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Fish biodiversity and fishing methods of some waterbodies in Katsina State of Nigeria

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Abstract
Knowledge of the fishing methods and the fish stock of some major water bodies in Katsina State is important for use in appraising the fisheries potential in the areas and similar ecosystem subject to similar ecological pressure. The study was carried in three water bodies: Ajiwa dam, Ajiwa; Jibiya dam, Jibiya Local government and Zobe dam, Dutsinma Local government. During the study, the fishermen's catches and fishing activities were recorded. The fish species at the landing site were identified using keys by Reed *et al*., (1967) and some pamphlets (species summary). Fish species composition recorded in Ajiwa dam belongs to 5 families: Bagridae (17.8%), Claridae (19.4%), Cichlidae (28.9%), Momyridae (13.8%) and Schilbedae (20.0%). In addition to the 5 families of fish species in Ajiwa dam, the catches in Jibiya dam composed of Characidae (3.0%), Cyprinidae (1.0%) and Mochokidae (7.5%), while those of Zobe dam composed of Characidae (2.5%). In all, the water bodies, Cichlidae made up the highest percentage of the composition accounting for 28.9%, 34.4% and 38.2% in Ajiwa dam, Jibiya dam and Zobe dam respectively. The fishing activities in the water bodies revealed that the gears being used were predominantly gill nets, cast nets, traps and hook and line. For sustainable management, enforcement of restriction should be adopted.

Keywords: fishing methods, fish species, gears, Ajiwa dam, Jibya dam, Zobe dam.

1. Introduction
An estimation of the species composition is important to the study of a stock's dynamics and in the management of species. Densities indices of stocks are often used in stock assessment in multi-species assessment, ecosystem studies and in studies of economically and environmentally important fish species, it is often necessary to the absolute size of the stock.
Thus, there is a strong need to develop methods of reasonable cost for estimation of absolute fish numbers (Auvnen and Juha, 1994) [1]. Fisheries stock assessment is primarily used for some decision making process, and as the process becomes more quantitative, the demand for on stock assessment is increasing (Hilborn *et al.*, 1994.) [4].
Several methods to estimate current stock size and potential productivity of exploited population have been developed. The most commonly used model is that developed by Schaefer (1957) on catch biomass and indices of abundance. Since aquatic resources are fundamentally important for some community, careful study must be made of their biology and ecology (Gulland, 1983) [3]. The objectives of this study are to find out the fishing methods practiced in the water bodies, to find out the fish species diversity of the water bodies and to find out the management tools used by the government in managing the water bodies.

2. Materials and Methods
2.1 Study Areas
2.1.1 Katsina State
Katsina is 20 year old state. The state lies between latitude 11° 7' and 13° 22' north and longitude 6° 52' and 9° 2' east. It has a total land area of about 23,930 km², with an estimated human population of 5.2 million of which majority live in the rural areas. The state extends to three major savannah vegetation zones: drier sahel zone in the north and sudan and guinea savannas in the middle and the southern zones respectively. The mean annual rainfall in the

zones are 300-400 m, 600-800 m and 900-1100 m respectively. Rain fall lasts from April to September depending on the zone.

2.1.2 Ajiwa District
Ajiwa is in the eastern part of Katsina State and lies between latitude 12.98° north and 12° 58' east and longitude 7.75° north and 7° 45'.

2.1.3 Jibiya Local government
Jibiya sits along with the Nigeria border with Niger Republic. It lies between latitude 13° 05' north and 7° 13' east and longitude 13.09° north and 7.23° east It has a total land area of about 1,037km² and estimated human population of 169,748.

2.1.4 Dutsinma Local government
Dutsinma lies between latitude 12° 27' north and 7° 29' east and longitude 12°.46 north and 7.49° east. It has a total land area of about 527km² and estimated human population of i69, 671.

2.2 Data Collection and Analysis
The methodology used for this research work involved the collection of primary and secondary data. The primary data were collected through field survey, administering of 45 questionnaires-15 questionnaires to each of the three water bodies (Ajiwa dam, Jibiya dam and Zobe dam). In administering the questionnaires, the fishermen were randomly selected. The secondary data were collected using textbooks. The specimens (species) were identified using Fish and Fisheries of Northern Nigeria by Reed *et al.* (1967) and some pamphlets (species summary). The fish were counted and measured using measuring board graduated in centimeters.
The data collected were analyzed in terms of mean, frequency and percentage (descriptive statistics).

3. Results and Discussion
3.1 Fishing Methods Practiced in the Water bodies
The periods during which the fishermen of the water bodies fished are shown in table 1. In Ajiwa dam and Jibiya dam, majority (75.3% and 66.7%, respectively) of the fishermen fished in the morning, while most (53.3%) of the fishermen in Zobe dam fished both in the morning and in the evening.

