

Enforcement on Allowable Fishing Gears and Boat Licensing Permits Cause Fishers to Avoid Designated Landing Sites

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Abstract

A study was conducted in Stratum I of Kafue Fishery for three months, from January to March to assess whether enforcement on allowable fishing gears and boat licensing permits were major contributing factors to fishers avoiding designated landing sites. Stratum I had a higher number of artisanal fishers partly because of its close proximity to Kafue town compared to other strata and also because the area had very highly productive lagoons namely; Chunga, Luwato and Chanyanya that encouraged more fisher entry into the fishery as a result of “good fish catches”, that led to having more permanent fishing villages. Data was collected through administration of questionnaires, personal interviews and by observations. Results obtained revealed that most of the fishers relied on fishing as their main source of income, employment and food (proteins). In spite of the government effort to manage the fisheries resources by control of fishing methods, reduce overexploitation of the fish by restricting entry to the water body through issuance of fishing licenses and setting up of designated landing sites where fishers were expected to land captured fish, the outcome was that fishers chose not to comply with the law. They avoided designated landing sites, from Kafue Gorge to Nanga and opted to use non-designated ones. It was further observed that following a decline in catch, these artisanal fishers had come up with modified fishing gears to increase their catch as the recommended ones could not catch much. Most of the fishers were using seine nets, long lines, baskets and gillnets of mesh sizes that ranged from 25 mm to 63 mm (1.0 to 2.5 inches). The illegal mesh size nets represented 28% of the total number of gillnets used in the fishery. That being the case, they landed their fish away from the designated landing sites. Other factors that contributed to avoidance of landing sites included: lack of storage facilities, absence of fish traders on some landing sites and poor road infrastructure for transportation of fish to the market. Furthermore, the increase in the price of a fishing license aggravated the situation to the extremes.

Keywords: Enforcement; Fishing Gear; Landing sites; Avoidance; Kafue Fishery

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Introduction

The Kafue River Basin is a major sub catchment of the Zambezi River Basin and lies entirely within Zambia (Schelle and Pittock, 2005) and with an area of 156 995 km² comprises about 20% of the total land area of the country (Tweddle., *et al.* 2015). The Kafue River, which

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is about 1,000 km long from its source (Chabwela and Mumba 1998), presents an opportunity to examine the importance of water regime in a highly relevant social, economic and environmental context: heavily exploited artisanal fisheries (Deines, *et al.* 2013). Stratum I of the Kafue fishery is mostly dominated by artisanal fishers whose fishing operations are predominantly gill netting using craft made of planks or fiberglass. Dugout canoes still feature in fishing operations on almost all water bodies (Mbewe, 2006).

The fisheries sector in Zambia like elsewhere was currently under serious threat due to unsustainable fishing practices such as fish poisoning as well as weak regulatory framework which had seen a number of unlicensed players in major fishing areas (SADC, 2016). The Kafue Flats floodplain fishery, which historically yielded between 6000 and 8000 tonnes of fish per year was considerable to be under threat from both internal and external pressures (ACP Fish II, 2011). In recent years, the resources of the Kafue River have come under severe pressure due to a variety of economic and ecological factors associated with over-fishing and a significant decline in fish species (APFM, 2007). Because of the heavy pressure on fish resources, catches were declining with increase in fishers and wrong fishing methods (CSO and DOF, 2006), which has resulted into increasing evidence of hardship amongst the fishing household (Geheb and Crean, 2003). Illegal fishing methods impact negatively on the fish as they disturb breeding sites, migration routes and indiscriminately kill fish.

According to the 2006, CSO frame survey report, it was noted that “a club shaped stick” called *Mundili* in Lozi, was used to hit the water so that fish in all surrounding areas got driven to be caught into the set gillnets. The practice was, one of the many illegal fishing method used to increase the efficiency of gillnet. Fishers had also resorted to fish poisoning, using mosquito nets and Chikukula, a net made of potatoes sacks, which went up to 400m and caught fish of all ages (CSO and DOF, 2006), fish traps, weirs and Kutumpula; where fish was driven into set 63 mm meshed net (Haller, 2013) by beating the water surface with wooden planks. Kutumpula as the process was very common in Kafue fishery as a number of *Mundili* were seen lying around as frame survey data was being collected. Some fishers used the same “supposedly” stationery gillnets as mini-active draw nets in a process known in one ethnic language as Kapopela. Furthermore, others set the nets across the river and drifted along with the water flow/current in what was being called “drift netting”. These were all illegal methods of fishing and had caused most fishers to avoid landing their fish with such types of gears.

