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A SURVEY OF THE ARTISANAL FISHERIES OF KONTAGORA RESERVOIR, NIGER STATE, NIGERIA

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ABSTRACT
A survey of the artisanal fisheries of Kontagora Reservoir was conducted between January – December, 2007, using statistical frame survey and catch assessment survey. Five fish families made up seven fish species were recorded. The fish species Hemichromis fasciatus, a cichlid was the most dominant with mean value of 414.3 and 7715 in terms of number and weight respectively. Nineteen fishermen using gill nets, cast nets, hook and line sets, and Malian traps as fishing gears were recorded in the reservoir with a total mean catch of 4.40kg/canoe or 167 fishes/canoe. The reservoir was productive and comparable with other smaller but productive African lakes. The monitoring, control and surveillance (MCS) system was suggested for management consideration, with emphasis on registration of fishermen and their fishing equipment, enforcement of minimum marsh size of 3" and establishment of community based cooperative scheme.

Keywords: Kontagora Reservoir, artisanal fisheries, MCS management, fishermen.

INTRODUCTION

Nigeria is blessed with over 14 million of hectares of reservoirs, lake, ponds and major rivers capable of producing over 980,000 metric tones of fish annually (FDF, 2007) However, majority of these reservoirs are built on seasonal rivers, with paucity of fish species composition, resulting in low fish productivity (Ita *et al.,* 1982). Statistical surveys have shown that the demand for fish in the country exceeds supply, and also, the domestic production is still very low, considering the increasing human population. The annual fish consumption/demand in Nigeria has been estimated to be over 1.3 million metric tonnes and the total domestic production is just about 450,000 metric tonnes per annum (Tsadu *et al.,* 2006).

Artisanal fisheries sector made up the most important sector, which accounts for the major fish supply in the developing world. According to FAO (1991) assessment, out of 1.9 million people engaged in either full time, part time and seasonal fishing about 98% belongs to the artisanal sector. Artisanal fishery is however characterized with low technology, lack of modern equipments and low fund to expand, etc. resulting in labour intensiveness of the sector, with little or no opportunities to expand. These problems however forced the fishermen to seek for additional income in non fishing activities.

Thus, fish being the cheapest source of animal protein to human, there is need to protect and manage the fishery in the reservoirs for the community. In order for this to be done effectively, detail knowledge of the artisanal fisheries of these reservoir is of great importance.

The research involved artisanal fisheries survey, i.e. frame and catch assessment survey of Kontagora Reservoir, conducted in 2007, to assess the current fishery situation in the reservoir.

The primary objectives of this study are: to determine the size and distribution of fishing villages, fishermen, fishing crafts and fishing gears around Kontagora reservoir, and also to assess the catch composition, abundance and current fish yield of the reservoir. These are aimed at formulating management plan and policies for the reservoir management, so as to enhance sustainable fish production of the reservoir.

MATERIALS AND METHODS

Study Area

Kontagora Reservoir officially commissioned in 1991, lies in the Northern Guinea Savanna zone between latitude $3^0 20'$ and $7^0 40'$ East and longitude 8^0 and $11^0 3'$ North (Figure 1). The climate is characterized by distinct dry and wet season. The reservoir was constructed by the impoundment of River Kontagora, a seasonal river. The reservoir created with the major objective of providing domestic water to Kontagora town, has a total storage capacity of 17.7million cubic metre, and a surface area of 143 square kilometers. The height of the reservoir is 20 metres and the crest length is 1000 metres.

Statistical Frame Survey

This involved total count of the fishing villages around the reservoir, number of fishermen and boats operating on the reservoir, and recording of the fishing gears used.

