THE FISHERY OF LAKE YAMAMA, KEBBI STATE, NIGERIA.

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ABSTRACT

The highlights of the Fisheries Assessment Survey conducted at Yamama Lake in Kebbi State, North-western Nigeria in 2005 is presented. There were 17 fish species found in fishermen's landings during the survey period. About 25 fishermen were found using undersized nets to catch the juveniles of these species. Fishing pressure was found to be very high. The lake is 900 m in length and 195 m wide giving a surface area of about 18 hectares. For an optimum catch, about 4 fishermen ought to have engaged in full time fishing activities if the fisheries of the lake are to be managed on a sustainable basis. However, a surplus of over 100 fishermen was recorded actively fishing during the period of the assessment. All these have a depleting effect on the abundance and sizes of fish caught from the lake. A community based fisheries management system, which establishes a participatory involvement of fishermen in the conservation and rational exploitation of fisheries resources for the well being of the stakeholders is recommended for the Lake.

INTRODUCTION

Nigeria has over 14 million hectares of inland waters, much of which lack proper management according to Aquaculture and Inland Fisheries Project Newsletter (Miller, 2004). Nigeria could be self-sufficient in fish production and be a major exporter of fish if the over 14 million hectares of Nigeria inland water bodies are developed and properly managed (Abiodun, *et al*, 2005). However, a resource can only be managed if sufficient good data and information are available. Unfortunately, this principle has been generally overlooked in the case of Nigerian inland fisheries where data are insufficient for taking the kind of management decisions that are needed. This lack of information has contributed to the generally poor state of inland fisheries resources in Nigeria.

Development and improved management of the country's inland water bodies must, therefore, start with increased knowledge of the water bodies, information on the current status of the fisheries and the socio-economic characteristics in fishing communities so that, people can be effectively integrated into co-management programme.

A survey embracing both frame and catch assessment was conducted in 2005 to appraise the current fishery situation in the lake. The results of the survey are very important ingredients for the management of the fisheries.

The objective of this work is to determine the size and distribution of fishing localities, fishermen, fishing craft and fishing gears around the lake and also to assess the catch composition, abundance, catch per unit effort (cpue) and the current fish yield of the lake. These are aimed at formulating management plan, which will enhance sustainable fish yield of the Lake.

Study Site:

The study site is Lake Yamama. Lake Yamama is a natural lake situated between latitude 11°20¹- 12° north and longitude 04°20¹- 06° East. Yamama Lake is an ox bow lake formed by the Shella River, which sometimes floods into the lake. The lake stretches some 900 m in length and is 195 m wide giving a surface area of about 18 hectares. At flood stage, Yamama Lake could be joined with its upper end at Unguwa Nenu village near Goru bridge and then form a lake of about 200 hectares. The Lake supports a small- scale fishery that calls for development at community level. Limnologically, the lake can be described as an organically rich with brown waters with depths up to an estimated 4.6 meters. Water analysis indicated a pH of 7.2, with hardness of 42

ppm and alkalinity of 58 ppm indicating waters capable of supporting good fish production. Aquatic vegetation in the lake consisted of large areas of *Lilypads*, emergent *Typha, Cerratophylum* and other weeds. About 60-70% of the lake is open waters; with the southern portion virtually covered with aquatic vegetation. The lake bottom is very rich in decaying vegetable matters. A few crocodiles were reported to be in the lake. There was little but intensive manual irrigation along the shorelines of the lake. The heavy soil supported some sugar cane in the margins.

MATERIALS AND METHODS

Fishery information on Yamama Lake was collected using frame and catch assessment surveys. The frame survey which was conducted for five consecutive days starting from 9th to 13th April, 2005, involved going round the entire lake to identify and count every fishing localities around the lake with the total number of fishermen (both full time and shoreline), the fishing crafts and gears employed. A full-time fisherman is one that has fishing canoe(s) and fishes at least 15 days per month whereas, a shoreline fisherman is one who does not have canoe or gourd but wades in the water to fish. A catch assessment survey (CAS), which involved a detailed examination and recording of the content of a canoe that had just landed on return from fishing trip was carried out for five days in April 2005, using properly trained ADP enumerators. As a fisherman landed his canoe on the beach, the enumerators examined the content, sorted them according to species and the gear type used, record the weights, number and beach prices of all the species of fish landed. Fishing time and the number of canoes were also recorded to establish the catch per unit effort (CPUE) expressed as kg fish caught/canoe/day. All active fishing canoes were counted to provide estimate of total fishing effort for each sampled day. Canoes catches were pooled to give an estimate of catch per unit effort (kg per canoe) for the landing for that day, which was taken as being representative of entire Lake. The number of canoes landing fish was multiplied by catch per unit effort to give an estimate of the catch at that landing on that day. The Catch per unit effort (CPUE) of gear is expressed as average weight of fish caught per day per unit of fishing effort of gear type. The estimation procedure is different from gear to gear, particularly for active as opposed to passive gears. The landings of passive gears were divided by the number of fishing units (i.e. bundles for gillnets, number of traps and number of long lines). For an active gear such as cast nets, the calculation is, total catch sampled multiplied by total number of hours fished per day divided by total number of hour(s) for fish sampled. Also informal interview and discussion were conducted to obtain information on the fishermen's knowledge of the fish species available in Yamama Lake and the number of days fishing activities takes place in a year.