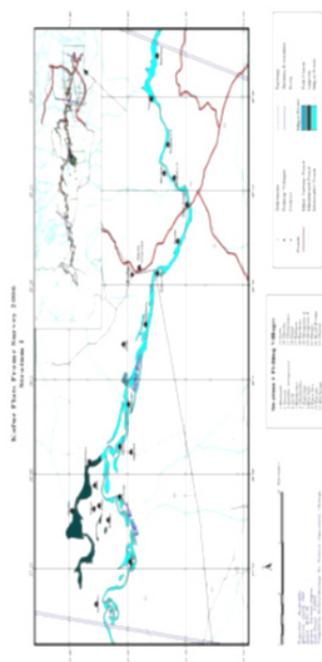
In an effort to address the problems affecting fisheries exploitation in Zambia, and in line with the Zambia Amended Fisheries Act 2007, the Department of Fisheries, initiated the formulation of fisheries management plans for well-defined water bodies in Zambia that make significant contributions to fish production (ACP Fish II, 2011). Rules require that all the fishers in the stratum oblige with the law by landing captured fish at designated landing sites to help in the management of the aquatic diversity. Even where the law exists, control measures in place were not effectively implemented as most of the fishers still avoided the designated landing sites, which were established along Stratum I of the Kafue fishery for observation of fishing activities in the stratum; a one off way of monitoring fishing gear, license and check for the amount of fish being caught per day and per year.

It was against this background that a study was conducted for three months (from January to March), in Stratum I of Kafue fishery to assess whether enforcement on allowable fishing gears and boat licensing permits were major contributing factors to fishers avoiding designated landing sites despite the rules and regulations implemented by government through DoF being there.

Materials and Methods

Description of Study Site

Stratum I of the Kafue fishery is an area which stretches from Kafue Gorge to Nanga covering all the fishing camps and fishing villages along the river sides (Mbewe, 2006).



Map of Stratum I of Kafue Fishery (Source; 2006 frame survey).

Sampling Method

There were 22 permanent and 1 temporal fishing villages, with only four major designated landing sites and a lot of illegal ones along the stretch of the entire stratum. All the designated landing sites and a selected few of the illegal ones were visited to collect data. Fishers were selected using a simple random sampling method at each landing site visited. A total of thirty-four questionnaires were administered to the fishers and one institutional questionnaire was administered to DoF.

Data Collection

Both primary and secondary data were collected.

Primary data

Primary data was collected through administration of questionnaires, personal interviews and by observations. The main instruments for data collection were self-administered questionnaires using mostly closed ended and a few open ended questions to collect all the information. Data collected included: information on the number of landing sites, the type of fishers who avoided landing sites, the reasons for landing sites avoidance, the number of fishers in the stratum, the landing sites being avoided, fishing gear prevalence and number of fishers with and without fishing licenses.

The structured questionnaire was pre-coded and the construction of the questionnaire was based on both closed and open ended questions, which were converted into numbers. De Vaus (2002) defines coding as a process that aims at transforming responses of interviews (e.g. closed ended questions) into numbers. Similarly, according to Neuman (2003), the process of coding however helps the researcher to present their raw data better.

Secondary Data

Secondary sources of information for this study included academic journals and publications. Much of the information was obtained through frame surveys conducted by the DoF and Central statistics office (CSO) (2006). Other relevant information was obtained from the internet and books.

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Data analysis

The data collected was analysed using SPSS version 17 and Microsoft Excel was used to come up with appropriate tables and charts.

Results and Discussion

The Fisheries Act of 2011 under the Laws of Zambia regulates the Fisheries Sector with the objective of improving the involvement of communities in fisheries management and promoting development of the aquaculture sector (SADC, 2016). The Fisheries Act defines under what conditions fishing is allowed for residents of Zambia with a licence and what equipment is allowed to be used in so-called defined commercial fishing areas such as the Kafue Fishing area or the Kafue River (Haller, 2013). It also defines the control of fishing (Haller, 2013). According to the fisheries Act of 2011, no person was allowed to: (i) use equipment for fishing which does not conform to any standard prescribed for that type of fishing equipment, including any net or trap the mesh size of which does not conform to the prescribed minimum mesh size for that type of net or trap either generally or in a prescribed area; (ii) use any weir or fishing equipment which is prohibited under this Act; or (iii) use for fishing, fishing nets that are of a number and size exceeding that which is permitted under this Act (SADC, 2016).

