Original Research Article

Capture Efficiency of some Artisanal Fishing Gears employed at Upper Benue Basin, Nigeria.

ABSTRACT

This study was carried out to compare the capture efficiency of some artisanal fishing gears employed at Upper Benue Basin, Nigeria. The study was carried out for a 6 months period running from July to December 2017. Sampling was by Direct observation of the Fish at the landing sites and the gears used by the fishermen. Coefficient of Variation is used for the assessment of variability in the Catch Per Unit Effort (CPUE) by gear types. Other data were analyzed using Analysis of Variance (ANOVA). A total of 5 different gear types were identified to include: Gill net – Taru; Malian trap – Gura/Malia; Lift net – Akauji; Cast net – Birgi; Longline – Rincha. The result further indicated that Coefficient of Variations (C.V) differ with the gear used. The study therefore recommends that further investigation on the efficiency of the nets over a longer period (for at least 2 seasons) should be carried out; government should take immediate action through public awareness and education to regulate fishing activities such that adequate numbers of fishermen should be licensed to fish in a particular water body, together with their gear and craft nets; and a minimum of 3" mesh size has been recommended for all inland net fishing. This is to protect the spawning stock of commercially valued species.

INTRODUCTION

Fish catching methods have been known since humanity's earliest days (Binyotubo, 2011). The artisanal form of fishing constitutes the most important sector of fisheries. It accounts for the major fish supply in the developing world (Food and Agriculture Organization, FAO, 2012). According to Raw Materials Research and Development Council (2007), over 10 million people are directly or indirectly engaged in fishery in Nigeria. Artisanal fishery is the harvesting of fish from rivers, streams, lakes and ponds by small scale fishermen using both traditional and modern fishing gears. It is the most important of fish production in Nigeria and accounts for over 90% of her fish production (Ogunbadejo *et al*., 2007).

A high percentage of landed fish in Nigeria is from artisanal catch. According to Emmanuel (2009) artisanal catch made up to about 40% of all the fish consumed in Nigeria, in order to improve in the catching efficiency, there is need for good knowledge of fishing gears availability and its effectiveness. The great divergence in the efficiency of different forms of fishing gear, in their adaptability to certain conditions, and in their desirability for specific job is important (Kingdom and Kwen, 2009).

Traditional fishing arts have been developed over the years to adapt to local body conditions; the species of fish desired and targeted size. The most successful fishing methods of an area or a region are those that have stood the test of time (Kingdom and Kwen, 2009). The artisanal fishermen apart from fishing engage in other economic activities such as farming and tailoring which in turn improves their socioeconomic status. Large population of the artisanal fishermen rely mainly on the predominant use of small fishing gears like gill nets, cast nets, clap net, Malian trap (gura), hook and line etc to harvest fishery resource in the various fishing grounds (inland rivers, streams, lakes, reservoirs, lagoons and creeks) of Nigeria (Adeleke *et al.,* 2013). Hence the study is to Artisanal fishing gears and the acceptability of the different fishing techniques used and to also determine the effects of using the different fishing gears

MATERIALS AND METHODS

Study area: Mayo Ranewo is located in the Southwestern part of Ardokola LGA of Taraba State, Nigeria. It is located at the confluence of River Fan Mangel with the Benue river. The town is roughly located between latitude $8^{o}47^{l}$ to $8^{o}53^{l}$ N and longitude $10^{o}50^{l}$ to $10^{o}55^{l}$ E. The town has a population of about 11,000 people according to the 2006 National Population Census. There are about 25 fishing ponds in the community. The

largest is the Mariwo. Others include Abarku, Anji, Kinkau, Na-huta, Ruwan Barau, Ruwan Juma'a, Kambari, Yoride, Nubi, Ji, Faran Kaya, Dogon Yashi, Jimdakoli and so on.

Method of Data Collection: The study was carried out for a 6 months period running from July to December 2017. The study area is characterized by wetlands and River Benue and thus has different landing sites. The study area was categorized into three sites: site A, B and C. Site A (fishing, farming, washing, bathing, other commercial activities). Site B (fishing farming, commercial activities site), while site C (fishing and farming). The sites were sampled twice monthly for fish species. Sampling was by: Direct observation of the Fish at the landing sites; The Fish were sorted into taxonomic groups, identified to family and species level. Fishers and fishing gears used.

