SELECTION OF EFFICIENT HANGING RATIOS OF GILLNET ON FISH CATCH IN LAKE KAINJI, AS MEANS OF ALLEVIATING POVERTY AMONG ARTISANAL FISHERMEN IN NIGERIA.

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ABSTRACT

Five experimental gillnet each measuring 50mx 3m nylon multi filament netting of 3" by 210/2 mesh size were constructed using 40%, 45%, 50%, 55% and 60% hanging percentages. the report was carried out at yunawa fishing village on the eastern bank of Lake Kainji. The nets were set over night (6 hours approximately). Between April – July 2004. the fish caught, by the five nets were recorded taking into consideration the three mode of capture i.e enmeshing. entanglement and wedging. Weight, number and percentage mean weight and number based on species at five different hanging ratios were analyzed. In general 50% hanging ratio was found to be the best followed by 40% among others. There was significant difference (P<0.5). in the mode of capture for both hanging ratios. Most of the fish were caught by entanglement i.e. about 83% of the catch was by entanglement. while 50% hanging ratio was the best considered after the report The occurrence of species of the five different hanging ratios has significant difference (P<0.5) in terms of catch by weight and number.

INTRODUCTION

Fishing gear can be described as any kind of equipment used in harvesting, cropping, or capturing of fish from any water body. Fishing as subsistence trade, commercial or as sport has been in practice for long time. Occupational fishing is said to be older than agriculture, while sport fishing came with civilization.

The history of fishing gear has been as old as man has been in existence. When translating the name of fishing gear from one language to another, the difficulties of nomenclature increased. The basic aim of designing any fishing gear is to produce such a gear that will give the highest catching potential at the lowest cost in material and labour inputs.

Gillnet fishing is a method that uses the most simple structures of all net fishing gears, and for that reason, it requires the smallest initial investment in material and lowest operating cost of any type of small scale fishing. There is also something else that separates gillnet fishing from all other types of net fishing methods. Whereas, other types of net fishing methods catch fish by a variety of means such as forming a bag-like structure in which the fish are caught e.g. (beach seine and trawl net) or catching them by directing them into a trap made with walls of netting (set net). It is only in gillnet fishing that the mesh of the net itself serves the fish catching function.

Entangle nets are always exemplified by the conventional gillnet, trammel net and semi trammel net with an unusually high degree of slackness on the basis of its construction (KLFTC, 1992)

Gillnet can be generally set on the surface, mid-water or bottom water. It is usually set and left over night on a fishing ground. Since the net has to wait for the fish to come to it, it usually takes some hours as a passive gear. However, it can be made active by drifting it along mid-water or sea bottom with the aid of a fishing vessel. The catchability and selectivity of a gill net depends on hanging ratio, which is the relationship between the head rope and length of net webbing mounted on it.

The justification of this study is the fact that gillnetting is very popular amongst artisanal fishermen in Nigeria. Infact. more than 78% of the fishermen in Nigeria Inland and coastal waters use gillnet at one time or the other within a fishing season (Reed et al. 1967).

Gillnet has been described as one of the major traditional fishing gears used in lake Kainji It is therefore important to investigate the appropriate hanging ratio that is best at catching fish by gilling. enmeshing, entangling and wedging process.

The subject of fishing gear technology is vast when considering its importance. However, the problem remains that it is one which has not comparatively received the attention it deserves: until recently. Thus, the traditional fishermen are left alone to practice their old method of hanging. using different kinds of netting materials for gillnets construction.

There is need therefore to come up with the most effective hanging ratios for the benefit of the fishermen. The main objective of the study is to assess the efficiency of different hanging ratios on the catch ability of different fish species in the lake as means of alleviating poverty among artisan fishermen in Nigeria The specific objective is to find out the selectivity of the five hanging ratios in terms of mode of capture by number and weight of different fish species.

MATERIALS AND METHODS

Study area.