In the commercial fishing areas of the Kafue flats, everybody needs a licence, even the local people, if they fish commercially. It is clear that the procedure to get a license is complicated (Haller, 2013).

Fisher categories

Legally, the area is opened up by the giving of licenses to everybody in the country who wishes to fish (Haller, 2013). Stratum I had two major fisher categories, namely full-time and part-time fishers. However, the majority were full-time fishers, whose representation was 79.4%, while part-timers constituted a partly 21% (Figure 1).

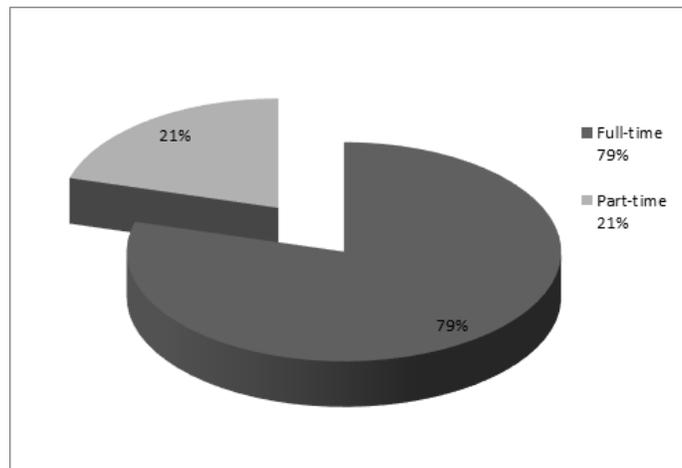


Figure 1: Status and percentage representation of fishers in stratum I.

Most of the full-time fishers were mainly found in permanent settlements partly because of the stratum’s close proximity to Kafue town compared to other strata and also because the area had very high productive lagoons namely; Chunga, Luwato and Chanyanya that encouraged more fisher entry into the fishery as a result of “good fish catches”. Fisheries are seen as offering the possibility of benefit to all Zambians (Haller, 2013). According to Mbewe (2006), the Kafue fishery was divided into four strata from its source up to where it ends. Each stratum had different number of fishers, level of exploitation and different types of gear usage. The fishers relied on fishing as their main source of income, employment and food (proteins). Mbewe (2006), equally reported that fishing had proved to reduce poverty mostly in the rural parts of Kafue district due to the great number of people involved in fishing along stratum one of

the Kafue fishery most of which were unemployed and hence dependent on fishing as their source of income. In addition because of its close proximity to Lusaka means that production and output from the region has a ready market (Tweddle., *et al.* 2015).

The study observed that the majority of full-time fishers had been fishing for more than 5 years. The part-time fisher category was mainly found in temporal fishing villages and was not entirely dependent on fishing for their livelihood. They were also involved in other activities, such as farming, small scale business and casual work to earn a living.

Fishers’ marital status distribution

The stratum was characterized by several marital statuses which included; single, divorced, separated and married fishers (Figure 2). Fifty (50%) of the fishers were married, followed by singles at 26%, while the rest comprised: widowers, divorcees and separated.

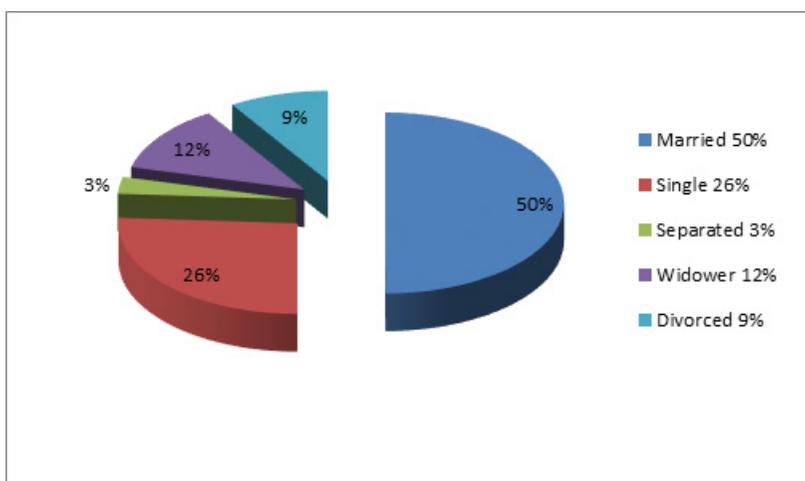


Figure 2: Marital status of respondents in stratum I.

