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Fish Landing and Transaction at Juba River Port in South Sudan: Management Perspectives and Selected Inventory

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Abstract: Fish landing at ports or landing sites is an important activity in the fisheries sector in terms of its contribution and sustainable use. Insufficient or lack of data on fish landing generally hinders landing estimates and economic valuation in many developing countries. In Juba and South Sudan at large, landing estimates and valuation of fishes are still unknown. As such, this study aimed at assessing landing weight according to type of fishes and production areas, determining fish landing frequency and rank as well as allied transaction at Juba River Port. The data were collected using semi-structured questionnaire and informal inventory sampling design which include landing declaration on generic fish names, landing weight, day and production areas beginning from 25th November to 20th December 2024, analysed using IBM SPSS Statistics version 20 and foundational revenue valuation, and presented in forms of tables and figures. The findings revealed that fish landing weights and frequencies at Juba River Port vary by types of fishes and production areas (worth more than ten billion South Sudanese Pounds or > SSP 10,000,000,000 per year) with *Oreochromis* fish having the highest but fluctuating landing frequency and total landing weight of 60,144 kg or 60 tons worth almost one billion South Sudanese Pound (SSP 902,160,000) per month (or SSP 10,825,920,000 per year) having the potential to cater for school fees, salaries of government employees and other projects. Two types of fish species (*Oreochromis* and *Heterotis*) are the most harvested and landed types of fishes from Sudd and other aquatic ecosystems. Other findings include the most frequent production areas supplying fish, type and mode of fish transaction, and recommendations for further studies.

Keywords: *Fish Transaction, Landing Weight, Inventory, Landing Site, Port, Sudd Wetland, South Sudan.*

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I. INTRODUCTION

The contribution of fish landings to food supply were estimated at approximately 80 or 195 billion dollars annually (FAO, 2024; Bueno-Pardo et al., 2020). Fish landing at landing sites or ports is an important component in fisheries resources or fish supply and value chains.

With the term landing site or port referred to as a blended area between land and water body, fish landing site or port is a place along a beach or point on the shore of any water/ coastline where boats land off their fish catches and then transferred to market or transport vessels load/ off-load (Semba, 2020; Saint Helena 2013; Chandra et al., 2011; Ali et al., 2004). Recording and reporting data of fish landing weights based on different types of fishes and production areas are other important considerations of fish landing sites or ports. The data may not only contain tables showing daily landing weight of fishes and their respective production areas but also associated prices per kilograms (Sathianandan, 2018) and/or tonnage as appropriately applied in many cases.

Fish landing site or port also requires structural specifications and equipment (layout of premises, equipment, and water supply), operational hygiene requirements (staff, waste and control), and food safety control system (HACCP, traceability, competent authority) among others, mainly to ensure safety conditions and best quality of fish and other fisheries resources (Goulding, 2016). Besides ensuring fish quality and/or safety conditions at landing sites, effective operation of a landing site also involves recruitment or participation of landing site workers. The workers can be

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free-lance, employees under the port authority or blockers under blockers union/association. In some landing sites, these workers are either nationals or foreigners (Yoshimura et al., 2016). The workers, middlepersons and customers are all part and partial of fish transactions at any landing site or port and market. As an operational exchange of fish business, fish transaction is considered in this study as an exchange of fish business dealing between producers (fishers or farmers) and customers (traders [wholesale or retail; including middlepersons] and end consumers) of fish and fish products along the fish supply chain (UNCTAD, 2023; Wolf and Asche, 2022; Gonzalez-Mon et al., 2019) following declaration and availability of landed fish stocks.

In countries that even lack technical expertise or financial resources to conduct assessment of fish biomass and surveys, fish landing and transaction still play a crucial role in estimates of stock status of fish and other fisheries resources (Bueno-Pardo et al., 2020) though previously considered a poor index of population abundance and structure because of market regulations as well as varying efforts and related restrictions (Pauly et al., 2013). So, landing data in terms of fish landing frequency and weight estimates, types of fish and sources of fish production are considered crucial information at any landing sites or ports. Insufficient or lack of such data on fish identification and/or landing inventory at landing sites or ports is one of the major problems hindering information generation on the awareness of the contribution of fish and other fisheries resources as well as concerns over their threats and/or sustainability.

