INFLUENCE OF NUMBER OF VALVES ON CATCH COMPOSITION OF A FISHING POT TRAP (*LEGE*) IN RIVER RIMA, NORTH WESTERN NIGERIA

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ABSTRACT

Three types of prototype (*Lege*) traps with different numbers of entrance valves were evaluated in River Rima, North Western Nigeria. The traps contained 4,6 and 8 valves, tagged 4-V, 6-V and 8-V, respectively. The experiment was carried out in a randomized complete block design with one factor each replicated three times. Data collected on fish diversity, number, biomass and sizes were subjected to descriptive statistics and analysis of variance. The results of the catch composition showed close diversity index of 0.86 for 6-V, 0.80 for 8-V and 0.60 for 4-V *Lege* traps. However, the number (41 %) and biomass (48 %) of fish caught in the 6-V *Lege* trap were significantly ($P < 0.05$) higher than those caught in the other traps. There was no definite trend in the sizes (length and girth) of fish caught in the traps. On the basis of species diversity, and the number and biomass of fish caught, the 6-V *Lege* showed preference for adoption than the other two traps. However, further studies are recommended on the appropriate mesh size net for the trap in line with the provisions of fisheries edicts.

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INTRODUCTION

The fishing gear and techniques employed in artisarnal 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 desirable. However, the improvement or development of a new gear should be made in such a way that the materials are locally available, the design is simple to copy and cheap. The improved or new gear should also be more efficient and, at the same time, ensure conservation of fisheries resources unlike the conventional ones being used .

Ipinjolu *et al.* (2004) conducted an exploratory survey of the *Malian* and *Ndurutu* traps widely used in northwestern Nigeria. Based on the findings in the study, a new fishing pot trap, chistened *Lege* trap, was developed as reported by Agbelege *et al.* (2004). The report showed that the new trap was more efficient than the *Malian* and *Ndurutu* traps. The better performance of the new trap was attributed mainly to its 8 non-return valves (7 inlet and one inner valves) compared to the *Malian* with 3 inlet valves and *Ndurutu* with one inlet and another inner valve that lead to the inner chamber.

Provision of valves in traps involves costs on materials and labour. Therefore, this study was aimed at optimizing the number of valves in *Lege* trap through comparative assessment of the catches of three types of the trap having 4, 6 and 8 valves

MATERIALS AND METHODS

Study Area

This study was conducted in River Rima around Sokoto, Sokoto State in the north western part of Nigeria. The State, located in the extreme northwestern corner of Nigeria lies within the Sudan Savannah zone where water constitutes the most limiting resource to development including food production. The climatic characteristics of the area have been earlier described (Mamman *et al.*, 2004 ; Ipinjolu *et al.*, 2004 ; Agbelege *et al.*, 2004). River Rima is the most important perenial river network in the northwest of Nigeria (Umar and Ipinjolu, 2001). The experiment was conducted in the river at Kwalkwalawa along the road to the main campus of Usmanu Danfodiyo University, Sokoto.

The *Lege* Traps

Three types of *Lege* trap with 4,6 and 8 non-return valves (V) were fabricated and tagged as 4-V and 6-V and 8-V *Lege* trap, respectively. In the 4-V trap, there were no side valves at either of the chambers while the 6-V had side valves only on the second chamber. The 8-V *Lege* was as described in the preceding paper (Agbelege *et al.*, 2004). The traps were fabricated following the configuration and specifications of the 8-V trap Agbelege *et al.*, 2004), except for the number and position of the non-return valves on the sides of the traps. A total of nine traps, three of each type were fabricated.

Setting, Baiting and Inspection of Traps

The design of the experiment was the randomised complete block design (RCBD) with one factor (trap type) at three levels, each replicated three times. Each of the nine traps was baited with two balls of *bulla* (local bait) in the first chamber and one in the second chamber. They were tagged and randomly set in the littoral zone of River Rima on the same day and at the same time. The traps were anchored to the ground using stones and stakes. Rebaiting was done after every inspection. The inspection of traps also involved cleaning and repairs of damages of the traps before resetting.

