

COMPARATIVE EVALUATION OF THE EFFICIENCY OF TRADITIONAL AND MODIFIED MALIAN TRAPS IN CAPTURE FISHERIES

J.Yusuf^{1*}, S.L. Lamai²,

Federal University of Technology Minna, Niger State

² Federal University of Technology Minna, Niger State

*Corresponding Author's E-mail: j.yusuf@futminna.edu.ng, GSM: 08136161501

ABSTRACT

An evaluation to comparatively determine the efficiency of a modified and traditional Malian traps in capture fisheries was carried out in Dan-Zaria Dam, Niger State. The traps were designed and constructed with the following wooden frame dimensions:- the traditional trap which was cone shaped, had a base diameter of 135cm, middle diameter of 115cm and terminal diameter of 77cm and height of 75cm; while that of the modified trap which was rectangular-shaped, had a base length of 100cm, width of 50cm and height of 40cm both were enclosed in a netting materials of 3.75cm mesh size. The traditional traps had two non-return valve while the modified had three non-return valves with recovery opening at top of each. They were both designed and constructed simultaneously at site. The traps were both introduced into the water and set unbaited in pairs at three different location in the Dam. To aid both stability and permanence, stone weights and wet grass were placed on top of the traps and stick pegged closed to them for easy identification during monitoring visits. Collection of catch was carried out twice weekly for a period of six weeks. At each visit, the location of traps were alter to create wider sampling area. The catches were each brought into the laboratory for analysis. A total of twelve visits were made and analysis of catches showed that a total of 146 fishes and turtles were caught by both traps. The comparative catches analysis of the total showed that traditional Malian trap caught 82 fishes only, comprising of 45 *Clarias gariepinus*, 25 *Clarias anguillaris* and 12 *Oreochromis niloticus* representing 54.87%, 30.48%, and 14.63% respectively; While the modified traps caught 50 fishes, comprising 28 *Clarias gariepinus*, 15 *Clarias anguillaris* and 7 *Oreochromis niloticus* representing 43.73%, 23.43% and 10.93% respectively and 14 turtles (*Testudinidae*). The species diversity index for the traditional and modified Malian traps were 0.023 and 0.027 respectively. Based on the results, it was concluded that while the traditional traps had higher caught than modified traps there was no significant difference ($P > 0.05$) between the two, hence in terms of catch efficiency the traditional trap is more efficient than the modified trap, however, modified trap had the advantage of trapping other aquatic living resources (Turtles) than fish.

KEYWORDS: Traditional Malian Trap, Dan-Zaria Dam, Modified malian Trap, Turtles

INTRODUCTION

The fishing gear and techniques used in artisanal fisheries, such as in the inland freshwater of Nigeria, are known to be labour intensive with low catch per unit effort and low income to the fishermen. Therefore, improvement on the fishing gears, particularly the traditional ones, or development of new and more efficient gear, is highly required. Therefore, the improvement or development of a new gear should be made in such a way that the materials are locally available to the artisanal fishermen, the design and

construction should be easy and cheap. It should also be More efficient and, at the same time, ensure conservation of fisheries resources unlike the conventional ones being used (Agbelege and Ipinjolu 2004)

Fishing gear generally undergoes a lot of modifications and fisher improvements in consonance with advances in modern technology, The technology of fish exploitation under small-scale fisheries, as in Nigerian inland fisheries, is characterised by the use of simple fishing gears and techniques. The designs, types and mode of

operations of the traditional and modern fishing gears used in inland and coastal waters in Nigeria have been fairly described. Agbelege and Ipinjolu (2004) Malian trap is one of the most widely used, in combination with other traditional and modern fishing gears. Agbelege and Ipinjolu (2001) reported in their studies that 70 to 100 % of the fishermen sampled in Lake Chad, used Malian trap in combination with other traps. Also a survey conducted along River Rima in North Western Nigeria also showed that 30-90% and 30 – 50 % of the fishermen used Malian and Ndurutu traps, Respectively.