In Juba and South Sudan at large, the status of fish landing at ports or landing sites is still unknown. Absence of such data or studies may even jeopardize efforts to trace and document previous or current trends in landings of fish and fish products that might revealed the status fish landing or supply (Ssebisubi, 2013) by states or nationwide as well as their valuation and potential threats. As such, the objectives of this study were to assess landing weight according to type of fish and production area, determine fish landing frequency and ranks as well as allied transaction at Juba River Port in Juba in the Republic of South Sudan. The need to conduct such a survey at fish landing sites or markets has previously been encouraged by other researchers (Satia and Staples, 2004), which often require monitoring of fish harvest with a focus on economic activities or market indicators (World Bank, 2024; Kelleher et al., 2012). With such surveys, the trend in fish landing or supply status (in kilograms or tonnage) may help portray estimates in terms of the rate of the landing volumes being constant, increasing, decreasing or fluctuating over time for all or individual fish species. Investigating fish landing and transaction at Juba River Port encompassing management perspectives of the port administration and selected inventory (e.g. weight, type of fish) present important information and a key step towards uncovering fish total (and species specific) harvest estimates as well as the monetary value of fish landings or contribution of the fishery sector in South Sudan.

II. MATERIALS AND METHOD

➢ *Study Area*

Juba Old-River Port (orange color in Fig 1), where the data were collected, is located at longitude 31°62’03.00”N and latitude 4°85’82.00”E in Juba Block of Juba County in Juba, the state capital of Central Equatoria State and the national capital of the Republic of South Sudan. The port is owned by the national government, administratively under the Ministry of Transport, and it is currently the main (though temporary) landing site in Juba awaiting completion of the ongoing construction of final Juba New-River Port (green color in Fig 1) (as also reported by Ministry of Transport, 2022) adjacent to Konyokonyo market in Kator Block of Juba County at longitude 31°61’44.27”N and latitude 4°83’11.27”E.

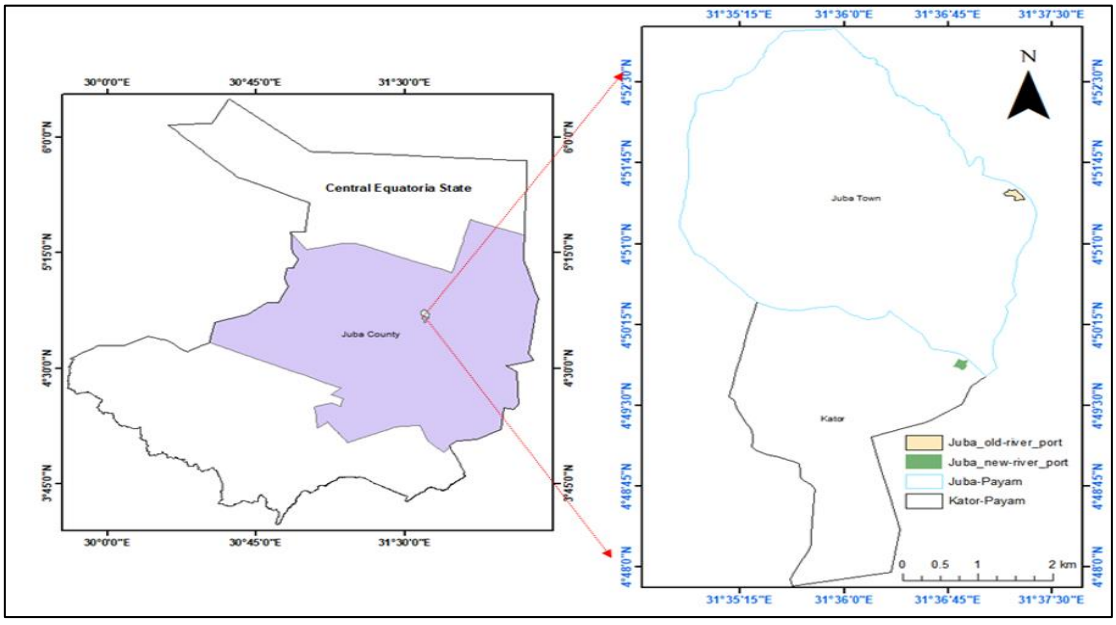

Fig 1 A Map Showing the Study Area at Juba River Port
(Source: Field Data).