The experiment was carried out on Lake Kainji about 2km inshore of Yunawa village in Magama Local Government Area of Niger State. Situated on the Eastern bank of the lake about 20km from NIFFR Headquarter in New Bussa.

Experimental design.

Complete Randomized Design (C.R D.) consisting of single factor (different hanging ratios) of 40%. 45%, 50%, 55%, and 60% as treatments. Each was replicated three times.

Experimental net webbing and accessories.

Seven and a half bundles of multifilament net 3" mesh size 210/2 net webbing were used for the construction of the gillnets, along with other materials i.e. Kuralon rope, Twine, float. lead, sharp knife, scale, yardstick and needles purchased at New Bussa market.

Design of the gillnets.

Each gillnet was 50 meters long and 3 meters deep. The design was carried out at the National Institute of Freshwater Fisheries Research Headquarters, to achieve a specific length and depth of each of the specified net.

Five different hanging ratios. were used with the same lengths and depths. The design and Construction was carried out for a period of two weeks with the

ASSISTANCE OF TWO STAFF FISHERMEN OF NIFFR.

GILLNET CONSTRUCTION

The netting was cut at a specific length and depth of 50 meters and 3 meters respectively. while kuralon head rope and foot rope were soaked and stretched at two-distance hook before mounting the cut webbing After stretching the kuralon rope for a period of 2 hours, then the corks were inserted into the head rope. The head rope was then marked using a biro and a stick cut into a required measurements based on the hanging ratio.

On the first mark, the head rope was tied double knot, called double clove hitch with the aid of a mounting needle that passed through three (3") meshes in the following order: (40%)23 meshes (45%)20 (50%)18 meshes (55%)16 meshes and (60%)15 meshes and the stapling line knotted to the next yardstick mark created some botch equivalent to the size of four fingers.

This process continued until the cut webbing was achieved on both head rope and foot-rope. Each Cork was inserted at an interval of 2m on the head rope. while pieces of lead were equally fixed at the foot – rope to opposite to the position of the cork.

Net setting

They were set on the open water along the shore (2km from the snore line) of t
elake. The setting was done between 6.00pm – 7.30pm for the period of 12 weeks. The setting was done along the direction of the water current to prevent the waves. logs. and other obstacles that could likely be carried by water current, which could disalingned, the setting.

Recovering of Fish

Every day. the net was usually checked between the hours of 6.30-7.30 am and 6.00-7.30 pm i.e. twice daily. This was achieved by raising the head rope from the water surface and removing the catch from the net. Each catch was recorded according to the mode of capture and its hanging ratio before the next net was checked. The experiment was carried out for the period of three. One-way ANOVA using Duncan Multiple Range Test was used for the analysis

RESULTS

DAILY MEAN NUMBER AND WEIGHT (g) OF FISH CATCH AT FIVE DIFFERENT HANGING RATIOS.

Table I shows the daily mean number and weight (g) of fish caught at different hanging ratios. The analysis indicated that there were significant differences (P<0.5) in both the number and weight of fish caught among the different hanging ratios. Thus 50% gave the best performance, followed by 40% hanging ratios.

Table I:

S/No	HANDING RATIOS	MEAN + SD ERROR	
		No	Wt
1.	40%	3.20±0.64ab	525.23±140.38ab
2	45%	1.47±0.39bc	241.67±36.54b
3.	50%	4.75±0.85a	959.10±177.36a
4.	55%	1.22±0.43c	326.50±81a
5.	60%	1.39±0.45 bc	473.93±150.27b
Mean	SD	1.66±0.43	328.39±84.79

Figures in the same column with different superscripts differ significantly from each other (p<0.05)

THE MEAN WEIGHT (g) AND NUMBER OF FISH CAUGHT IN THE THREE MODES OF CAPTURE.

Table 2 shows the mean weight (g) and number in the three modes of capture. The summary result indicated that there were significant differences (P<0.5) in both the weights and numbers of fish caught by the modes of capture. Thus 50% gives the best performance followed by 40%.

Table 2.