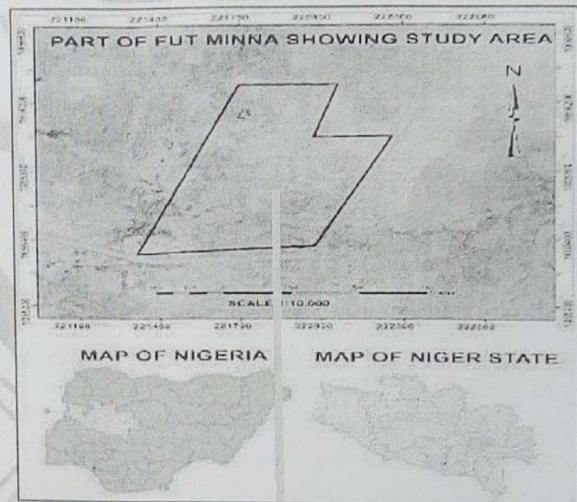
The Malian trap was introduced to Kainji Lake area by immigrating fishers from the Republic of Mali (Ipinjolu *et al.*, 2004). The trap is known to be gaining ground among the artisanal fisher folks of the Kainji Lake basin. Popularly known as gura in the area, it is a wicker trap essentially made of wood-cane either from 2cm diameter branches of a tree locally named taura or a shrub identified as the giant sensitive plant, *Mimosa pigra* and *Mimosa invisa* (Akobundu and Agyakwa, 1987; du Feu, 1993 and Ahmed *et al.*, 2004). reported that the frame of the trap is covered with 25.4mm mesh polyamide netting material with mean height of 0.71m (range 0.36-1.37m) and the base width mean of 0.52m. The diameter of the fish entry holes at the base is 0.10m on the average.

(Lamai and Kolo, 2003) studied biodiversity and abundance of fish and plankton using cast net, fleet of gill net of various sizes from one inch to seven inches in Dan-zaria Dam for a period of one year and caught a total of 2,010 fishes. The species caught were *Clarias gariepinus*, *Oreochromis niloticus*, *Tillapia zilli*, *Aleste nurse* and *Lebeo senegalensis*

Ago *et al.* (2012) studied the comparative performance of the newly developed Malian trap and the traditional Malian trap in lake

kainji and caught a total of 1,885 fishes belonging to 19 species of 10 families with a total weight of 72,235 grams. During dry season a total of 203 fish weighing 4, 685 grams were caught with the PVC trap while the Malian trap caught 868 fish, weighing 18, 335 grams.

METHODOLOGY



Map of the Study Area

Wooden stick of giant sensitive plant (*Mimosa pigra*) was used as wooden frame for the construction. The diameters of the stick were 3cm to 4cm respectively. The

sticks were cut and dressed with the aid of cutlass. They were soaked in water for 2 weeks for its offensive odour to escaped. Thereafter, the sticks were dried. The dried sticks were bent to form round shape of different diameters 135cm, 115 cm and 77cm respectively, and tied strongly with rope Number 9, to prevent loosening. 6 wooden frames of 75cm height were mounted and tied on the round bottom. The same procedure was repeated for the middle and the tops. Thereafter, the structure was enclosed in polyamide netting material of 3.75cm mesh size. Space for non-return valves were carved out and the non-return valves were finally fixed. All in all 3 traditional Malian traps were constructed.

2.2.2 Modified (Semi-circular) Malian trap

Similarly too the giant sensitive plant (*Mimosa pigra*) was also used for the construction of modified Malian trap. The wooden sticks from the giant sensitive plant passed through the same process as explained in (2.1.2). 110cm length, and 64cm width of the wooden stick were tied together to formed rectangular shape. This was followed with the mounting of bent wooden frame of 46cm height. The frame was supported with straight wooden sticks strongly

tied together. Thereafter the structure was also enclosed in polyamide netting material of 3.75cm mesh size. Space for non-return valves were carved out and the non-return valve were finally fixed. All in all, three modified Malian traps were constructed.

2.3 Trap setting procedure

After construction, the traps were set in Dan-zaria Dam. 12 fishing visits were conducted in different locations and depth of the water at different times. Both the traditional and modified traps were set in pairs in three different locations on every fishing visit. They were set un-baited with a stone and wet grasses placed on the top for stability of the traps. Sticks pegged close to

the trap for easy identification during monitoring visits.

2.4 Inspection and Data collection on trapped fishes and turtles

The trap were inspected for collection of trapped fishes and tortoise twice a week for six weeks. At each visit the traps were lifted out of water and the trapped fishes and tortoise were retrieved. They were then collected into a cooler jug and transported to the Laboratory for analysis by measurement of length, weight, and identification to species level.

