

EXPLORATORY SURVEY OF *MALIAN* AND *NDURUTU* TRAPS IN RIVER RIMA, NORTH WESTERN NIGERIA

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ABSTRACT

The fabrication and operational techniques of *Malian* and *Ndururu* traps mostly used by the fishermen in River Rima in North Western Nigeria were evaluated through structured questionnaire and measurement of samples of the traps. Data collected were analysed using descriptive statistics. There was no standard in the dimensions of either of the traps. The traps were made of locally-sourced materials, except the synthetic net of the *Malian* trap. About 81 and 80 % of the respondents fabricated their *Malian* and *Ndururu* traps, respectively. The major problems encountered in the structure and operation of the *Malian* trap included projection above water, stealing of catches and trap, and trapping of small sized fishes as indicated by 61.9, 47.6 and 28.6 % of the respondents, respectively. In the case of the *Ndururu* trap, 72.0, 48.0, 12.0 and 8.0 % of the respondents respectively indicated poor durability, single entrance valve, destruction by cattle and instability in water, as the major problems encountered. As improvement measures for the *Malian* trap, the respondents suggested increase in number and size of valve (81.0 %), horizontal positioning (57.1 %) and square shape (47.6 %) while 52.0 % each suggested increase in number of entrance valve and netting of *Ndururu* trap. The fishermen demonstrated ingenuity in the fabrication and operation of the traps, but they failed to initiate the required improvement. It is important to critically examine the designs, materials, costs and limitations of the traps and the suggestions of the fishermen, as basis for improvement on the technology of the traps.

INTRODUCTION

The technology of fish exploitation under small-scale fisheries, as in the Nigeria inland fisheries, is characterised by the use of simple fishing gear and techniques. The types, designs and mode of operations of the traditional and modern fishing gears employed in the inland and coastal waters in Nigeria have been fairly described (Reed *et al.*, 1967; Holden and Reed, 1972; Udolisa *et al.*, 1994). The array of traditional fishing gear that have been identified included those of wounding gear such as spear, club and arrows, and traps including pot traps with or without non-return valves. There are standards for classification of these traditional and modern fishing gears (Hickling, 1961; Everhart *et al.*, 1975; Nedelec, 1982; Udolisa *et al.*, 1994). It is known that traditional fishing techniques employing traps have developed in all regions of the world, including Africa, to catch demersal species of fish (NRC, 1982).

The fishermen in most northern part of Nigeria still rely greatly on various types of fishing traps, and they have over the years become sophisticated in the design. This could be due to the hydrology of the diverse water bodies, scale of fishing operation, availability of the local materials and relatively cheap costs of the traps compared to the modern ones (Umar and Ipinjolu, 2001). *Malian* and *Ndururu* traps (Plates 1 and 2) are the most widely used, in combination with other traditional and modern fishing gears. Agbelege and Ipinjolu (2001) found that 70 and 100 % of the fishermen sampled in Lake Chad, employed *Ndururu* and *Malian* traps, respectively, in combination with other traps. A survey conducted along River Rima in northwestern Nigeria also revealed that 30 - 50 % and 30 - 90 % of the fishermen used *Malian* and *Ndururu* traps,

respectively, depending on the size and abundance of fish resources in the water bodies (Umar, 2001).

Malian trap is a relatively new trap, reportedly copied by Nigerian fishermen from migratory *Malian* fishermen while *Ndurutu* trap is appeared indigenous and reported in Reed *et al.* (1967). The wide adoption of these two traps could be an indication of better performance over the other traps. However, most of the available published works on either of these traps are simply descriptive (Reed *et al.*, 1967; Holden and Reed, 1972) but Udolisa *et al.* (1994) gave the dimensions of some of them. It is important to quantify the efficiency, the intensity usage and the effects of these traps on fish resources so as to guide policy formulation. In a study conducted in River Rima, Umar and Ipinjolu (2001) found that the catch efficiencies of these two traps were similar, but there was species preference, and while the two traps trapped juveniles of commercial fish species. The authors recommended increases in the mesh size of net and cane webbings for *Malian* and *Ndurutu* traps, respectively.

