bibi	Kawara	<i>Alestes dentex.</i>
	Bulti	Tilapias
Um Sura	Shilba	<i>Schilbe intermedius</i>
	kawara	<i>Alestes dentex</i>
Non-selective gear		
Long-lines		
Sareema and Jago	Bayad	<i>Bagrus bayad</i>
	Kabarous	<i>Bagrus docmak</i>
Per-suit net		
	Tambeira	<i>Tetraodon laneatus</i>
	Barada	<i>Malapterurus electricus</i>
Cast net	Gargor	<i>Synodontis schall.</i>
	Bulti	Tilapias
	Dabis	<i>Labeo niloticus</i>

during flood season of high water level, while seine nets made of 3 and 4 cm mesh sizes and 1 m in width, were utilized during low level of water in winter and summer. These results are in harmony with results of Ali (1977), Hamza (1981), Kawai (1994) and Mohammed (2004; 2006).

DISCUSSION

Depth of fishery and its nature plays an essential role in the use of a particular type of gill-nets in fishing and also luring gear as shown in Tables 1, 2, and 3 and Figures 1 and 2. These agree with results of Mohammed (2006).

Small mesh sizes of gill-nets that is used by fishers confirmed that fish composition of both KF and JADF has subjected to their negative effect representing in overfishing and only 16 fish species that recorded during whole year, also confirm this phenomenon (Table 4). This harmonizes with results of Ali (1977) and Kawai (1994).

The cast nets in JADF were used depending on dam barrier, which helps fishermen to catch fish in deeper water. Therefore, cast nets were not used in KF due to low depth of fishery and there was difficulty in using them from the back of fishing boats into middle of fishery.

According to low benefit of long-lines and their seasonal usage, fishermen in both fisheries did not tend to use them in fishing frequently. This agrees with the results of Mohammed (2006). Types of fish and their sizes indicated that selectivity of gill-nets and seine nets and explained why fishermen preferred to use them in fishing activity. This agrees with Mohammed (2006).

REFERENCES

- Ali MT (1977). Studies on gill-net selectivity in lake Nubia fishery. M. Sc. Thesis, Dept. of Zoology, University of Khartoum, Sudan.
- Ali MT (1984). Status of African Reservoir fisheries. In Kapetsky, JM & Petr T (eds). Status of African reservoir fisheries. CIFA Tech. Pap./Doc. Tech. CPCA, (3): 247-259.
- FD (2003). Database program. Report, Fisheries Department (FD), Ministry of Agriculture and Animal Wealth Khartoum State, Sudan, p. 29 (in Arabic).
- Hamza KM (1981). Studies on fish populations in Jabel Awlia Reservoir. M. Sc. Thesis, Faculty of Science, Dept. of Zoology, University of Khartoum, Sudan.
- Kawai MK (1994). Fishing effort & fishing intensity in the northern part of Jabel Awlia Reservoir. M. Sc. Thesis, Institute of Environmental Studies, University of Khartoum, Sudan.
- Mohammed MO (2004). Studies on fishing gear, fish compositions and fishermen sector in the fisheries of Khartoum State. B. Sc. Dissertation (Honour), Dept. of Zoology, Faculty of Science, University of Khartoum, Sudan.
- Mohammed MO (2006). Effects of gill-nets and fishing gear on fisheries of Jabel Awlia and Al-Kalakla on the White Nile, Khartoum State. M. Sc Thesis, Sudan Academy of Sciences, Sudan.