RESULTS AND DISCUSSION

Frame Survey - A total of 4 fishing localities were identified. These localities included one fishing camp - a place inhabited all year round for the sole purpose of fishing, it does not have brick buildings and there is little farming activity around the place and three permanent fishing villages (a permanent fishing village is a village that has permanent buildings including markets, mosque, etc and it is always in the same place). Table 1 shows the distribution of fishermen, their fishing crafts and gears in relation to the villages around the lake. Altogether, 80 crafts were counted of which 34 were canoes and 46 were gourds-these are large calabashes with holes in the top and little water in the bottom, majorly used in place of canoes on Yamama lake. A total of 107 fishermen were also counted of which only 66 were on full-time fishing and the remaining 41 were on part-time who also engaged in farming activities. A full-time fisherman is one that has fishing canoe(s) and fish at least 15 days per month whereas, a part-time fisherman fishes less than 15 days per month with or without fishing canoe. A total of 32 shoreline fishermen (a shoreline fisherman is one who does not have canoe but wade in the water to fish) and 91 fishing assistants were also recorded. The Fishermen used mostly gill nets, cast nets, longlines (hooks) and fish traps for fishing. A total of 432 gill nets, 102 cast nets 266 longlines and 4,072 fish traps were recorded (Table 1).

Catch Assessment The species composition of the fishermen catch remained relatively stable through out the period of assessment. Table 2 gives the species composition of the catch by number and weight. The species most consistently represented in the catch in Yamama Lake were *Tilapia zilli, Oreochromis niloticus, Sarotherondon galilaeus, Clarias spp., Schilbe spp, Alestes spp., Synodontis, Auchenoglanis, Heterotis niloticus, Labeo, Citharinus citharus and Others (Polypterus, Ophiocephalus obscura, protopterus Ctenopoma Gnathomemus* and *Marcusenius psittatus*). The cichlids dominated the catch and contributed 45.6% to the number and 61.4% to the weight of the total fish caught on the lake during the survey. *Sarotherodon*

galileaus tops the other two species of cichlids in terms of abundance and in weight by contributing 24.5% to the number and 10.5 to the weight of the cichlids caught. This was followed by *Oreochromis niloticus*, which contributed 9.6% to the number and 22.3% to the weight while *Tilapia zilli* contributed 11.5% to the number and 5.6 % to the weight of all the tilapia species caught during the survey. Table 3 shows the fish species identified on the lake with their scientific, English and local names. Figure 1 shows relative fish species abundance by number and biomass on Yamama Lake. The *Sarotherondon galilaeus* tops the list by percentage weight followed by *Oreochromis niloticus, Heterotis niloticus, Labeo spp., Clarias spp., Tilapia zilli, Citharinus citharus, Others spp., Alestes spp., Auchenoglanis and Synodontis spp.* The order in terms of numerical abundance is *Tilapia spp., others spp., Labeo spp., Claria spp., Alestes spp., synodontis spp., Citharinus citharu, Auchenoglanis* and *Heterotis niloticus (*Table 2).

Fishing Gear- A number of fishermen were found using small mesh nylon monofilament gill nets, cast nets and fish traps of less than 1 inch mesh sizes. Many of the fishermen know that it is a bad method to fish with such type of nets but they believed small mesh nets have higher catch rate than bigger mesh sizes. This has a negative impact on *Clarias, Tilapia* and almost all the fish species in the lake as many immature individuals were found in the catch at landing site. Very few fishermen used gillnets of 4 inches mesh size and cast nets of 3 inches. Many part-time fishermen used gourds for "floating fishing" and a large number of fishermen fish from the shore with traps and cast nets.