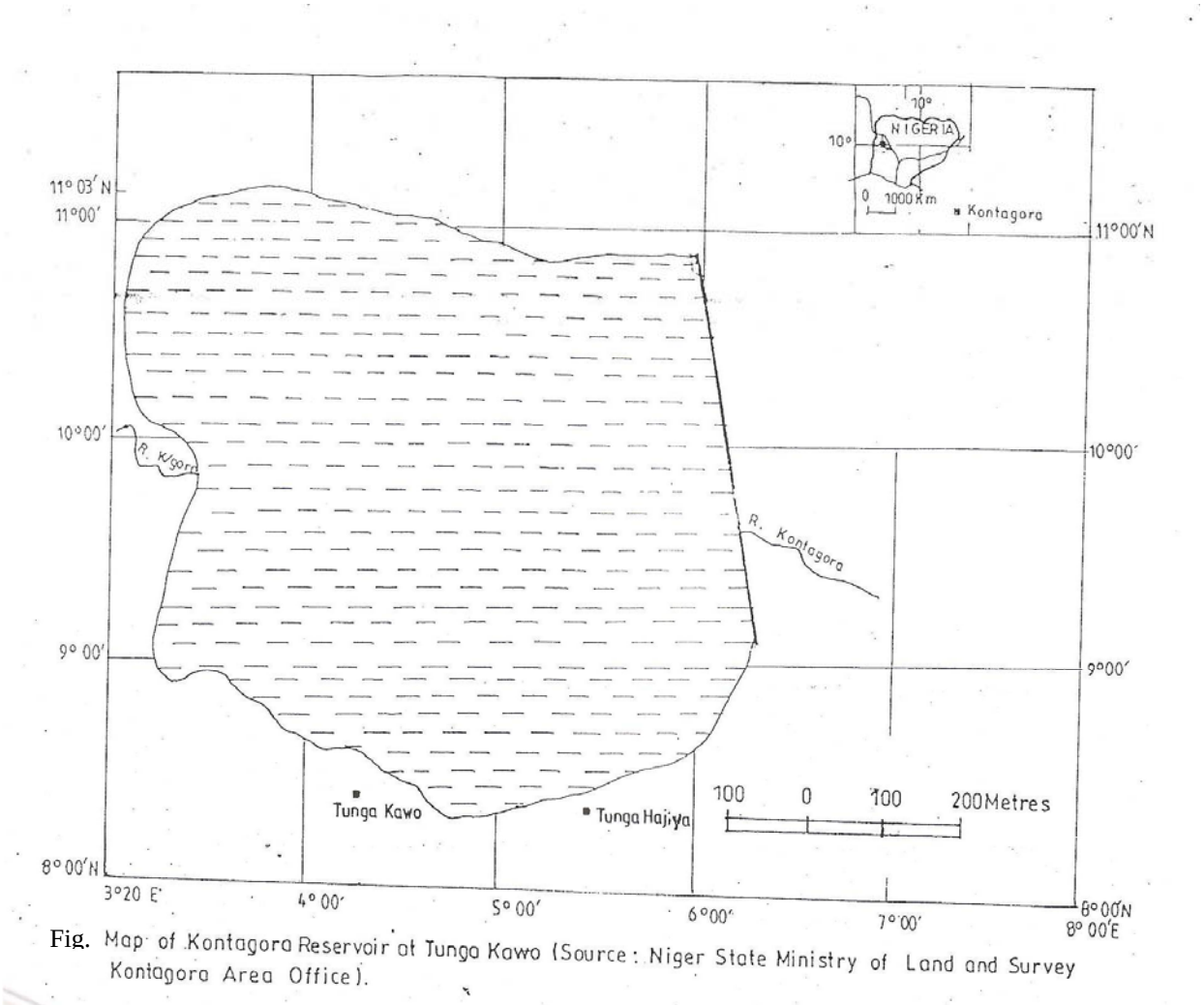

Fig. Map of Kontagora Reservoir at Tunga Kawo (Source: Niger State Ministry of Land and Survey Kontagora Area Office).

Catch Assessment Survey

This involved the actual count and weighing of the fishes caught by the local fishermen at the major landing site Tunga Kawo. Weights were measured using a weighing balance. The fishing gears were also recorded.

Statistical Analysis

Statistical analysis of the results was based on the use of one way analysis of variance (ANOVA), with the means compared using Duncan multiple range test (DMRT) (Steel and Torrie, 1980).

RESULTS

Statistical Frame survey

The number of Artisanal fishermen in Kontagora Reservoir and the types of fishing gears used is shown in Table 1. Variation of fish species caught in relation to different types of gear used and season were recorded in Table 2.

Table 1: Number of Artisanal fishermen in Kontagora Reservoir and their fishing gears and craft (January – December, 2007).