This study was conducted to assess the design, materials, costs and operations of these two traps, and the indigenous knowledge of the fishermen on them, with a view to identifying areas for further improvement. It was anticipated that such a participatory exploratory study, involving the scientists and the fishermen, would help to evolve improved technology that will be adoptable.

MATERIALS AND METHODS

Study Area

This survey was carried out along River Rima around Sokoto, Sokoto State. The State is located in the extreme northeast corner of Nigeria between longitudes 4 ° E and 6 ° 54' E and latitudes 12 ° 0' and 13 ° 54' N (Mamman *et al.*, 2000) within the Sudan Savannah zone. Rainfall in the area is restricted to between May/June and early October, when the natural waterbodies are often flooded (Umar and Ipinjolu, 2001). River Rima is the most important perennial river network in the northwest of Nigeria its major tributaries are Rivers Bunsuru and Gagare. The river takes its course from Katsina State flows through Zamfara State and in Sokoto State joins Sokoto River before flowing to River Niger in Kebbi State (Ita, 1993). Annual rainfall in the area ranges between 500 and 1300 mm, while the dry season lasts for 7 - 8 months (October to May), when River Rima is restricted to the main valley (SSMIYSC, 2001). The fishermen were sampled along the river

Formulation and Administration of Questionnaire

The data used for this study were collected with the aid of structured questionnaire. In the design of the questionnaire, several factors such as the socio-economic characteristics of the fisherman, sizes and dimensions of their *Malian* and *Ndurutu* traps, costs of materials, advantages and limitations of the design of the traps, and the operational problems were considered. Suggestions on ways to improve on the two traps were sought from the fishermen. Twenty five (25) structured questionnaires were administered on 25 randomly selected fishermen operating along River Rima in Sokoto.

Dimensions of the *Malian* and *Ndurutu* Traps

The traps were carefully examined and relevant measurements such as length (cm), height (cm), width (cm) and weight (g). were taken. The mesh size of the traps was noted. Seventeen *Malian* and twenty *Ndurutu* traps were measured. The traps are shown in Plates 1 and 2.

Statistical Analysis

Data collected were collated and analysed using descriptive statistics (mean, standard deviation and percentage) (SPSS, 1999).

RESULTS AND DISCUSSION

Sociodemographic Profile

The sociodemographic profile of the respondents (Table 1) revealed that they were all male and majority were aged 20 to 44 years. They engaged in other occupations, mainly farming and trading, to augment income from fishing. There was low level of western education among the fishermen but majority had over 10 years experience in fishing. The sociodemographic characteristics of the fishermen are similar to the findings in many fishing communities in the zone (Ipinjolu, 1994).

Table 1: Socio-demographic profile of the respondents

Parameter	No. of Respondents	Percentage (%)
Age (yrs)		
Below 20	2	8.0
21 – 26	4	16.0
27 – 32	6	24.0
33 – 38	7	28.0
39 – 44	2	8.0
45 – 50	3	12.0
Above 51	1	4.0
Sex		
Male	25	100.0
Marital Status		
Married	23	92.0
Single	2	8.0
Other Occupation		
Farming	23	92.0
Trading	2	8.0
Education		
Quranic (Arabic)	24	96.0
Primary	3	12.0
Adult Education	3	12.0
Mother Tongue (Hausa)	25	100.0
Family Size (Number)		
Below 3	9	36.0
4 – 6	8	32.0
7 – 9	7	28.0
Above 10	1	4.0
Fishing Experience (yrs)		
Below 9	4	16.0
10 – 14	9	36.0
15 – 19	6	24.0
20 – 24	1	4.0
25 – 29	3	12.0
30 – 34	2	8.0