A 30cm Ruler was used to measured the total length of each fish while monograph of Olaosebikan and Raji (1998) was used to identify the species caught. Citizen sensitive weighing balance was also used to determine weight of the fish and tortoise

Statistical analysis

Data obtained were subjected to t- test, in order to test for the significant difference between efficiency of the traditional with modified Malian traps. Also, species diversity index was calculated using the formula below-

Determination of Species Diversity Index

The species diversity index was calculated using Shanon-Wiener index 1963:

$$H = - \sum_{i=1}^n \left(\frac{n_i}{N} \left[\log_2 \left(\frac{n_i}{N} \right) \right] \right)$$

Where:

H = Shannon-Wiener index of diversity

n_i = Total No. of individuals of a species

N = Total No. of individuals of all species

Species diversity index (SDI) =

$\frac{\text{Total number of individual of species}}{\text{Total numbers of individual of all species}}$

RESULTS AND DISCUSSIONS

Both the traditional and modified Malian traps caught 3 species of fish. The species were *Clarias gariepinus*, *Clarias anguillaries* and *Oreochromis niloticus*. Only the modified Malian trap caught 14 turtles (*Testudinidae*). The total species, numbers and percentage of organism caught by the traps is shown in Table 1. A total of 82 fishes were caught with the traditional Malian trap, these include *Clarias gariepinus*, *Clarias anguillaries* and *Oreochromis niloticus* accounting for 45, 25 and 12 with a percentage of 54.87%, 30.48%, and 14.63% respectively. While a total of 64 fishes and turtles were caught with modified Malian trap. 14 accounted for turtles with 21.87% while *Clarias gariepinus*, *Clarias anguillaries* and *Oreochromis niloticus* accounted for 28, 15, 7 with percentage of 43.73%, 23.43%, and 10.93% respectively. Species diversity index for the traditional and modified Malian trap were 0.023 and 0.027 respectively. The mean total for the

species of fish and tortoise for the traditional and modified Malian traps were (Mean 27.3) and (Mean 21.2) respectively. The statistical analysis carried out for the species caught using t-test showed no significant difference ($P>0.05$)

Table 2 showed the total weight of the fishes and turtles caught. A total of 146 fishes and tortoise were caught with total weight of 29,756.7gram (29.7 kg). 14,449.7gram (14.4 kg) of the weight accounted for traditional Malian trap, while 15,307gram (15.3 kg) was the total weight of fishes and turtles caught with modified Malian trap. 10,160 gram (10.1 kg) and 5,147 gram (5.1 kg) accounted for weight of fish and turtles respectively. Statistical analysis for the weight of fish and turtles caught with modified and traditional Malian trap using independent t- test showed no significant difference ($P>0.05$)

Table 4. 1: Species of organism caught with the traditional and modified Malian traps

Species	Traditional Malian				Modified Malian trap			
	Number	Mean	%	Mean %	Number	Mean	%	Mean %
Turtles	-	0	-	0	14	4.6	21.8	7
<i>Clarias gariepinus</i>	45	15	54.87	9.7	28	9.3	43.7	15.7
<i>Clarias anguillaries</i>	25	8.3	30.48	10.1	15	5	23.4	7.8
<i>Oreochromis niloticus</i>	12	4	14.63	4.8	7	2.3	10.93	3.6
Total	82	27.3	100	24.6	64	21.2	100	34.1
Diversity index	20.5				16			

The mean values are the replicate value for the catch. Traditional Malian traps 3 replicate.
Modified Malian traps. 3 replicate

Table 2: Biomass of fish and turtles caught with the Traditional and Modified Malian traps.

	Traditional Malian Trap			Modified Malian Trap		
	Weight(g)	Mean	%	Weight(g)	Mean	%
1	4,773.7	1591.2	33.03	-	0	-
2	2,544.7	973.8	17.61	2,767	922.3	18.07
3	-	0	-	766.8	255.5	5.00
4	2,921.4	973	20.21	5,607	1869	36.63
5	2,193.3	731.1	15.17	215	71.6	1.40
6	228.4	76.13	1.58	97.2	32.4	0.63
7	282.9	94.3	1.95	-	0	-
8	355	118.3	2.45	665.2	221.7	4.34
9	54.1	18	0.37	1,366	455.3	8.92
10	395.5	131.8	2.73	1,460	486.3	9.53
11	429.2	214.6	2.97	1,731	577	11.30
12N	271.5	90.5	1.87	630.3	210.1	4.11
Total	14,449.7		100		5101.2	100
Total	5012.7		115,307		425.1	
Average mean						