Figures in the same column with different superscripts differ significantly from each other (p<0.05)

Table 3 shows the mean percentage number of fish caught based on the species at the different hanging ratios. The analysis indicated that there were significant differences (p<0.05) in some of the species caught.

According to the results. *Lates* species indicated significant difference (P<0.5) at the five different hanging ratios. Thus 55% gave the best performance followed by 60% hanging ratios. *Tilapia* catch was significantly different (P<0.5) among the different hanging ratio. Thus 50% gave the best performance, followed by 40% hanging ratio. However. *Alestes* species indicated significant differences (P<0.5) at the five different hanging ratio, thus the best performance was obtained at 45% followed by 40% hanging ratio respectively. Similarly. *Hydrocynus* species was significantly different (P<0.5) among the different hanging ratios with 60% giving the best performance followed by 50%. *Distichodus* was also significantly different (P<0.5) among the five different hanging ratios thus. 40% gave the best performance followed by 50%

Mode of Cauture	40% Wt No	45% Wt No	50% Wt No	55% Wt No	60% Wt. No	mean SD (No.)
Entanglement	7.33± 2.17a 7.30±1.02 b	3.66±0.33a 3.67±0.38c	11.89±2.74a 11.91±1.91a	2.55±1.18a 2.56±0.29c	3.22±0.78a 3.22±0.49c	5.73±1.44 3.93±1.01
Wedging	3.56±0.29ab 3.57±0.59ab	1.11±0.49b 1.11±0.68b	4.67±1.07b 4.68±0.96a	1.33±0.00a 1.34±0.71b	1.44±0.49a 1.34±0.78b	2.42±0.47 1.86±0.48
Enmeshing	1.78±0.39b 1.77±0.47ab	0.56±0.29b 2.44±0.59ab	2.44±0.29b 2.44±0.59ab	0.78±0.29a 0.78±0.39b	1.11±0.49a 1.11±0.49ab	1.33±0.35 0.98±0.25
Standard Deviation (Wt.)	3.13±1.04 4.21±0.69	1.54±0.51 2.41±0.55	4.98±1.66 6.34±1.15	1.31±0.44 1.56±0.46	1.33±0.44 1.89±0.59	

There was also a significant difference (P<0.5) in the catch of *Citharinus* species among the five different hanging ratios, 50% gave the best performance followed by 55%. *Labeo* species were significantly different (P<0.5) among the different hanging ratios with 60% hanging giving the best performance followed by 50% hanging respectively. *Auchenuglanus* species was significantly different (P<0.5) among the different hanging ratios with the best performance obtained at 50% followed by 60% hanging ratios.

Similarly the catch in *Chrysichthys* species recorded a significant difference (P<0.5) among the five different hanging ratios with 40% hanging recording the best performance followed by 60%. *Synodontis* species also gave significant difference (P<0.5) among the five different hanging ratios where 50% gave the best performance followed by 40% hanging. But however there were no significant differences (P>0.5) in the catches of *Small berbus* and *Schilbeids* species respectively.

In view of the general analysis, there were significant differences (P<0.5) in the number of fish species caught at different hanging ratios with 50% and 40% hanging ratios giving the best performance respectively.

THE MEAN PERCENTAGE WEIGHT (GRAMS) OF FISH CAUGHT BASED ON SPECIES AT THE DIFFERENT HANGING RATIOS.

Table 4 shows the mean percentage weight of fish caught based on the species at different hanging ratios. The analysis indicated that there were significant differences (P<0.5) in weights of some of the fish caught at different hanging ratios. According to the results. *Lates* species indicated significant difference ($p<0.5$) at the five different ratios. Thus 60% gave the best performance followed by 55% hanging. *Tilapia* catch was significantly different ($p<0.5$) among the different hanging ratios. Thus, 50% gave the best performance followed by 40% hanging ratio. *Alestes* species indicated significant difference ($p<0.5$) at the five different hanging ratios with 40% giving the best performance, followed by 45% hanging.