Quantities and Dimensions of the Traps

Tables 2 and 3 shows the quantities owned and dimensions of *Malian* and *Ndurutu* traps used by the fishermen. All the fishermen employed *Ndurutu* while 84 % used *Malian* traps. Earlier study in the area also revealed that majority (90 %) of the fishermen used *Malian* and *Ndurutu* traps (Umar, 2001) and in Lake Chad 100 and 70 % of

Table 2: Quantities and dimensions of *Malian* traps used by the respondents

Parameter	No. of Respondents	Percentage (%)
Number*	21	84.0
Quantity**		
Less than 10	1	4.76
11 – 20	8	38.09
21 – 30	11	53.38
Above 30	1	4.76
Dimension**		
Width (cm)		
45 – 54	6	35.29
55 – 64	7	41.18
65 – 74	4	23.53
Height (cm)		
52 – 61	2	11.76
62 – 71	4	23.54
72 – 81	8	47.06
82 – 91	2	11.76
92 – 101	1	5.88
Weight (g)		
700 – 800	2	11.76
801 – 900	5	29.42
901 – 1000	9	52.94
Above 1000	1	5.88
Entrance Valve Diameter (cm)		
8	13	29.49
9	17	33.33
10	21	41.18

*Number of respondents using *Malian* trap

**Based on 17 *Malian* traps measured fishermen sampled were found to employ *Malian* and *Ndurutu* traps, respectively, in combination with other fishing gears (Agbelege and Ipinjolu, 2001).

The *Malian* and *Ndurutu* traps used by the fishermen could be considered to be small size categories, compared to those large sizes used in Lake Chad most probably due to the size and hydrology of the water bodies in the area. The design of each trap type was also found to be the same. However, the dimensions of each trap type measured (Tables 2 and 3) revealed lack of uniformity in the measurements including the sizes of the inlet valves. Standardization of the measurements could be important for categorization of the traps and for research.

Table 3: Quantities and dimensions of *Ndurutu* traps used by the respondents

Parameter	No. of Respondents	Percentage (%)
Number	25	100.0
Quantity*		
Less than 10	2	8.00
11 – 20	10	40.00
21 – 30	9	36.00
Above 30	4	16.00
Dimension**		
Length (cm)		
74 – 96	2	10.00
96 – 118	1	5.00
118 – 140	17	85.00
Width (cm)		
12 – 32	1	5.00
33 – 53	16	80.00
Above 53	3	15.00
Height (cm)		
25 – 38	4	20.00
39 – 52	12	60.00
53 – 66	4	20.00
Weight (g)		
750 – 850	2	10.00
851 – 950	5	25.00
951 – 1050	7	35.00
1051 – 1150	6	30.00
Entrance Valve Diameter (cm)		
12 – 14	4	20.00
15 – 17	8	40.00
18 – 20	6	40.00

*Number of respondents that used *Ndurutu* trap

**Based on 20 *Ndurutu* traps measured

Advantages and Limitations of the Traps

Some of the views of the fishermen on the design of the traps (Table 4) are also related to their advantages and limitations as summarised in Table 5. Catching of live fish is one of the major advantages of traps over other fishing gear like gill net and hook. This attribute could also be of importance to research particularly where procurement of live fish is desired. However, removal of catches in *Ndurutu* involved loosening it at the rear

Table 4: Respondents views on designs of *Malian* and *Ndurutu* traps

Parameter	No. of Respondents	Percentage (%)
<i>Malian</i> (Conical)		
To sit without submergence	12	57.14

Tradition	5	28.81
For easy baiting	1	4.76
Do not know	3	14.29
Ndurutu (Double chambered)		
To hold fish in second chamber	15	60.00
Setting without bait	5	20.00
Tradition	1	4.00
River fishing	9	36.00
Good fish collection	5	20.00

end, unlike *Malian* trap that can easily be emptied of catches through a more or less open top. *Malian* trap is set with the top projecting above water, thus attracting stealing of catches which could also include the trap as reported by 13 % of the respondents (Table 5). *Ndurutu* trap appeared more fragile because it is constructed using only cane mat that formed the structure and the body and this may partly account for the poor durability.