Collection and Analysis of Data

The traps were inspected on alternate days (between 3.30 pm and 4.00 pm) and catches were recorded for each trap. Fish caught were counted and species identified following the descriptions of Reed *et al.* (1967), Holden and Reed (1972) and Olaosebikan and Raji (1998). Total length (cm) was measured on a graduated measuring board, while the total weight (g) was obtained using a spring balance of 1 kg maximum capacity. The data collected were subjected to simple statistical analysis using mean, standard deviation and percentage. Analysis of variance (ANOVA) was carried out using the Statistical Package for the Social Sciences (SPSS, 1999).

RESULTS

Species Composition

The various types of fish caught in the three types of the *Lege* trap are shown in Table 1. A total of 15 fish species belonging to nine families was recorded. Mormyridae and Mochokidae families were each represented by four and three species, respectively, while the family Bagridae was represented by two species. The other six families had one species each.

Table 1: Composition of fish caught in the different types of *Lege* traps

Family	Species	Trap Type		
		4-VLege	*6-VLege*	*8-Vlege*
Clariidae	*Clarias gariepinus*	X	X	X
Mormyridae	*Gnathonemus cyprinoides*	-	X	X

	Marcusenius isidori	X	X	X
	Hyperopisus bebe occidentalis	-	-	X
	Mormyrus rume	X	X	-
Mochokidae	*Synodontis clarias*	X	X	X
	Synodontis eupterus	X	X	X
	Synodontis gobroni	-	X	-
Cichlidae	*Oreochromis niloticus*	X	X	X
Bagridae	*Bagrus bayad*	X	X	X
	Clarotis laticeps	-	X	X
Citharinidae	*Citharinus distichodoides*	-	X	-
Characidae	*Alestes nurse*	X	X	X
Schilbeidae	*Schilbe mystus*	X	X	X
Malapteruridae	*Malapterurus electricus*	-	-	X
Total Species	15	9	13	12
Diversity Index		0.60	0.86	0.80

X=Recorded

-=Nil recorded

Out of the 15 fish species caught in the three Lege traps, 13 were caught in the 6-V *Lege* trap, giving a species diversity index (SDI) of 0.86. This was almost the same with the SDI of 0.80 obtained for the 8-V *Lege*, but higher than the value of 0.6 for 4-V *Lege* trap.The types of species caught in the three traps were the same,except *M. rume* that was not caught in the 4-V trap.

Number of Fish Caught

The number and proportion of each fish species caught in the traps are shown in Table 2. A total of 515 fish was caught, out of which about 25 and 35 % were caught in 4-V and 8-V *Lege* traps, respectively. *O. niloticus* accounted for the largest proportion of the fish caught in the three traps. Among the species caught in 4-V trap, *S. clarias* and *O. niloticus* accounted for 35 and 31 %, respectively. In the 6-V trap, the two species accounted for lower roportions of 33 and 22 %, respectively. In the 8-V trap, *S. clarias* accounted for a higher proportion (37 %) than the other two traps. The distribution of the number of fish caught showed that *S. clarias*, *O. niloticus*, *B. bajad* and *C. gariepinus* accounted for 35, 25, 11 and 10 %,
respectively. The numbers of fish caught in the three types were significantly different ($P < 0.05$) from each other (Table 3).

Biomass of Fish Caught

Values for the biomass of the fish caught in the three traps are contained in Table 2. A total of 37.68 kg was caught, of which the largest biomass (48.4 %) was caught in the 6-V trap. The 4-V and 8-V traps accounted for about 20 and 32 % of the total biomass of fish caught, respectively. Tilapia (*O. niloticus*) dominated the catches and it accounted for 55.4, 30.7 and 34.6% of the biomass of fish caught in the 4-V, 6-V and 8-V traps, respectively with overall mean of 36.8%. The biomasses of fish caught in the 4-V and 8-V *Lege* traps were not significantly ($P > 0.05$) different from each other, but both were significantly lower than the biomass of fish caught in the 6-V *Lege* trap ($P < 0.05$) (Table 3).