Fisher ethnicity distribution

The fishery had several ethnic groupings, which included: Tonga, Bemba, Lozi, Nyanja and many other tribes (Figure 3).

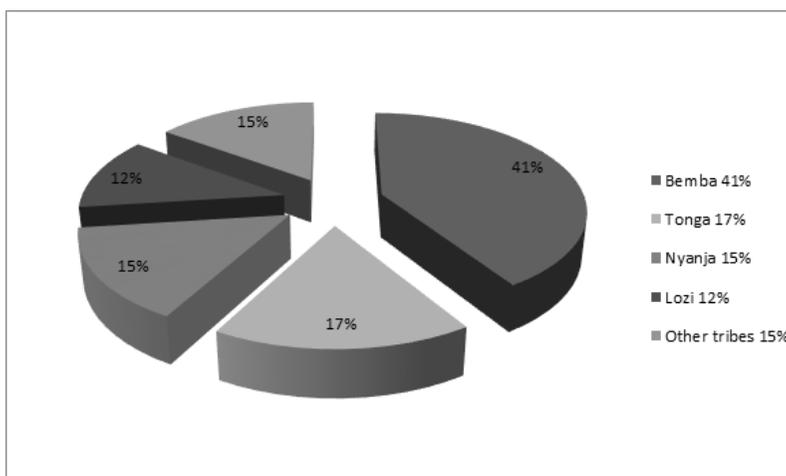


Figure 3: Fishers’ ethnicity.

However, Bembas were a dominant ethnic group (41%), followed by Tongas (17%), Nyanja (15%), others (15%) and Lozi (12%), was the least.

Fish licensing

In accordance with the Fisheries (Fishing Licence Fees) Regulations, 2008, special fishing licence was pegged at K28 per year. There was a marked reduction in the number of fishers obtaining licenses although there was no corresponding reduction in fishing. It was observed that in 2008, where out of a total of 358 fishers in the stratum, only 7 were licensed representing 1.96%. Based on that, it was established that most of them avoided designated landing sites. As such, DoF had no option but to follow the fishers in their fishing camps and villages for licensing. DoF further ensured that the boats were licensed and each boat was given a specific number for identification or confirmation that it was licensed.

Most fishers claimed that the fishing licence was expensive for them, although they were able to fish more than three times a week which made it easy to generate enough money to pay for the licence. But due to poor planning on how to manage the finances realised from fishing, they found it difficult to pay for the licence. Nevertheless, the license does not have a long duration and it is therefore, not in the interest of a license holder to behave accordingly for he can always apply for a new lincense the year after (Haller, 2013). Gillnets are the most widely nets by artisanal fishers in the entire stretch of Stratum I of Kafue Fishery. Each boat was also checked for fishing license at the landing site and any failure to being licensed attracted a penalty. Sanctions are foreseen and by law all fishers not acting as stated in the regulations are committing an offence that will mean that they have to pay a fine. However, these fines are not high and also difficult to enforce (Haller, 2013).

However due to continuous sensitization and patrols on the entire fishery, the number of fishers being licensed began to increase although at a smaller percentage. For instance, in 2009 the number went up to 13, representing 3.63%, in 2010, the number of licensed fishers almost doubled and stood at 7.26%. Similarly, in 2011, the representation of licensed fishers stood at 8.10% and 9.21% in 2012 respectively (Table 1).

Year	Number of licensed fishers	Percentage (%)	Total number of unlicensed fishers	Percentage (%)
2008	7	1.955	351	98.04
2009	13	3.63	345	96.37
2010	26	7.26	332	92.74
2011	29	8.100	329	91.90
2012	33	9.21	348	97.21

Table 1: Number of licensed fishers from (2008-2012) in stratum I.

Unfortunately, licensing does not restrict fishers on the number of nets to own or use since they only paid boat licence. Any person could go fishing as long as he/she used a licensed boat. The study therefore, observed that with massive sensitization and patrols to enforce fisheries regulations, more fishers were able to come forward to license their boats. Enforcements done in collaboration with the Zambia police helped to bring to book all those carrying out illegal fishing operations.