Catch Per Unit Effort- Catch per unit effort (CPUE) is expressed as average weight of fish caught per day per unit of fishing effort of gear type. The estimation procedure is different from gear to gear, particularly for active as opposed to passive gears. Landings of passive gears are divided by the number of fishing units (i.e. bundles for gillnets, number of traps and number of long lines). For an active gear such as cast nets, the calculation is, total catch sampled multiplied by total number of hours fished per day divided by total number of hour(s) for fish sampled. Therefore for the 5 days catch assessment of Yamama Lake, the catch per unit effort of the gill nets was 1.5 while that of cast nets was 1.4 and traps 0.1. Cast nets contributed 56 % to the total fish yields, gillnets 23% and traps 21%. During our visit, the cast nets activity level was very high while that of traps was very low and longlines was not active through out. This corroborates the information given in the seasonal calendar about the type of gear used at particular periods of the year on the lake.

The daily catch per unit effort per canoe is a measure of fishing success for the average canoe and is influenced primarily by the catchability of gears and abundance of fish. Based on the survey data, the fishing success or cpue was 1.6 kg per canoe per day. This was very low and could be an indication of overfishing in Yamama Lake. The

observation made from the beach during the visit at Yamama Lake showed that increase in fishing time of cast nets did not result in a proportional increase in the catch. This supports my fear that the fish stock of the lake is likely overexploited. However, to obtain an accurate CPUE for determining fishing success and fish abundance in

Yamama Lake so as to confirm if there is overfishing, a long time series of catch data is required.
Estimate of Current Fish Yields-Analysis of full catch assessment survey is required before the current yields can be determined accurately. In the meantime, we obtain an approximate estimate through the rapid appraisal of the 5 days catch assessment conducted. From the frame survey carried out within the same period, 80 fishing craft were recorded (34 canoes and 46 gourds). During these days, catches from several cast nets, gillnets and fish traps were examined. Most of the catches were between 4 and 12 kg per fishing day. No catch data was available for longlines fishing through out the assessment period although 266 longlines were recorded in the frame, so it will be assumed that catches are about the same. Based on the informal interview with the fishermen, the activity level can be put at 150-200 fishing days in a year, 175 days on average. An approximate yield could therefore be calculated as shown below:

34 fishing craft x 175 (150-200) fishing days x 8 kg/day (4--12)
= 47.6t (Range: 20-82)

Thus, the total yield can be estimated at about 48 tonnes per annum, with minimum and maximum values of 20 and 82 tonnes respectively. The total yield estimate is likely to be more because, the yields from shoreline and gourds fishermen were not included in the calculation.

CONCLUSION

It is important here to emphasize key considerations relative to development of a management system for the Yamama Lake fishery in Kebbi State. A number of fishermen were found using small mesh size gillnets and Malian traps to catch the juveniles of highly valued fish species. Therefore fishing pressure, both in terms of the number of fishermen and the kinds of fishing gear in use, has a depleting effect on the abundance and sizes of commercially exploited species.

The protection of small sized fish cannot be achieved without placing limitations on the kinds of gears used for fishing and possibly also on when and where those gears can be used. Cast nets can be overly effective during low water when fish are concentrated and vulnerable. This gear should be prohibited during low flow periods. However, it could be acceptable during normal flow periods when effectiveness is reduced.

Furthermore, the minimum mesh size for this gear should not be less than 2 inches in line with Federal Inland fisheries decree (ANON 1992). Gill nets should not be less than 3 inches size to protect the spawning stock of commercially valued species. In an effort to maintain availability of fish to the households, it would be reasonable to allow children to use "noncommercial" gears such as traps, clap nets and hook and lines in shoreline areas. It is assumed that this kind of fishing pressure would not be detrimental to the stocks of commercially valuable species, though immature individuals of these species will surely be captured. It is certainly feasible that household members engaging in this kind of fishing can be taught to recognize small individuals of valuable species, which could be put back to the water when caught. Typically, management has been approached in a top-bottom fashion with an emphasis on strong government authority. But, it has been shown repeatedly that top down management of the fisheries cannot work in Nigeria and thus should be abandoned (Ita 1982). I therefore suggest bottom-up community based management of fisheries in Yamama Lake and other inland water bodies in Nigeria.