The catch in *Hydrocynus* species was also significantly different ($p<0.5$) among the different hanging ratios with 50% giving the best performance followed by 60% hanging. *Distichondus* species was significantly different ($p<0.5$) among the different hanging ratios where 40% was the best followed by 50%. Similarly. *Citharinus* catch was significantly different ($P<0.5$) among the different hanging ratios. Thus, 50% gave the best performance followed by 55% hanging. *Labeo* species was also significantly different ($P<0.5$) among the five different hanging ratios with 50% giving the best performance followed by 40% hanging.

Schilbeids catch in the five different hanging ratio is significantly different ($P<0.5$). Thus, 40% gave the best performance among others. *Auchenoglanus* catch was significantly different ($P<0.5$) among the five different hanging ratios where 50% gave the best performance followed by 60% hanging. *Chrysichthys* catch indicated significant difference ($P<0.5$) among the five different hanging ratios, 40% gave the best performance followed by 60% hanging. *Chrysichthys* catch indicated significant difference ($P<0.5$) among the different hanging ratios, 40% gave the best performance followed by 60% hanging. *Synodontis* species were significantly different ($P<0.5$) among the different hanging ratios. Thus, 50% gave the best performance followed by 40% hanging. But there were no significant differences ($P<0.5$) in the catches of *Small berbus* species in the five different hanging ratios.

Finally, the general analysis showed that there were significant differences ($P<0.5$) in the weights of the various fish species caught at different hanging ratios with 50% and 40% hanging ratios giving the best performance respectively.

Table 3: MEAN PERCENTAGE NUMBER OF FISH CAUGHT BASED ON SPECIES AT DIFFERENT HANGING RATIO

%	Lates	Tilapia	Alestes	Hydrocynus	Distchodus	Citharinus	Labeo	Small Berbus	Schils
	c	A	c	C	c	c	c	c	c
40%	0.00±00	17.67±2.73	1.67±0.67	0.00±.00	1.00±0.58	3.00±1.37	1.00±0.38	0.00±0.00	0.00:
		A	bc	C	c	b	c	c	c
45%	0.00±00	6.00±1.15	3.00±1.16	0.00±0.00	0.00±0.00	2.00±0.00	0.00±0.00	0.00±0.00	0.00:
50%		A	d	dc	de	b	dc	c	d
	0.00±00	18.33±4.85	0.00±0.00	0.67±0.33	0.67±0.33	11.67±1.67	22.00±0.58	0.00±0.00	0.00:
55%		Bc	c	C	C	a	c	c	c
	1.33±1.33	1.68±0.67	0.00±0.00	0.00±0.00	0.00±0.00	5.68±2.03	0.33±0.33	0.00±0.00	0.00:
60%		Bc	c	C	c	ab·	c	c	c
	1.00±0.58	2.33±0.33	0.00±0.00	0.67±0.67	0.00±0.00	3.33±1.33	3.33±.033	0.00±0.00	0.00:

Figure in the same column with different superscripts differ significantly from each other (P<0. 5)

Table 4: WEIGHT (GRAM)s OF FISH CAUGHT BASED ON THE SPECIES AT DIFFERENT HANGING RATIOS.

%	Lates	Tilapia	Alestes	Hydrocynus	Distchodus	Citharinus	Labeo	Small Berbus	Schils
40 %	0.00±00 [c]	2391±430.07 [a]	89.67±44.73 [bc]	0.00±.00 [c]	103.33±7.26 [bc]	740.00±24.263 [b]	126.67±63.69 [bc]	0.00±0.00 [c]	10.0(00 [c]
45 %	0.00±00 [c]	1034.00±197.47 [a]	20.00±20.00 [c]	0.00±0.00 [c]	0.00±0.00 [c]	407.33±1.221 [b]	0.00±0.00 [c]	0.00±0.00 [c]	0.00: [bc]
50 %	0.00±00	2770.33±801.07 [a]	0.00±0.00 [d]	500.00±250.07 [dc]	0.67±0.33 [de]	2777.33±436.49 [b]	253.67±134.11 [dc]	0.00±0.00 [c]	0.00: [d]
55 %	1200.00±1200.00	316.67±131.69	0.00±0.00 [a]	0.00±0.00 [a]	0.00±0.00 [a]	11178.67±369.63 [a]	0.00±0.00 [a]	0.00±0.00 [a]	0.00: [a]
60 %	1633.33±187.18 [a]	363.33±55.34 [bc]	0.00±0.00 [c]	433.33±433.33 [bc]	0.00±0.00 [c]	1042.33±.149.58 [ab]	46.67±46.67 [c]	0.00±0.00 [c]	0.00: [c]