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➢ *Data Collection and Materials*

Prior to data collection, an informal assessment was conducted to identify the most common fishes landed at Juba River Port and price per kilogram. A total of four types of fishes, including Tilapia or Oreochromis (SSP 15,000 per kilogram), Heterotis (SSP 10,000 per kilogram), Distichodus (SSP 10,000 per kilogram) and Gymnarchus (SSP 12,000 per kilogram), were documented. Under the category of other fishes, Protopterus or Lung fish was identified among the landed types of fishes. Fish names were recorded and reported at genus level (only) using Bailey (1994) and Sandon (1950) as guides. All in-text citations were arranged in a descending order; starting with the most recent source(s), chronologically. The price per kilogram of Lung fish was SSP 5,000. Furthermore, the data on management perspectives regarding operations and fish related landings at Juba River Port were collected using semi-structured questionnaire comprising of open and closed ended questions. Additionally, data on fish name, production area, landing weight, time and economic value per month were collected as the selected fish landing inventory. An informal inventory sampling design was used to determine the selected inventory data collection on generic name, landing weight and day as well as production area. Data on production areas were obtained via landing declaration by a fish dealer who was a middleperson found actively managing fish transaction in Juba River Port.

Moreover, this study lasted for a period of four weeks starting from 25th November to 20th December 2024 every Monday through Friday between 7:00AM and 4:00PM. Saturday and Sunday are excluded because there are no boats' loading/offloading activities on these two days (i.e. boats may arrive on these two weekend days but can't be offloaded). During the first week, Juba River Port was visited for almost all the five week days. But field visits during the following three weeks were done based on phone call notification from the fish dealer (or middleperson). That's to say, when a boat landed at Juba River Port, the fish dealer makes a call before it is offloaded. Furthermore, if a boat arrived at night hours, offloading is done the next day.

The questionnaire was printed out (hard copies) as guide for collecting the data on management perspective. Mobile phone was used for taking photos, pen and notebook for taking notes and recording additional information or comments. All fish landing weights were measured using MP-platform weighing balance scale as shown below (Fig 2).

Fig 2 MP-Platform Scale Used for Weighing Fish Landing Weights by Sacks
(Source: Field Data).

➢ *Data Analysis*

The data collected for this study were organized using Microsoft Excel 2013 and analysed using IBM SPSS Statistics version 20. The findings of the data analyses were presented as descriptive statistic in the forms of tables and figures (e.g. mean, frequency). The units of calculations of fish landing weights were kilograms and tons as documented in metric conversions (Johanns, 2024; Weiland and Smith, 2007). The term figure refers to either a chat or picture in this study.

Using an estimated total cost per fish landing trip (either SSP 5,000,000 or SSP 10,000,000), the approximate profit from the total value of the fish landed at Juba River Port during the study period, using the foundational revenue valuation of profit upon obtaining the total revenue (quantity of fish landed x selling price of fish), was computed as: Profit = (Quantity of Fish Landed x Fish Selling Price in the Market) – Total Cost.

III. RESULTS AND DISCUSSION

➢ *Juba River Port*

According to the introductory or general information obtained from the management of Juba River Port, the following key findings were revealed about the Port. As listed below, Juba River Port is:

- A Government owned landing site or port. But the Government is not involved in the management of fish landing and transactions.
- A Port that started hauling fish around 2012 under Engineer Marisan and Philip Apath.
- Operational between 6:00am and 4:00pm (vary by types of businesses).
- Still operating without a website or online present; and its management is also undecided on developing any.

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- A Port that receives irregular landings of fish products at any time of the day or night from Monday to Sunday. But offloading is done only during day time from Monday to Friday between 7:00am and 4:00pm.
- A Port that facilitates landings and transactions of different fish products (e.g. fresh, salted, sundried etc.).
- A Port that also facilitates production and transaction of ice and ice-cooling boxes/rooms as well as transportation of other goods to Jonglei and Bahr El Ghazal, and maintenance of boats.