Table 2

Table 2. Number and biomass (g) of fish caught in three different types of *Lege* trap

Species	Traps										Overall
	4-*Lege*				6-*Lege*				8-*Lege*		
	No	%	Biomass	%	No	%	Biomass	%	No	%	Biomass
C. gariepinus	8	6.25	606	8.20	26	12.44	2553	14.02	18	10.11	1359
G. cyprinoids	-	-	-	-	2	0.96	250	1.37	1	0.56	50
M. isidori	1	0.78	5	0.07	3	1.43	29	0.16	2	1.12	14
H. bebe	-	-	-	-	-	-	-	-	2	1.12	353
M. rume	2	1.56	151	2.04	8	3.83	1186	6.51	-	-	-
S. clarias	46	35.94	1373	18.58	68	32.54	2431	13.35	65	36.52	2254
S. eupterus	6	4.69	255	3.45	8	3.83	347	1.91	6	3.37	242
S. gobroni	-	-	-	-	2	0.96	403	2.21	-	-	-
O. niloticus	40	31.25	4090	55.36	45	21.53	5591	30.70	44	24.72	4166
B. bajad	8	6.25	444	6.01	24	11.48	2553	14.02	23	12.92	2396
C. laticeps	-	-	-	-	3	1.43	730	4.01	3	1.69	730
C. distichodoides	-	-	-	-	2	0.96	1530	8.40	-	-	-
A. nurse	5	3.91	166	2.25	10	4.78	411	2.26	3	1.69	89
S. mystus	12	9.39	298	4.03	8	3.83	196	1.08	10	5.62	287
M. electricus	-	-	-	-	-	-	-		1	0.56	100
Overall	128	100	7388	100	209	100	18210	100	178	100	12040
%		24.85		19.63		40.58		48.38		34.56	

Table 3: Mean number and biomass of fish caught in the three types of *Lege* trap

Parameter	Trap type	No. of Catches*	Total Fish No.	Mean	SD	Min	Max
Number	4-V	39	128	3^{c}	1.07	2	5
	6-V	41	209	5^{a}	1.69	2	9
	8-V	42	178	4^{b}	1.76	1	9
Biomass	4-V	39	128	189.44^{b}	106.30	60	564
	6-V	41	209	442.20^{a}	322.52	55	1295
	8-V	42	178	286.67^{b}	199.65	32	833

Means in the same column with same letter are not significantly different ($P > 0.05$)
*No of time of fish collection from the traps.

Length of Fish Species

Table 4 shows the summary of the mean lengths (cm) of the various fish species caught in the traps. There was no definite relationship between the lengths of the various species caught and the trap types. The lengths of the fishes caught reflect more of species morphology and size than the effects of the trap type. The *C. gariepinus* and *B. bajad* were significantly longer ($P < 0.05$) than those of the other fish species caught in the 4-V trap. In the 6-V trap, *M. rume* was significantly longer ($P < 0.05$) than the other species, while in the *8-v Lege*, *B. bayad* and *C. gariepinus* had lengths that were significantly higher ($P < 0.05$) than the lengths of the other fish species (Table 5).

Weight of Fish Species

Table 6 presents the weights of some of the fish species caught in the three *Lege* traps. The mean weight of fish caught in 4-V trap was 57.86 ± 43.84 g. *O. niloticus* had the highest mean weight of 102.25 ± 55.71 g. In the 6-V trap, *M. rume* had the highest mean weight of 148.25 ± 101.84 g, while the overall mean weight of fish caught in the trap was 77.50 ± 65.87 g. In the 8-V trap, *B. bayad* had the highest mean weight of 104.17 ± 74.99 g while the overall mean weight recorded for the trap was 64.48 ± 46.26 g. Therefore, the weight of each fish species recorded was influenced by its length and not necessarily the

Table 4

Table 4. Minimum, maximum and mean total lengths (cm) of fish caught by the three types of *Lege* trap