All the fish species landed were counted. Fish species that cannot be identified at the landing site were preserved and transported in cool box and labeled for laboratory identification and analysis. In the laboratory, the fish were preserved in 2% formaldehyde solution (Bankole, *et al*., 1994). Identification of the fish species was according to Olaosebikan and Raji (2013).

Statistical Analysis: Coefficient of Variation is used for the assessment of variability in the Catch Per Unit Effort (CPUE) by gear types (Abu Sayeed *et al.,* 2014). Other data were analyzed using Analysis of Variance (ANOVA).

RESULTS

Table 1 and Fig 1 identified the various artisanal fishing techniques identified to be used by the fishermen. A total of 5 different gear types were identified and the commonest ones used by fishers at the study area were Gill net – Taru, Malian trap – Gura/Malia, Lift net – Akauji, Cast net – Birgi and Longline – Rincha.

Table 1: Fishing gears identified at the study sites

Gear	Local name	Site A	Site B	Site C
Gill net	Taru	+	+	+
Cast net	Birgi	+	+	+
Lift net	Akauji	+	+	+
Longline	Rincha	+	+	+
Malian Trap	Gura/Malia	+	+	+

Table 2: Gears types, specification and period of operation

Gear name	Local name	Parameter Length of net (m)	Depth of net (m)	Mesh size (cm)	Age of gear (yrs)	Target species	Period of Operation
Gill net	Taru	50-100	1-5	1-4	1-3	All	Sept – Dec.
Cast net	Birgi	1-5	1-5	1-2	1-2	All	Year Round
Lift net	Akauji	3-5	1-3	$\leq$ 1	1-2	All	Sept – Dec
		No. of Hooks	**Size of Hooks (inch)**				
Longline	Rincha	100 - 500	15-17		1-3	Carnivores	July – Dec.
		Width (cm)	**Height (cm)**	**Entrance Valve diameter (cm)**	**Mesh size (cm)**		
Malian Trap	Gura	10 – 65	10 – 90	8 – 10	1 – 4	Economic fish	July – Dec.

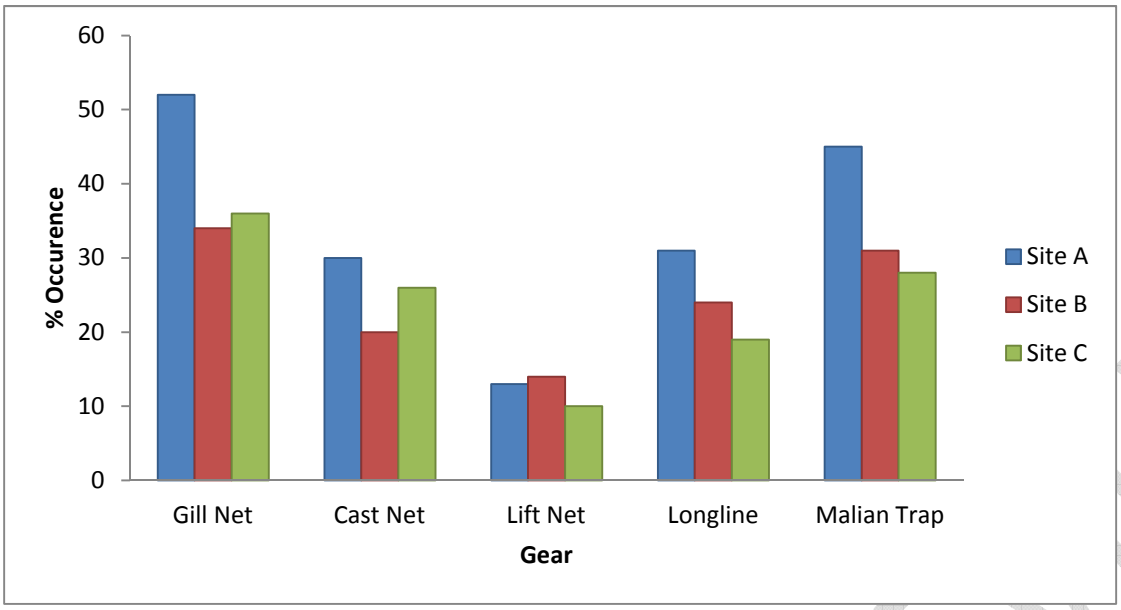

Fig 1: Fishing gears distribution across the study sites

Table 3: Choice of the Artisanal Fishing Gear in the study sites

Reason(s) for Gear Usage (n=65)	Site A	Site B	Site C	Total	Mean	S.D	% Total Sum
Area to be Fish	1	0	1	2	1.00	0.00	0.91
Cost of Gear	1	1	1	3	1.00	0.00	1.30
Efficiency	19	15	11	45	15.00	4.00	19.30
Fish to be caught	21	17	18	56	18.66	2.08	24.00
Freshness of catch	27	18	12	57	19.00	7.54	24.50
Live catch	1	1	1	3	1.00	0.00	1.30
Safety at operation	1	0	1	2	1.00	0.00	0.91
Season	30	21	14		21.66	8.02	100.0