➢ *Landing Weight at Juba River Port Based on Fish Name and Production Area*

Table 1 Fish Landing by Week Days at Juba River Port

Week No.	**Week Days**				
	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1				Phankuei	
Week 2	Phanhial	Phanwel	Marial	Pagok	Phanhial
Week 3		Hizak	Pagok		Phankuei
Week 4	Phankuei	Phankuei		Hizak	Hizak

(Source: Field Data)

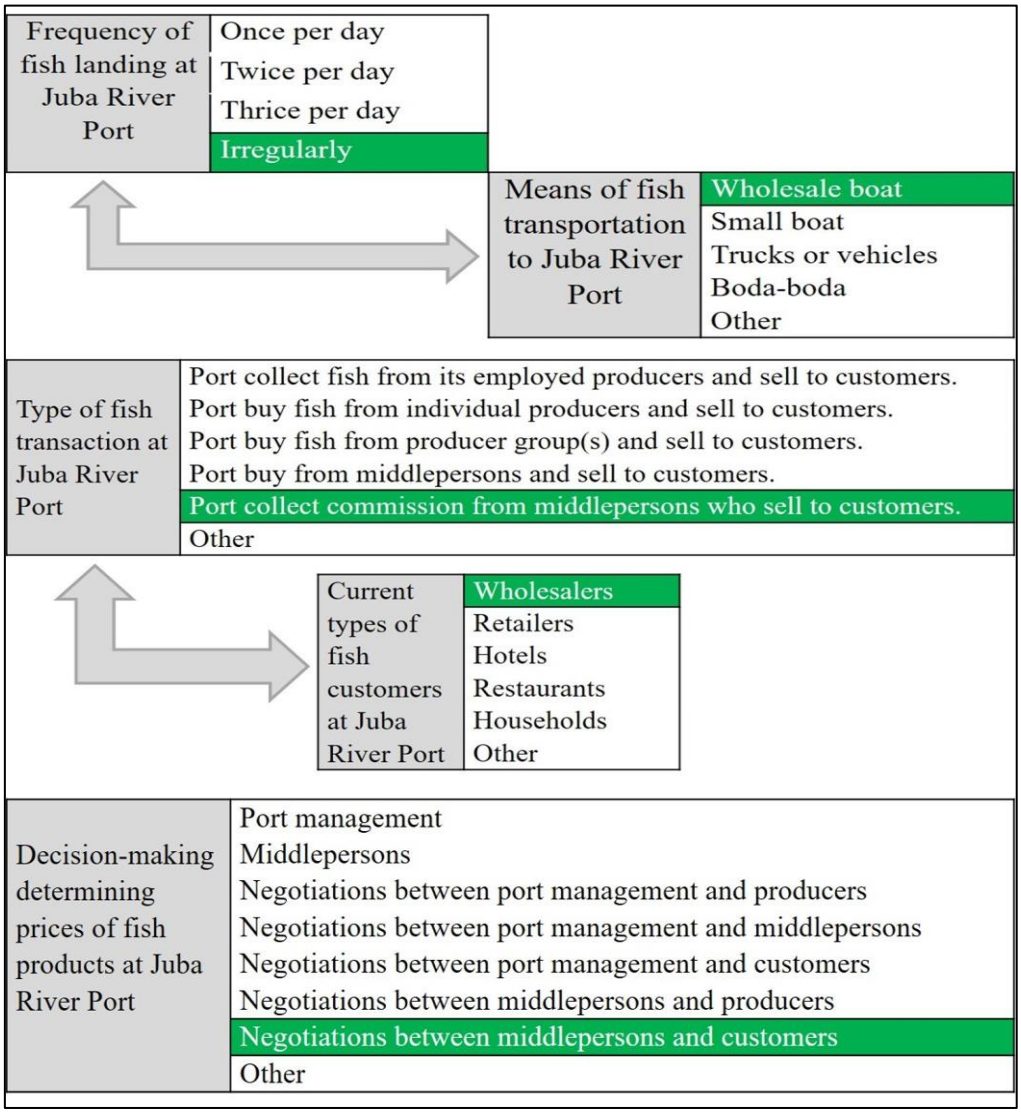

Fig 3 Landing Frequency, Means of Transporting, Transaction and Price Determination of Fish at Juba River Port (Source: Field Data).

Besides price per kilogram and other inventory records, portraying records of fish landing weights and production areas supplying landing sites are a key component of landing estimations (Sathianandan, 2018). In this study, fish landing weights vary by types of fishes at Juba River Port (Fig 4 and Tab 2).

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Fig 4 Data Recording From Weighing Scale and Fish Landed in Sacks at Juba River Port Each Sack Contains One Type of Fish. (Source: Field data).