Species	Type of *Lege* trap										
	4-Valves				6-Valves				8 Valves		
	No.	Min.	Max.	Mean ± SD	No.	Min.	Max.	Mean ± SD	No.	Min	M
C. gariepinus	8	15.00	25.00	20.37± 3.29	26	13.0	32.00	20.50 ± 4 93	18	14 00	2
M. rume					8	17.0	38.00	25 19 ± 7.42			
S. clarias	46	8	16.00	11.72 ± 1.95	68	9.0	16.00	12.30 ± 1.80	65	8.00	1
S. auritus	6	12	13.00	12.58 ± 0.49	8	12.0	13.00	12 31 ± 0 46	6	12 00	1
O. niloticus	40	9	40.00	18.37 ± 5.18	45	9 0	30 00	19 39 ± 5.61	44	9 00	2
B. bayad	8	15	30.00	19.81 ± 5.85	24	14.0	33.00	22.75 ± 6.31	23	14 00	3
A. nurse	5	10	15.00	13.00 ± 2.00	10	10 0	16.00	13.35 ± 2.38			
S. mystus	12	12	17.80	15.11± 2.23	8	12.0	19 00	14 56 ± 2 47	10	12.00	2
Total	125	8 00	40.00	15.34 ± 4.93	197	9.00	38 00	16.94 ± 6.13	16 6	8 00	3

Table 5: Mean lengths, weights and girths of the various fish species caught in the different types of *Lege* traps

Parameter	Species	Traps		
		4-Lege	*6-Lege*	*8-Lege*
Length	*S. mystus*	15.11^{ab}	14.56^{c}	15.20^{c}
	S. clarias	11.72^{c}	12.30^{c}	11.80^{d}
	A. nurse	13.00^{c}	13.35^{c}	-
	S. eupterus	12.58^{c}	12.31^{c}	12.17^{d}
	B. bayad	19.81^{a}	22.75^{ab}	22.96^{a}
	C. gariepinus	20.37^{a}	20.50^{b}	20.50^{a}
	O. niloticus	18.37^{ab}	19.39^{b}	17.92^{b}
	M. rume	-	25.19^{a}	-
Weight				
	S. mystus	24.83^{c}	24.50^{c}	28.70^{c}
	S. clarias	26.85^{c}	35.75^{c}	34.68^{c}
	A. nurse	33.20^{c}	41.10^{c}	
	S. eupterus	42.50^{c}	43.37^{c}	40.33^{c}
	B. bayad	55.50^{ab}	106.37^{b}	104.17^{a}
	C.gariepinus	75.75^{ab}	98.19^{b}	75.50^{b}
	O. niloticus	102.25^{a}	124.24^{ab}	94.98^{ab}
	M. rume	-	148.25^{a}	-
Girth				
	A. nurse	3.50^{b}	3.63^{c}	-
	S. clarias	3.65^{b}	3.98^{bc}	3.86^{c}
	C.gariepinus	3.81^{b}	4.24^{bc}	4.08^{c}
	B. bayad	4.12^{b}	4.98^{b}	5.20^{b}
	S. mystus	4.26^{b}	3.90^{c}	3.97^{c}
	S. eupterus	4.50^{b}	4.00^{bc}	4.00^{c}
	O. niloticus	6.30^{a}	6.74^{a}	6.52^{a}
	M. rume	-	6.79^{a}	-

Means in the same column with same letter are not significantly different (P>0.05)

trap type. In the 4-V trap, the weight of *O. niloticus* was significantly heavier ($P < 0.05$) than the other species caught in the trap, while in the 6-V trap, the mean weight of *M. rume* was significantly higher ($P < 0.05$) than those of the rest species in the trap. In the 8-V trap, *B. bayad* had a significantly higher ($P < 0.05$) mean weight than the other species trapped in the gear (Table 5).

Girth of Fish Species

Table 7 contains the summary of the girth lengths of fish species caught in the three *Lege* traps. *O. niloticus* had a mean girth length of 6.30 ± 1.41 cm, which was significantly higher ($P < 0.05$) than those of the other species caught in the trap. However, the mean girth