Fishing village	Full time fishermen	Part time fishermen	Number of wooden canoe	Fishing gears used
Tunga Kawo	-	22	18	Gill net, cast net, hook and line set Malian trap
Tunga Hajiya	-	12	8	Gill net and Malian trap
Total	-	34	26	

Table 2: ANOVA showing variations of fish species/fish landing in catch assessment survey at Tunga Kawo using different fishing gears and seasons.

Source of variation	Df	Number of fish	Weight of fish
Treatment (trt)	48	290753*	5623944*
Species	6	551543.7*	9734217*
Gear	3	571371.3*	3972856*
Season	1	127971.4*	7783920*
Species X Gear	18	93135.7^{ns}	52190414*
Species X season	6	467492.5*	9690861*
Gear X Season	2	322115.0*	1755953^{ns}
Species X Gear X Season	12	306599.1*	3897806*
Error	148	214741	5112460

* - significant P < 0.05, ns – non significant P > 0.05

Catch Assessment Survey

The result of the catch assessment survey is presented in Table 3.

Table 3: Mean fish landing by species in catch assessment survey

Species	Number of fish	Weight of fish
Barilius niloticus	224.8^{ab}	3635^{d}
Hyperopsis bebe occidentalis	337.2^{b}	6472^{ab}
Hemichromis fasciatus	414.3^{a}	7715^{a}
Auchenoglanis occidentalis	140.1^{c}	7386^{b}
Tilapia melanopleura	254.5^{ab}	4190^{c}
Clarias anguillaris	30.9^{e}	3001^{e}
Clarias gariepinus	48.7^{d}	2674^{f}

Means with the same alphabet in each column are not significantly different

The weight and number of fish caught per fishing gear during the survey is shown in Table 4

Table 4: Mean fish landing by different fishing gears in catch assessment survey

Type of gear	Number of fish	Weight of fish
Gill net	153.0^{b}	4846^{b}
Cast net	305.6^{a}	6839^{a}
Hook and line sets	97.5^{c}	2313^{c}
Malian trap	31.8^{d}	1658^{d}

Means with the same alphabet in each column are not significantly different.

Table 5: Mean fish landing by season in catch assessment survey

Season	Number of fish	Weight of fish
Dry	224.72^{a}	5727^{a}
Rainy	173.11^{b}	4458^{b}

Means with the same alphabet in each column are not significantly different.

Table 6: List of fish families/species identified in Kontagora Reservoir, Niger State, Nigeria.

Fish families /Species	English	Local Name
Cichlidae		
Tilapia melanopleura	Tilapia	Gargaza
Hemichromis fasciatus	Tiliapia	Kulkula
Cyprinidae		
Barilius niloticus	Barb	Dankursa
Bagridae		
Auchenoglanis occidentalis	Cat fish	Kurungu
Mormyridae		
Hyperopsis bebe occidentalis	Trunk fish	Kuma
Claridae		
Clarius anguillaris	Mud fish	Tarwada
Clarias gariepinus	Mud fish	Hananoma

DISCUSSON

Frame survey

There are two fishing villages located around the reservoir, Tunga Kawo and Tunga Hajiya (Figure 1). The main fish landing site is Tunga Hajiya. Table 1 showed the distribution of the fishermen, their fishing craft and gears. A total of 34 fishermen were counted, all of them are part time fishermen, who also engaged in farming activities. A total of 22 fishermen recorded in Tunga Kawo, and 12 recorded in Tunga Hajiya. Wooden canoe is the fishing craft used, and 26 wooden canoes without engines were counted. The fishing gears recorded include gill nets, cast nets, hook and line sets and Malian traps.

Catch Assessment survey

The analysis of variance (ANOVA), showing variations of fish species/fish landing in catch assessment survey using different fishing gears and seasons, presented in Table 2, revealed that there was significant variations among species of fish landing, fishing gears and seasons. When considering the number of fish landing, the analysis of variance (Table 2), revealed that the interaction between fish species and gears, showed no significant variation ($p < 0.05$). However, the interaction between fish species and the season, showed a significant variation ($p < 0.05$). The mean number and mean weight of fish species in the catch assessment (Table 3), showed a significant variation among the species, with *Hemichromis fasciatus*, a cichlid being the most dominant in terms of number and weight. While the least dominant in term of number and weight is *Claridae*, i.e *Clarias anguillaris* and *Clarias gariepinus* respectively. Similarly, the mean number and mean weight of fish landing (Table 4), showed the significant variation for fishing gears, the highest number and weight of fish landing was recorded from cast net and the least recorded from Malian trap. Table 5 revealed that the mean number and mean weight of fish landing in catch assessment showed a significant variation among the seasons, with the highest number and weight of fish recorded in the dry season. Table 6 is a checklist of the fishes observed during the study period, comprising of seven species of fish belonging to five families.