Table 2 Landing Weight (Number of Sacks) of Fish at Juba River Port. Other Fish Found was Lung Fish

Week No.	Fish Name	Monday	Tuesday	Wednesday	Thursday	Friday	Total
Week 1	Oreochromis	0	0	0	5,525 kg (55)	0	5,525 kg (55)
	Heterotis	0	0	0	0	0	0
	Distichodus	0	0	0	0	0	0
	Gymnarchus	0	0	0	0	0	0
	Other	0	0	0	0	0	0
	Sub-total	0	0	0	5,525 kg (55)	0	5,525 kg (55)
Week 2	Oreochromis	7,722 kg (79)	3,990 kg (38)	4,920 kg (48)	3,794 kg (36)	3,210 kg (31)	23,636 kg (232)
	Heterotis	0	398 kg (4)	212 kg (2)	100 kg (1)	513 kg (5)	1,223 kg (12)
	Distichodus	0	319 kg (3)	0	0	0	319 kg (3)
	Gymnarchus	0	0	0	0	0	0
	Other	0	0	0	0	0	0
	Sub-total	7,722 kg (79)	4,707 kg (45)	5,132 kg (50)	3,894 kg (37)	3,723 kg (36)	25,178 kg (247)
Week 3	Oreochromis	0	5,283 kg (51)	5,219 kg (50)	0	4,883 kg (47)	15,385 kg (148)
	Heterotis	0	219 kg (2)	221 kg (2)	0	0	440 kg (4)
	Distichodus	0	0	0	0	0	0
	Gymnarchus	0	0	0	0	0	0
	Other	0	103 kg (1)	0	0	0	103 kg (1)
	Sub-total	0	5,605 kg (54)	5,440 kg (52)	0	4,883 kg (47)	15,928 kg (153)
Week 4	Oreochromis	5,344 kg (51)	1,533 kg (15)	0	6,934 kg (66)	1,787 kg (17)	15,598 kg (149)

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	Heterotis	309 kg (3)	228 kg (2)	0	318 kg (3)	0	855 kg (8)
	Distichodus	0	0	0	0	0	0
	Gymnarchus	0	0	0	0	0	0
	Other	0	0	0	0	0	0
	Sub-total	5,653 kg (54)	1,761 kg (17)	0	7,252 kg (69)	1,787 kg (17)	16,453 kg (157)
	Total	13,375 kg (133)	12,073 kg (116)	10,572 kg (102)	16,671 kg (161)	10,393 kg (100)	63,084 kg (612)

(Source: Field Data).

Table 3 Average Landing Weight of Fish Sack at Juba River Port

Week No.	Fish Name	Min. Weight	Max. Weight	Total Weight	Number of Sac	Mean Weight of Sac
Week 1	Oreochromis	35 kg	115 kg	5,525 kg	55	100.45 kg
	Heterotis	0	0	0	0	0
	Distichodus	0	0	0	0	0
	Gymnarchus	0	0	0	0	0
	Other	0	0	0	0	0
	Sub-total			5,525 kg	55	**100.45 kg**
Week 2	Oreochromis	50 kg	115 kg	23,636 kg	232	101.88 kg
	Heterotis	73 kg	112 kg	1,223 kg	12	101.92 kg
	Distichodus	105 kg	108 kg	319 kg	3	106.33 kg
	Gymnarchus	0	0	0	0	0
	Other	0	0	0	0	0
	Sub-total			25,178 kg	247	**103.38 kg**
Week 3	Oreochromis	73 kg	115 kg	15,385 kg	148	103.95 kg
	Heterotis	104 kg	115 kg	440 kg	4	110 kg
	Distichodus	0	0	0	0	0
	Gymnarchus	0	0	0	0	0
	Other	103 kg	103 kg	103 kg	1	103 kg
	Sub-total			15,928 kg	153	**105.65 kg**
Week 4	Oreochromis	77 kg	115 kg	15,598 kg	149	104.68 kg
	Heterotis	101 kg	115 kg	855 kg	8	106.88 kg
	Distichodus	0	0	0	0	0
	Gymnarchus	0	0	0	0	0
	Other	0	0	0	0	0
	Sub-total			16,453 kg	157	**105.78 kg**
	Total			63,084 kg	612	**103.82 kg**

(Source: Field Data).