DISCUSSIONS

Different aquatic organisms were caught with traditional and modified Malian traps. Traditional Malian trap caught only fish, while modified Malian trap caught both fish and tortoise. The fish caught with the 2 traps differ in shape, feeding habit, and ecological niches Holden and Reed 1972. The fish comprised of pelagic fish (*Tillapia*) and mid water fish (*Clarias*). The differences in organism caught could be attributed to the feeding habit of the tortoise and absolute immersion of the modified Malian trap when set for fishing at the lithoral part of the water. Because tortoise feed on plants, insect, worm and snail at the lithoral part of the water. This is in consonant with what Muoneke *et al.* 1993 reported that the capture efficiency of passive gear depends on a variety of factors including shape of the gear, species, habitat, size, behaviour and gear attributes. Neither fish nor tortoise were caught with the modified Malian trap during the first visits while traditional Malian trap caught a total of 24 fishes. The reason for this could be as a result of the structure of the modified trap which appeared unfamiliar to the fish and tortoise. However, subsequent visit yielded record of catch after gradual familiarity of the fish to the modified trap. Ahmed *et al.* (2010) studied the effect of 3 fishing baits on catch composition of traditional Malian trap in Kainji Lake and caught a total of 218 fish, weighing 8.66 kg. Also Ago *et al.*, 2012 caught 203 fish weighing 18.5kg during dry season in Kainji Lake using PVC Malian trap. Agbelege *et al.*, 2004 and Ogunfowora *et al.*, 2011, all reported fish in their catch when compared to the catch in this study. None have reported tortoise or other aquatic organism in their catch. Though catch of several species such as *Lates niloticus*, *Hemichromis fasciatus*, *Labeo coubei*, *Chrisichthys nigrodigitatus*, *Tillapia zilli*, *Oreochromis niloticus*, *Bagrus bayad*,

Clarias gariepinus, *Clarias anguillaries* and *Malapterus electricus* were reported in their studies. The differences in species, numbers and their weight with this study could be attributed to location, duration of studies and season of the year. The bait employed in their studies could also be one of the contributing factors. As this study was conducted during the flood season and over a short period of time, precisely September to October. Also, no bait was employed in the study.

The large number of *Clarias gariepinus*, *Clarias anguillaries* and *Oreochromis niloticus* caught with traditional and modified Malian in this study is an indication of their dominance over others species in Dan-zaria dam. This differed with what Lamai and Kolo 2003 reported in their studied of biodiversity and abundance of fish and plankton in Dan-zaria Dam. Where *Tillapia zilli* was among the dominance species in their catches. Also, *Lebeo senegalensis* and *Alestes nurse* were among the species reported in their catches. In comparison with the result of this study, it indicates either rapid decline in population or seasonal fluctuation of these species (*Lebeo senegalensis* and *Alestes nurse*) since non of these 2 species were caught during this study.

Higher numbers of fish were recorded from Traditional Malian trap while higher biomass of fish and turtles were recorded from modified Malian trap as shown in (Table 2)

T-test statistical analysis for the numbers of fish and tortoise caught with the traps showed no significant difference ($P > 0.05$). No significant difference ($P > 0.05$) was also observed in biomass of fish and tortoise caught with traditional and modified Malian traps. Higher species diversity index of 0.027 was calculated for the traditional Malian trap as compared to the modified one of 0.023

The mean total for the species calculated were 27.3 and 21.2 for the traditional and modified Malian traps respectively.

CONCLUSION AND RECOMMENDATIONS

Modified Malian trap was constructed in this work to determine increase in catch efficiency of fish in capture fisheries and to overcome the problem of poaching and stealing of traditional Malian trap due to its protrusion when set by the fishermen for fishing in Nigeria inland water bodies. The modified trap can be set with complete immersion at the lithoral part of water. The fishing visits conducted proved both traps in trapping similar species of fish of different size, and weight in Dan-zaria Dam. The species caught were (*Clarias gariepinus*, *Clarias anguillaries* and *Oreochromis niloticus*). Based on the result of species caught, it can be deduced that there is decline or that some species like *Alestes nurse*, *Tillapia zilli* and *Lebeo senegalensis* which were earlier reported to be present in the Dam could not be trapped due to seasonal fluctuation. Only the modified trap caught turtles. Therefore, in terms of comparative efficiency between the traps, The Modified Malian trap proved to be efficient in trapping both fish and reptile. This indicates that a modified Malian trap of this type can be used efficiently to trap reptiles like turtle either for food or research purpose.

RECOMMENDATIONS

Based on the result, the modified Malian trap can be recommended to fishermen who have the intention of not only trapping fish but also turtles. The trap can be set with absolute immersion in lithoral part of water body to overcome poaching.

More studies should be carried out on the appropriate mesh size and number of non-return valve that will be efficient as this study is a preliminary research based on comparative efficiency between traditional and modified Malian trap in capture fisheries.

Aside the dominance species discovered in this study, additional species of fish should be stocked in the Dam. During the course of the fishing visits there was an incident of poaching and stolen of one traditional Malian trap which was later recovered with the intervention of the University security. It is on the basis of this fact that the Department should further explore a means of securing the Dam in order to curb these challenges occasioned by some of the villagers dwelling around the vicinity of the Dam. The study was conducted during the flood season over a short time frame, September to October to be precise. Subsequent study on the modified Malian trap should be conducted over a longer period of time that will cover both wet and dry seasons.

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