Artisanal fisheries survey comprises of statistical frame survey and catch assessment survey. In the frame survey, two fishing villages are located around Kontagora reservoir, with a total of 34 part time fishermen. A total of 26 canoes were counted without engines. The most common fishing gears used include gill net, cast net, hook and line sets and Malian traps, while the common transport system is by wooden canoes. Balogun *et al*., (2000), in a similar study on Zaria reservoir recorded 8 fishing villages, and a total of 49 fishermen, with the following fishing gears, cast nets, gill nets and traps and the transport system include canoe without engines and gourds. Balogun and Auta (2001) recorded three fishing villages located around Lake Kangimi, with a total of 50 fishermen, and the fishing gears used include cast nets, long lines, gill nets and the transport system include dug out canoes and gourds. The density of the fishermen engaged in daily fishing in the reservoir was relatively low, because the fishermen migrate to other towns like Yauri, Shiroro and Mararaba Jos, while those that remain are part time fishermen, engaging in farming activities as well as fishing mostly early in the morning and towards evening. Thus, based on the FAO standard of 2 fishermen per square kilometers, only 72 fishermen ought to be registered to actively fish on the 143 square kilometers Kontagora Reservoir. It was also observed that during the rainy season, majority of the fishermen engaged in full scale crop farming.

In the catch assessment survey, the actual count and weight records of fish caught by the local fishermen were carried out at Tunga Kawo fishing village for the period of January – December, 2007. The actual counts and weights of fish by 19 local fishermen, showed a total mean catch of 4.40kg/canoe or 168 fishes/canoe, with a total of seven different fish species, belonging to five different families. Balogun *et al.,* (2000) in a similar study on Zaria Reservoir recorded 4.48 kg of fish per canoe or 77 fishes per canoe from 10 local fishermen, with a total of 18 different species from artisanal fisheries. Balogun and Auta (2001), also recorded a total mean catch of 7.03kg/canoe or 62 fishes/canoe for artisanal fisheries in Kangimi lake from 14 fishermen, and a total of 19 different species belonging to 9 fish families were caught from artisanal fisheries. The diversity of five families and seven fish species in Kontagora Reservoir in artisanal fisheries survey are comparable with fish diversities in small reservoirs impounded across seasonal rivers such as nine families and 18 species in Zaria Reservoir, reported by Balogun *et al*., (2000). Similarly, Balogun and Auta (2001) reported nine fish families and 19 species in Kangimi Lake. However, the dominance of the fish family *Cyprinidae* in Kontagora Reservoir differs from other reservoirs. The dominance of the fish family *Cichlidae* have been reported in Tiga Dam (Ita, 1984), Zaria Reservoir (Balogun *et al*., 2000), Kangimi Lake (Balogun and Auta, 2001), and Ero Reservoir (Kester *et al.,* 2007).

Conclusion and Recommendations

A systematic approach toward management and development of Kontagora Reservoir is hereby recommended, for more efficient fishery conservation and management. This involves appropriate monitoring, control and surveillance (MCS) system (FAO, 1995). The system focused on registration of fishermen and their fishing equipment, enactment of minimum mesh regulation and community based scheme (FAO, 1995). A minimum of 3" mesh size has been recommended for all inland gill net fishing (Ita, 1982). This is to protect the spawning stock of commercially valued species. Mesh size regulation prevent over exploitation of young fish, before they attain sexual maturity.

Cooperative society should be formed by fishermen in the villages surrounding Kontagora Reservoir, as this play a significant role in conservation and management decisions for fishery resources. FAO (1995) confirmed that fisheries managed through communal system tend to be both resource sustainable and economically efficient.

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