Fish landings weights vary by types of fishes and daily/weekly records (Tab 2). During the first week, Oreochromis or tilapia fish was the only type of fish that landed on Thursday with a total landing weight of 5,525 kg from 55 sacks. In the second week, Oreochromis fish has the highest landing weight of 23,636 kg from 232 sacks, followed by 1,223 kg for Heterotis fish from 12 sacks, 319 kg for Distichodus fish from 3 sacks with a grant total landing weight of 25, 178 kg (247 sacks) for all types of fishes. Landing weight also vary during the third and fourth weeks. The total landing weight for all the four weeks was 63,084 kg from 612 sacks. As shown in Table 3, the average landing weight of fish sack also vary right from the first week (100.45 kg), second week (10.38 kg), third week (105.65 kg) and fourth week (105.78 kg) with a sum of average of 103.84 kg or 104 kg for the whole study period.

In the context of 2-3 years trends in fish landings, Ssebisubi (2013) revealed an increasing landing estimates of Tilapia compared to Nile perch (fluctuating landing estimates) and Mukene (constant landing estimates) in Uganda. Landing weights for tilapia or Oreochromis fish differ in this study. As shown in Figure 5 of this study, records for landing weights of tilapia or Oreochromis fish differ in spite of the uniqueness in the type of species identified and duration of the study among other parameters. Landing weights of Tilapia at Juba River Port were fluctuating.

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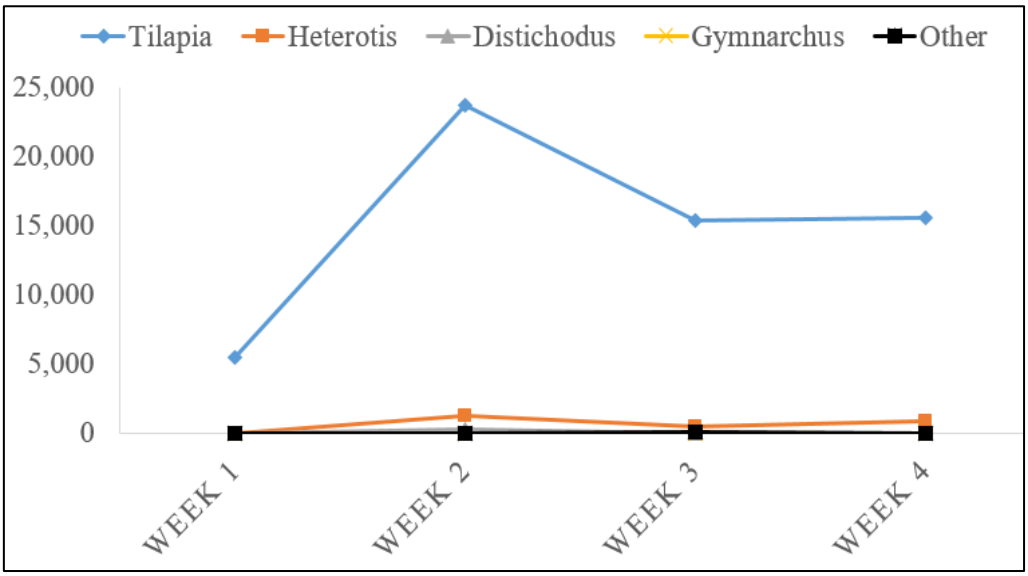

Fig 5 Weekly Fish Landing Weight at Juba River Port (Other: Lung Fish)
(Source: Field Data).

Juba River Port also has workers to load and/or off-load fish and other goods (Fig 6). The workers are Blockers under Blockers Union/Association (unlike in some cases where the workers are Port Employees or Freelance Blockers etc.).

Fig 6 Fish Landing Blockers Offloading a Wholesale Boat at Juba River Port
(Source: Field Data).

➢ *Type of Fish Transaction at Juba River Port*

Fish transaction at Juba River Port is supported by individual connections among producers, middlepersons and all customers. Business was the type of relationship influencing fish transaction (unlike in some cases where transaction relied on other relationships such as family, friend, colleague etc.).

Although fish transaction at Juba River Port used to reach different types of customers (e.g. wholesalers, retailers, households etc.), the fish dealer or middleperson currently trading fish landings at Juba River Port deals with wholesalers only (Fig 3). These wholesalers transport their fishes from Juba River Port to their respective destinations mainly using Rickshaw and/or Boda-boda (Fig 7).

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Fig 7 Customers' Means of Fish Transporting Fish from Juba River Port
(Source: Field Data).