Figure in the same column with different superscripts differ significantly from each other (P<0 5)

DISCUSSION

Results obtained indicates that 50% hanging ratio recorded the highest daily mean number and weight of fish caught using the five different hanging ratios, followed by 40% while 45% and 55% recorded the lowest (table I). This could be attributed to the seasonal and relative abundance of *Tilapia. Synodontis,* and *Citharinus spp.* among others caught in relation to the efficiency of the hanging ratios. According to J F R O, (1963) maximum fishing efficiency could only be obtained by paying great attention to small, simple, but nevertheless important details of the mounting, laying, handling, care and maintenance of the net used. Such gillnets have up to date been found more suitable for catching hard rather than soft fish FAO (1959). These results are consistent with the work of Garner, (1962) that hanging ratios and seasonal abundance are determinant factors in fish catch.

In the modes of capture, entanglement which recorded the highest mode at *50%* and wedging in *40%* hanging ratios (Table 2), could be attributed to the variations in body shapes of the fish species caught and their modes of movement. The highest mean number and weight of fish caught at *50%* and *40%* with the lowest mean weight recorded at *55%* hanging based on the modes of capture (table 1) could also be as a result of tension of net hung. Similar result proved that 50% hanging is more effective than *59%* hanging (KLFTC, 1992).

According to the results obtained from the mean percentage number of fish caught, 50% hanging recorded the best in terms of species caught i.e. (*Tilapia, Citharinus, Auchenoglanus* and *Synodontis* among others, followed by 40% hanging ratio. Similarly, the highest mean percentage number by species catch is recorded in *Tilapia* at 50% hanging ratios, followed by 40% hanging ratio with the least species catch of small berbus and *Schilbeids* at all the five different ratios (Table 3). Past study reports showed that the nearness the hanging to the numerical, the greater the tension of the mesh and the best hanging ratios does not stop the other hanging from performing based on the capabilities of their fish catch (Nomura, 1986). It could also be as a result of the small diameter of the twines and the season in which the fish are caught during the experiment. In the mean percentage weight of fish caught (table 4), 50% hanging recorded the best result, followed by 40% hanging ratio. According to the results, *Synodontis, Citharinus,* and *Tilapia* recorded best in weight at 50% followed by 40% hanging ratios with the least weighted species of Small berbus among all the five different hanging ratios. These could be as a result of the important factors such as mesh size, exposed net area, floating mesh shape, hanging ratios, visibility and type of netting materials in relation to the softness and breaking strength influencing the efficiency and selectivity of gillnet (van Brandt, 1986).

CONCLUSION AND RECOMMENDATION

The experiments on the selection of efficient different hanging ratios (40%, 45%, 50%, 55% and 60%) of 3" 210/2 mesh size gillnet were conducted.

The fish catch by number and by weight were recorded according to the hanging ratios and mode of catch. Thus, there was some significant difference (P<0.5) among the five hanging ratios However, the best result according to the study is obtained in 50% hanging followed by 40% hanging respectively. In view of the result obtained 50% hanging ration was consider best among others. this should be recommended for the artisan fishermen of the inland water and further experiment should recommend to be carried out on different twines size with the same 3" mesh size at 50% hanging ratios, throughout the year so as to ascertain the effectiveness of the result.

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