The accounts of Reed *et al.* (1967) suggest that *Ndurutu* was originally designed for use mainly in rivers and creeks during flood. The shape of the trap (Plate 2) also appeared quite appropriate for setting against wnsater current. However, with the creation of many reservoirs in the zone, the trap is now used in both lotic and lentic water bodies. It will therefore be desirable to improve on the design of the trap so as to make it more suitable for fishing in diverse water bodies.

Table 5: Responses on advantages and limitations of the shape and operations of *Malian* and *Ndurutu* pot traps

Parameter	No. of Respondents	Percentage (%)
Advantages		
<i>Malian</i> (Conical shape)		
Holding of live fish	9	42.86
Easy baiting	4	19.05
Sitting well in shallow water	11	52.38
Year round usage	4	19.04
Easy removal of catches	5	23.81
<i>Ndurutu</i> (Double chambered)		
Holds live fish	12	48.00
Hidden in water	12	48.00
Usable in any water	4	16.00
Non-selectivity	2	8.00
Usable in all seasons	1	4.00
Limitations		
<i>Malian</i>		
Stealing of catches	13	61.90
Unusable in deep water	2	9.52
Catches mostly small fishes	3	14.29
High cost of net	1	4.75
Catches mainly small size fishes	6	28.57
Damage by crab	4	19.04
<i>Ndurutu</i>		
Not stable in the water	2	8.00

Poor durability	18	72.00
Single entrance valve	12	48.00
Catches not easily removable	4	16.00
Destruction by cattle	2	12.00

The materials used for construction of *Malian* trap were cane sticks and net twine and shaped as in Plate 1 while *Ndurutu* is made up of mainly webbed cane mat with mid-rib of raffia palm as rope. The latter was double chambered and dome shape (Plate 2). About 81 and 80% of the fishermen sampled fabricated the *Malian* and *Ndurutu* traps respectively while other purchased them from open market (Table 6)

Improvement on the Traps

The suggestions of the fishermen on the necessary improvements of the traps (Table 7) were mainly on the shape of the *Malian* trap, materials for *Ndurutu* trap and increase in the number and size of valves of the two traps. These should be critically considered in attempts at improving the technology of the traps.

Table 6: Sources of the traps owned by the fishermen

Trap / Source	No. of Respondents	Percentage (%)
Malian		
Self fabricated	17	80.95
Purchased from market	5	23.81
Ndurutu		
Self fabricated	20	80.00
Purchased from market	6	24.00

Table 7: Respondents' suggestions on improvement of the pot traps

Trap / Improvement	No. of Respondents	Percentage (%)
<u>Malian</u>		
Preference for square shape	10	47.62
Preference for rectangular shape	2	9.52
Can be made to lie flat	12	57.14
Increase size and number of entrance valves	17	80.95
<u>Ndurutu</u>		
Increase number of entrance valves	13	52.00
Can be netted	13	52.00
Increase size of the trap	1	4.00

CONCLUSION

There was a widespread acceptance and adoption of *Malian* and *Ndurutu* traps by the fishermen in the area, due to simple technology of fabrication, available cheap materials and ease of operation. This study revealed that the fishermen were not only aware of the materials, structural and operational limitations of each of the traps they also realised the need for improvement. However, they failed to initiate the necessary improvement probably due to

tradition, low level of education or lack of opportunity to do so. Therefore, these traps could be the focus of scientific investigation in order to improve on their technology. The identified areas of research include enhancing structural rigidity of the *Ndurutu* trap; shape modification of *Malian* trap; improvement on the structure, size and number of non- return valves of the two traps; sourcing of cheap durable materials for the construction of the traps; and any other modifications that could enhance easy baiting, catch removal, catch efficiency and management operations of the traps.

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