Understanding price determination of fish is an important component of fish landing and transactions at any fish landing site or port. In this study, the main factor influencing prices of fish products at Juba River Port is free/open price setting via negotiations between middlepersons and customers/producers (unlike in some cases whereby prices are influenced by landing volumes among other factors). The role of individual-based or cooperative-based middlepersons in price setting and negotiations has been documented (Gomez and Maynou, 2021; Desai and Baichwal, 1959).

The main transaction characteristics in operation at Juba River Port landing site was reliance on negotiations between middlepersons and customers/producers (Fig 3). According Yoshimura et al. (2016), the transaction characteristics in operation not only involves middlepersons and customers/producers but also landing site owners (a disagreement). Involving landing site owners is probably deemed fit in the context of private landing site as in the case of Yoshimura et al. (2016) unlike in the case of Juba River Port which is a government-owned landing site.

➢ *Fish Landing Frequency and Ranking at Juba River Port*

Table 4 Fish Landing Weight, Frequency and Ranking Based on Production Area

Production Area		**Weekly Landing Weight (kg)**				**Landing Frequency**	**Frequency-based Ranking**	**Total landing weight (kg)**	**Weight-based Ranking**
Name of Area	**County / State**	**Week 1**	**Week 2**	**Week 3**	**Week 4**				
Hizak	Twic East, Jonglei			5,605	9,039	3	2nd	14,644	2nd
Marial	Twic East, Jonglei		5,132			1	4th	5,132	5th
Pagok	Bor, Jonglei		3,894	5,440		2	3rd	9,334	4th
Phanhial	Duk Padiet, Jonglei		11,445			2	3rd	11,445	3rd
Phankuei	Twic East, Jonglei	5,525		4,883	7,414	4	1st	17,822	1st
Phanwel	Twic East, Jonglei		4,707			1	4th	4,707	6th

(Source: Field Data).

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Table 5 Total Lading Weight and Estimated Value of Fish at Juba River Port (Other = Lung Fish; N/A = Not Applicable)

Fish Name	Total Landing Weight		Total Monetary Value (SSP)		Unit Conversion Monetary Difference (SSP)	Weight-based Ranking
	Kg	Ton	Per kg	Per ton		
Oreochromis	60,144	60.14	902,160,000	902,100,000	60,000	1st
Heterotis	2,518	2.52	25,180,000	25,200,000	-20,000	2nd
Distichodus	319	0.32	3,190,000	3,200,000	-10,000	3rd
Gymnarchus	0	N/A	N/A	N/A	0	5th
Other	103	0.1	515,000	500,000	15,000	4th
Total	63,084	63.08	931,045,000	931,000,000	45,000	N/A

(Source: Field Data).

IV. CONCLUSION

Landing weights and frequencies at Juba River Port vary by types of fishes. The most common landed types of fishes are Oreochromis fish (or tilapia fish), Heterotis fish, Distichodus fish, Gymnarchus fish and Protopterus fish (or Lung fish). Tilapia or Oreochromis fish alone (Fig 8) has the highest landing frequency and total landing weight of 60,144 kg or 60 tons worth almost one billion South Sudanese Pound or SSP (SSP 902,160,000) (Tab 5) per month, albeit at fluctuating rates (Fig 5). The total landing weight for all types of fishes during the study period was 63,084 kg or 63 tons that worth a sum of SSP 931,045,000 or nine hundred thirty-one million forty-five thousand South Sudanese Pounds. At such landing weight per month, the annual fish landing weight may surpass 700,000 kg (757,008 kg) that worth more than ten billion South Sudanese Pounds SSP 10,000,000,000 (SSP 11,172,540,000) if production and supply conditions remain constant. Two types of fish species (i.e. Oreochromis and Heterotis) are the most harvested types of fishes during the study period (or probably across South Sudan). Such a finding potentially attracts the need for a comprehensive biodiversity assessment or targeted investigation on the most threatened fish species via fishing (a common anthropogenic pressure; besides land use etc.) and other pressures (climate change; e.g. inconsistent rainfall, flooding, rising temperatures etc.) here in South Sudan. Such concerns in South Sudan have already been raised or documented (World Bank, 2024; Zeleke et al., 2024; Nile Basin Initiative, 2022, 2020).

Fig 8 Gatkhor Wuol Holding Oreochromis Fish During Data Collection at Juba River Port (Source: Field Data).