The Kafue River system fishery makes an important contribution to national fish production and supply and statistical records suggest production fluctuated over a 7-year cycle between about 3000 and 10 000 tonnes per year before the closure of the upstream Itezhi-tezhi Reservoir in 1987, but has stabilised around 6000 tonnes per year in recent years, although this is considered a gross underestimate—it is likely the annual harvest in the Kafue Flats will be in excess of 20 000 tonnes per year (Tweddle., *et al.* 2015). However, Shotton (1999) observed that management measures should be put in place such as closures, seasonal closures and regional area

quotas in order to preserve the aquatic resource in the water bodies. These measures were aimed at preserving the aquatic ecosystem in the fisheries as at a global scale, many fisheries were in trouble. Similarly, Hindson., *et al.* (2005), reported that there is need to manage the fisheries more carefully to overturn the current downward trend and to sustain fish production into the future. A fishery management plan should be implemented to manage the fisheries.

Fishing gear usage and net mesh size

Fishing Gear includes all the implements or equipment used to exploit the fishery resource (Mbewe, 2006). The dominant fishing gear used in the Kafue fishery is gillnets (often using in conjunction with beating the water), but longlines, baskets/traps and seine nets are also used (Tweddle., *et al.* 2015). According to CSO (2006), frame survey report for Kafue floodplain fishery, there were; 445 boats (Table 2).

Type of boat	Engine	Canoe	Plank	Fibre	Metal	Asbestors	Total
Number	0	330	3	58	0	54	445

Table 2: Total number of boats in stratum I.

The boats were categorized according to the type of material they were made of. No fisher had a metal boat and at the same time no one used an engine propelled boat (Table 2).

Similarly, there were 13,341 types of gears with various mesh size used by the fishers in stratum I (Table 3).

Fishing gears	Total number
Gillnets	12,341
Seine nets	64
Longlines (hooks)	574
Baskets (mesh size no known)	53

Table 3: Fishing Gears usage by fishers in stratum I.

Emphasis is also on fishing gear whereby seine nets, techniques using noise (Kutumpula) and mesh sizes bellows 76 mm are prohibited (Haller, 2013). The fishery had a standard recommended mesh size of 76 mm (3.0 inches) and above for multi-filament gillnets and not less than 120 mm (4.75 inches) for monofilament nets. This study observed that 28% of the total number of gillnets used in the fishery, were illegal ones (Figure 4).

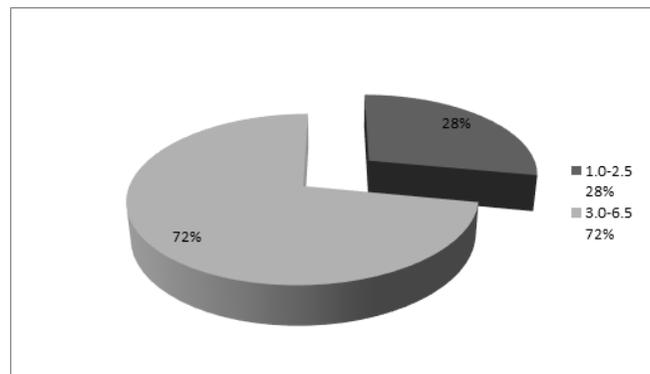


Figure 4: Gillnet Legal and illegal mesh size range.

The stratum had a wide range of fishing gears of mesh sizes that were commonly used by most of the fishers. The frequently used fishing gear was gillnet, followed by long lines, seine nets and baskets. A gillnet was a passive gear that was set, left and removed or hauled the following day or after some time on the same day. The number of nets per fisher was correlated to the number of boats. Each fisher was able to use more than 8 nets on average on the water per day and about ten (10) nets were used as single fleet by each individual fisher on average. Tweddle., *et al.* (2015), reported that some 47% of gillnets in use had mesh sizes below the permissible mesh size and mosquito mesh seine nets were used widely in this fishery. The illegal gears were used to catch tilapia and catfish species (Tweddle., *et al.* 2015).

According to Mbewe (2006), the people along the river were mainly fishers who depended on fisheries as an important source of food, social and cultural benefits and contribute to rural development through employment, income generation, poverty reduction, while others were farmers. Many of the fishers often used seine nets made of mosquito nets, whose mesh size was less than 25 mm (1.0 inch) and others considered to be illegal. The most rampant fishing methods were the non-permitted such as seine nets, driving of fish into the nets (Kutumpula, Sensa, etc), Chikukula, even the use of poisonous stuff and explosives. This increase in illegal gears is coupled with a large increase in number of fishers and their gears over the past 10-15 years thus the relatively stable catches suggest CPUE has declined (Tweddle., *et al.* 2015). According to the authors, the assumption was supported by feedback from fishers during consultation who unanimously indicated that catches per gillnet had declined in recent years, thus driving each fisher to increase the number and length of gillnet set to maintain catches (Tweddle., *et al.* 2015). Equally, the challenge to researchers was for them to develop suitable fishing gear for the Alestes, Clupeids (Kapenta), etc. as opposed to the current use of traditional and untested fishing methods.