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Village name	Village type	Fishermen	Full-time	Part-time	Shoreline fishermen	Asst	Can	Gou	Gn	Cn	LL	Tr
Yamama	**PFV**	**54**	**17**	**37**	**3**	**11**	**14**	**33**	**93**	**22**	**77**	**421**
Yamama Ketere	**PFC**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**30**
Janbaki	**PVV**	**17**	**17**	**-**	**13**	**50**	**-**	**5**	**63**	**5**	**47**	**125**
Unguwa Nenu	**PFV**	**33**	**29**	**4**	**13**	**30**	**20**	**8**	**276**	**75**	**142**	**3,496**
Total		**107**	**66**	**41**	**32**	**91**	**34**	**46**	**432**	**102**	**266**	**4,072**

Table 1. Frame survey data showing village names, distribution of Fishermen and Assistants, number of canoes and fishing crafts on Yamama Lake.

Note: PFV = Permanent fishing village; PFC =Permanent fishing camp; Ass =Assistant; Can = Canoe; Gou = Gourd; Gn = Gillnet; Cn = Castnet; LL= Longlines; Tr = Traps

Table 2. Total catch by species during the 5 days catch assessment survey at Yamama fishing village.

Type of species	Number	Weight	% Number	% Weight
Oreochromis niloticus	26	7.1	9.6	22.3
Sarotherondon galilae	66	10.5	24.5	33.5
Tilapia zilli	31	1.8	11.5	5.6
Alestes	9	0.8	3.3	2.6
Clarias Spp.	16	2.0	5.9	6.4
Citharinus citharus	5	1.6	1.9	5.1
Labeo	53	2.5	19.6	8.0
Synodontis	7	0.1	2.6	0.3
Auchenoglanis	5	0.2	1.9	0.6
Heterotis	1	3.4	0.4	10.5
Others	54	1.6	19.0	5.1
Total for 5 days	273	31.6		
Number of canoe sampled		**19**		
Catch/canoe (kg)		**14**		**1.7**

Table 3. Fish Species identified in Yamama Lake with their Scientific, English and Local names.

Fish Species	English	Local Name (Hausa)
Oreochromis niloticus	**Tilapia**	**Gargaza**
Sarotherondon galileaus	**Tilapia**	**Bakaba**
Tilapia zilli	**Tilapia**	**Bazamfara**
Schilbe mytus	**Butterfish**	**Balo**
Claria Spp.	**Mudfish**	**Kulume**
Alestes	**Silverside**	**Kawara (Gari)**
Synodontis	**Catfish**	**Karaye (Kurungu)**
Auchenoglanis	**Catfish**	**Buero**
Heterotis	**Osteoglosid**	**Balli**
Labeo	**Afican carp**	**Dumi**
Citharinus citharus	**Moon fish**	**Falia**
Ctenopoma Polypterus	**Sail fins of bichir**	**- Gartsa**
Ophiocephalus	**Snake head**	**Tufi**
Gnathomemus	**Trunkfish**	**Kuma**
Protopterus annectens	**lungfish**	**Budo Maima**
Marcusenius psittatus	**Trunkfish**	**Kuma**

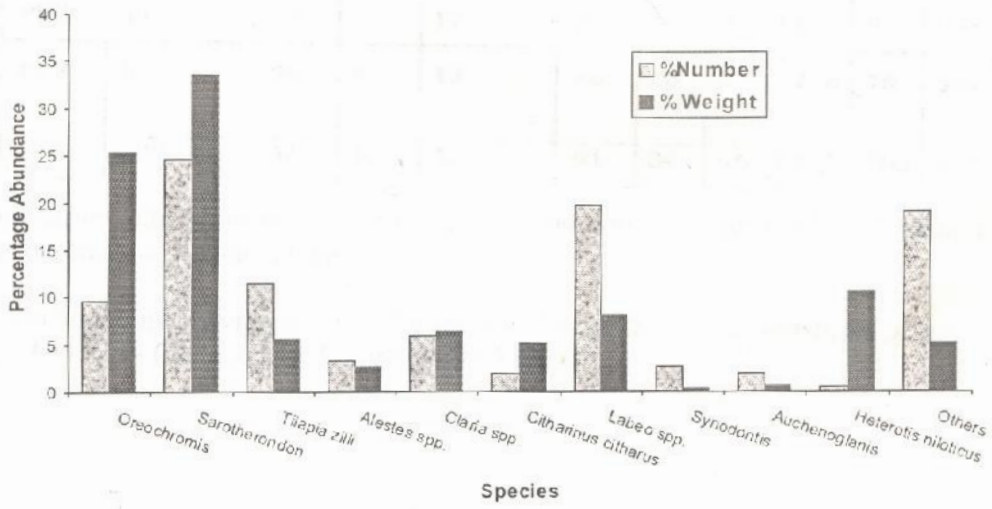

Fig. 1. Relative fish species abundance by number and biomass on Yamama Lake.

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