Table 4 shows the Mean, Standard Deviation (SD) and Coefficient of Variations (C.V) of the Catch Per Unit Effort (CPUE) for each artisanal fishing gear in respect to the sites studied. The analysis of variation between the sites and types of artisanal fishing gear showed no significant variation difference. The highest Coefficient of Variations (C.V) of 84% was recorded in Site A for Longline.

Table 4: Catch Per Unit Effort (CPUE) of the study sites

GEAR	SITE A			SITE B			SITE C		
	MEAN	S.D	C.V	MEAN	S.D	C.V	MEAN	S.D	C.V
Gill net	7.65	2.69	35	8.03	2.83	35	6.92	2.77	40
Cast net	6.19	20.8	46	5.96	2.77	47	4.38	1.81	41
Lift net	5.84	3.03	52	6.08	2.55	42	6.03	2.69	45
Longline	21.8	18.3	84	16.2	10.1	62	12.1	8.07	67
Malian Trap (Taru)	32.0	24.8	77	25.5	21.0	82.1	19.71	12.6	64

Fig 2 shows the mean monthly estimate (kg)/gear across the study sites for the six months surveyed. It is observed that the highest total catch is recorded in October.

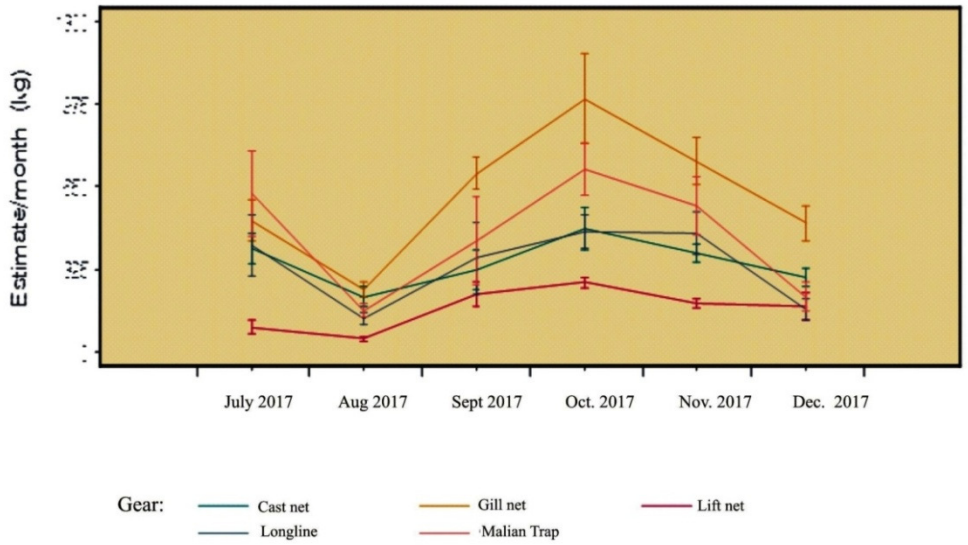

Fig 2: Mean Month estimate (kg)/gear across the study sites from July – December, 2017