Total seine nets (inches)	Percentage (%)
1.0	7.23
1.5	0.58
2.0	1.0
2.5	0.14
Long lines	83.07
Baskets	7.67
Total	100

Table 4: Distribution of Seine Nets and Long Lines/Hooks and Baskets Stratum I.



Figure 5: A towed boat with illegal fishing nets in Stratum I of Kafue fishery.



Figure 6: A DoF Vehicle carrying confiscated nets from fishers in Stratum I of Kafue fishery.

The Department of Fisheries had adopted strict gear restrictions for fishers as the main management tool. The possession of restricted gear on boats was also prohibited and those found wanting, were brought immediately to book through a collaboration between Zambia Police, the courts, Department of National Parks and Wildlife Services and the Department of Fisheries. These restrictions were very important because the use of such types of gears would greatly affect the fishery and make recovery of the stocks much more difficult. However, compliance was below average due to few or no DoF enforcement patrols. Fishers seemed not to also appreciate gear restriction since illegal gear guaranteed higher catches in the short term. The community response to fishing management practices was quite poor with less than 40% (Mbewe, 2006)

Designated landing site

The study noted that there were many landing sites, from Kafue Gorge to Nanga, which included both designated such as: Central Harbour, Nanga, Chanyanya and Chilumba, while the rest were illegal ones. The study further noted that there was no charge levied against fishers who avoided designated landing sites; hence they were free to land their fish on any site. To curb those vices, there was need to fine all fishers landing their fish elsewhere. Furthermore, all the small landing sites should be made illegal especially those where DoF members of staff did not have access to.



Figure 7: Central Harbour, one of the designated landing sites (Source: Authors).

There was also need to build some basic infrastructure in landing sites where the processing industry could buy and collect the artisanal catch, in order to keep the fish products in fresh conditions, with the maximum possible quality.

Factors Causing Fishers to Avoid Landing Sites

- **Increase in fishing licence**

The increase in fishing license had led to fishers avoiding designated landing sites. The fishers without licenses instead landed fish at landing sites where DoF officers did not reach, thus a factor contributing to fishers avoiding designated landing sites. Therefore government should take action addressing the loose ends of the law, through aggressive regulations.

1. **Use of illegal fishing gears**

There was a wide range of fishing gear usage, which mainly comprised wrong types of gears, which were of small mesh sizes. The fishers who used illegal fishing gears could not land on the designated landing sites where the DoF officers checked them as that caused fear in those who used wrong fishing gears.

2. **Lack of storage facilities**

The absence of ice plants or storage facilities was one of the contributing factors to fishers avoiding designated landing sites. They in turn used disposed off their fish at landing sites nearer to the market where they did not need storage facilities. Most fish traders went with their ice blocks or sometimes bought at the landing sites where some people sold them such ice blocks.

3. **Absence of fish traders at landing sites**

The absence of fish traders was found to be one of the contributing factors causing fishers to avoid landing sites. Some of the major fish landing sites such as the central harbour had no traders to buy the fish after the fishers landed. That had caused most of the fishers to land their fish on some landing sites with a lot of fish traders. The absence of traders was attributed to the bad road network to the market as some landing sites were not easily accessible by vehicles. A lot of fish traders found it so hard to visit some of these designated landing sites as the road network was bad to be accessed by vehicles and bicycles. One typical example was Chilumba, which only be accessed by bicycles and on foot.

Conclusion

The study outlined some factors that caused fishers to avoid designated landing sites hence using other undesignated landing sites. Chabwela and Haller, (2010) reported that in the case of fisheries, the consequences were dramatic for local people in the Kafue Flats as fish caught were smaller in size and less abundant. In addition Fishermen spent more time and effort and used more fishing gear to catch fewer fish (Chabwela and Haller, 2010). Some factors that lead to fishers avoiding landing sites included; lack of storage facilities, fishing gear usage (mesh size limitation), fish licensing and absence of fish traders on some designated landing sites. Fish licensing and fishing gear were a major contributing factor that causes fishers to avoid the designated landing site on the stratum one of the Kafue fishery. It can be concluded that these factors have greatly contributed to fishers avoiding the designated landing sites. Lack of storage facilities and access to ice blocks for preservation of fish before reaching the market also caused the fishers to avoid designated landing sites.

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