A comprehensive study should also factor the cost of inputs, such as collection of undocumented charges at multiple check-points portrayed by Alosias (2023), taxes collected by the State or local authorities, cost of ice, labor and fuel (etc.) when projecting such monetary value. If, for instance, the cost of inputs was estimated around SSP 5,000,000 or SSP 10,000,000 per the number of landing trips underscored in Table 1, the monetary value would have amount to SSP 866,045,000 or SSP 801,045,000 or simply eight hundred million forty-five thousand South Sudanese Pounds per month. With such monetary value of almost a billion South Sudanese Pounds per month or more than ten billion South Sudanese Pounds per year from only four types of fishes within just a period of four weeks – if properly collected and credibly audited with accountability under competent authority – alongside investment on development of a robust aquaculture industry nationwide, the contribution of the fishery subsector cannot only cater for supply/value

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chains actors' basic needs (e.g. medication, transport fares, school fees) but also probably paying salaries of government employees and cater for some funding gaps in developmental projects or programs (e.g. infrastructures and other services) across South Sudan. And it is believed that such contributions is one of the untapped potentials of the rich natural resources (fisheries) of South Sudan that should be utilized sustainably to achieve economic development in line (or without compromising) conservation and biodiversity goals.

Fish transaction in Juba River Port is done on a basis of business relationship via individual connections as well as negotiations between middlepersons and customers/producers. Most of the fishes during the study period came from Phankuei and Hizak production areas (landing weights and frequencies); with all these two areas located in Twic East, Jonglei State (Tab 4).

As recommendations from the findings of this study, similar further studies should be conducted for periods longer than four weeks; and encompassing even landing variations between seasons and more than one landing site (including other ports or landing sites). With Oreochromis and Heterotis being the most dominant types of fishes landed at Juba River Port or harvested from Jonglei State, this may raise the need to investigate ecosystem pressure via human activities (e.g. fishing) in terms of identification and quantification of harvested types of fishes in the production areas in Table 1; including the Sudd wetland and other water bodies within or near Jonglei State. Portraying probably higher rate of harvest may raise concerns over threats to some types of fishes and related impact on aquatic ecosystem.

In addition, concerns over some common challenges such as decreasing fish harvest, high cost of fuel, difficulty in finding workers, lack of policies on general requirements for fish landing at Juba River Port and other landing sites in South Sudan should also be investigated. Improving research communication on the estimated contributions of fish and fisheries resources to Growth Domestic Product and related economic activities in collaboration with development partners (Kelleher et al., 2012) and continuous surveys at fish landing sites and markets are important in giving indications of fish value and even trading trends (Satia and Staples, 2004) that encompass upgrading possibilities in terms of provision of cold chain and portable water systems. Such efforts should also not overlooked the impacts of climate change which include climate extremes (e.g. inconsistent rainfalls and flooding, rising temperatures etc.) as well as anthropogenic pressures (e.g. fishing, settlement of returnees and land use changes, pollution from municipal liquid or solid wastes) (World Bank, 2024; Zeleke et al., 2024; Pinna et al., 2023; Nile Basin Initiative, 2022; Bowler et al., 2020) on fish and other aquatic biological communities.

Because previous studies (e.g. Yoshimura et al., 2016) indicated that landing sites owned by government were not kept clean compared to private landing sites, further studies should evaluate hygiene and sanitation in Juba River Port to compare such a claim as most of the sacks were landed on plastic sheets on the ground as shown below.

Since Juba River Port is still operating without a website, and its management or administration was not sure or still undecided on developing/establishing such an online presence sooner, it is recommended that the Ministry of Transport and/or the administration of Juba River Port develop a website for the port. Unless concerns over the known common challenges (e.g. lack of online data protection etc.) associated with online fish transactions out-weigh the common benefits (e.g. extensive customer reach geographically, reduced paperwork etc.), having a website may even bring more opportunities such as targeting online customers, and the potential for integration of electronic One Stop Shop in South Sudan (as emphasized by Alosias, 2023). This is also considered a promising avenue since some South Sudanese preferred or are willing to explore online sources of information about fish (Alosias and Draga, 2022).

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- *Contribution Statement*

John Alosias: conceptualization, methodology, drafting, data analysis, writing and editing. Gatkhor Gatluak Wuol: data collection and writing.

- *Conflict of Interest Statement*

The authors declare no conflict of interest.

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