DISCUSSION

The gear types found in this present study are: Gill net – Taru, Malian trap – Gura/Malia, Lift net – Akauji, Cast net – Birgi and Longline – Rincha. All these gear types have been acknowledged by researchers such as du Feu *et al*., (1997); NIFFR (2002) during previous surveys of the inland water bodies in Nigeria. The artisanal fishing gears are the commonest gear in Kainji Lake (du Feu *et al*., 1997; Damilare, 2014); Lake Alau (Bankole *et al*., 2007); Lake Chad Basin (Neiland, *et al.,* 2000), Tabatu floodplain (Tagogo and Ahmed, 2011) all in Nigeria. Gill net and Malian Trap is ranked as the most important and the most used fishing gear among the fishers. The dominance of gill net and Malian Trap followed by Lift net can be traced back to the mid 70's as it has been earlier reported (Seisay, 1998). Gill nets and Malian traps are widely used in artisanal fisheries in developing countries because they are efficient, relatively inexpensive and capable of catching higher amount of economically valuable fish than other artisanal gears (Kingdom and Kwen, 2009). The efficiency of these net types is influenced by mesh size, exposed net area, flotation, mesh shape and hanging ratio, visibility and type of netting material in relation with stiffness and breaking strength (Binyutobo, 2011; Emmanuel, 2009; Kingdom and Kwen, 2009). Despite acceptance of the gears in the study area, fishermen switch gear during fishing activities, a practice that is in consonance with the research conducted in Lake Chad and Nguru-Gashua wetlands of North East Nigeria by Neiland *et al*., (2000). For instance, a fisherman could own one gill net, one cast net, one set of hook & line as well as some traps and any of them can be used anytime the fisher want (Neiland *et al*., 2000). This may be as a result of fishing patterns (mixed fisheries) of the region, but is also a reflection of the flexibility in nature utilization and lack of rigid fishing regulations as has been reported by Tagago and Ahmed (2011), different gears are used for targeting fish because of habitat changes. According to du Feu *et al*., (1997), and Bankole *et al.,* (2007), fishers used different kind of fishing gear because of seasonal variations in species availability. Kingdom and Kwen (2009) also reported that more than 70% of fishers in the lower creek of the Niger Delta had more than three fishing gears in-use. Emmanuel (2010) stated that gill nets were the main gears used by local fishers, followed by longlines and castnets. Emmanuel *et al.,* (2008) also found gill nets and cast nets as dominant gears in Lagos lagoon and its adjacent creeks in Nigeria. Kingdom and Kwen, (2009) also observed that majority of the artisanal fisherfolks are characterized by utilization of low cost craft/gear, usually one-three gears. Furthermore, Solarin and Okorie (2007), reported nets as constituting the

most abundant Small Scale fishing gear in Nigeria. Gill net was the commonest gear in River fishing in the Niger Delta in Nigeria (Kingdom and Kwen, 2009).

The efficiency of gear is directly associated to the possibility that a fish will encounter and be caught in the gear (Kingdom and Kwen, 2009). According to Portt *et al.* (2007), efficiency varies among gear types. There is variation in efficiency of the fishing gear used by the fishers in the study area, this efficiency variation may be influenced by the mesh size of the gear, which may invariably have greater influence on the size of species caught (Portt *et al.,* 2007). This may be attributed to the behavioral pattern of the gear itself (passive or active) and even be related to materials used in the fabrication of the fishing gear (Binyotubo, 2011).

The mean CPUE for all fishing gears in study area differs because the CPUE is affected not only by environmental factors (e.g. water level, water quality, productivity, turbidity), but also by fishing gears, fishing pressure and the fishers' preferences (Abu Sayeed *et al.,* 2014). The reasons for the significant differences in the CPUE were dependent on the size of the nets, the total number of hooks used, bait and the experiences of the artisanal fishers. Another reason for the difference in the fish catches was the location. According to Abu Sayeed *et al.,* (2014), the environmental factors such as waves, turbidity, wind direction, rainfall and weather most times affect catches. Furthermore, the CPUE showed an increased and decreased trends over the study period. This is because the month of July was the water entering period, therefore, fishes entered with flood water in the Upper Benue Basin and this results to fish abundance. Moreso, the high yield recorded in October maybe as result of minimal water level.

CONCLUSION

Gill nets, Cast nets, Lift nets, Longlines and Malian trap are typical gears employed in the Upper Benue Basin. The most prominent among them is the Gill-net and Malian trap. The Lift net which is used during the high water can encourage a fishing festival to be introduced during high water period.

The gill net at appropriate mesh size (1-4cm) proof highly efficient and it is durable when properly maintained. It has no discrimination in selecting species to be entangle or gilled into the net, hence fishermen enjoy the usage. As a passive gear it can be set and other daily activities can be possible for the fishermen such as farm and marketing.

Longline is an efficient gears, it hook mostly the carnivorous fishes. But it is labour intensive, time wasting, both during construction and operation. But the fishermen enjoyed the high market value of the catch.

Cast net (an active gear) the usage is seasonal and it select suitable water body. Fishermen at the study area enjoyed the usage during the high water level with low current. It catches species such as Tilapia, mormyrus and heterotis species.

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