Table 1: Fishing periods of the fishermen

Fishing	Ajiwa dam		Jibiya dam		Zobe dam		Total	
periods	No.	%	No.	%	No.	%	No.	%
Morning	11	75.3	10	66.7	7	46.7	28	62.2
Evening	-	-	-	-	-	-	-	-
Both	4	26.7	5	33.3	8	53.3	17	37.8
Total	15	100	15	100	15	100	45	100

Source: field survey 2007

Fishing at these periods may be because of the fishermen's experience that the fish at these periods tend to swim at a level within the range of their net settings. During these periods. Photosynthetic activities are limited. So, the fishes swim to the surface where atmospheric oxygen seems to be abundant.
The gears that were predominantly used gears in all the water bodies were gill nets, cast nets, hooks and line and traps. Hence, netting, lining and trapping were the mainly employed methods of fishing in the water bodies. The predominant use of these gears is because they are the cheapest and less sophisticated types of gears requiring little financial inputs in obtaining them and little effort in and skills in using them. Canoes (planked and half dug-out) were the main water fishing crafts used in the water bodies. The fishermen of the water bodies were found to be using nets with undersized mesh size. This may be due to the reluctance of the government to the enforcement of restrictions. Using nets with undersized mesh size leads to the exploitation of smaller fishes that will make up the stocks in future.

3.2 Composition of Catches in the Water bodies
The catch from the water bodies consisted of 19 species belonging to 8 families. Jibiya dam is more diverse in terms of species, followed by Zobe dam and then the Ajiwa dam with diversity indices of 1.0, 0.6 and 0.4 respectively as shown in tables 2, 3 and 4.

Table 2: Composition of catch in Ajiwa dam.

Family/species	No.	%	Mean Length (TL; cm)
Bagrus bayad	58	17.8	26.0
Claridae			
Clarias garipienus	53	16.3	14.5
Clarias anguillaris	10	3.1	9.0
Cichlidae			
Oreochromis niloticus	55	16.9	17.0
Sarotherodon galilaeus	12	3.6	8.5
Tilapia zillii	27	8.3	8.5
Momyridae			
Marcusenius brachiystius	45	13.8	8.5
Schilbidae			
Schilbe mytus	65	20.0	10.0
Total	325		
Diversity index	0.4		

Source: field survey 2007

Table 3: Composition of catch in Jibiya dam

Family/Species	No.	%	Mean Length (Tl; Cm)
Bagridae			
Bagrus Bayad	76	13.5	27.5
Auchenoglanis Biscutatus	20	3.6	15.5
A .Occidentalis	11	2.0	15.5
Characidae			
Alestes Baremoze	9	1.6	15.0
Alestes Nurse	8	1.4	7.0
Claridae			
Clarias Gariepinus	77	13.7	18.5
Clarias Anguillaris	19	3.4	14.5
Cichlidae			
Oreochromis Niloticus	132	23.5	14.5
Sarotherodon Galilaeus	34	6.1	9.0
Tilapia Zillii	16	2.9	10
Hemichromis Fasciatus	11	2.0	8.5
Cyprinidae			
Labeo Senegalensis	3	1.0	10.0
Mochokidae			
Synodontis Clarias	25	4.5	10.5
Synodontis Occelifer	17	3.0	12.0
Momyridae			
Gnathonemus Cyprinoids	19	3.4	15.0
Gnathonemus Senegalensis	23	4.1	13.5
Marcusenius Brachystius	25	4.5	6.0
Petrocrphalis Bovei	8	1.4	6.5
Schilbidae			
Schilbe Mytus	28	5.0	14.5
Total	561		
Diversity Index	1.0		

Source: Field survey 2007

Table 4: Composition of catch in Zobe dam

Family/Species	No.	%	Mean Length (Tl; Cm)
Bagridae			
Bagrus Bayad	34	12.0	25.0
Characidae			
Alestes Baremoze	2	1.5	10.5
Alestes Nurse	5	1.8	9.0
Claridae			
Clarias Gariepinus	47	16.6	14.5
Clarias Anguillaris	9	3.2	13.0
Cichlidae			
Oreochromis Niloticus	89	31.4	12.5
Sarotherodon Galilaeus	6	2.1	5.5
Tilapia Zillii	9	3.2	10.0
Hemichromis Fasciatus	4	1.4	6.5
Momyridae			
Marcusenius Brachyistius	42	14.8	8.0
Petrocephalus Bovei	22	7.8	6.5
Schilbidae			
Schilbe Mytus	14	4.9	9.0
Total	283		
Diversity Index	0.6		

Source: Field survey 2007

$$\text{Diversity index} = \frac{\text{Number of species in a water body}}{\text{Number of species in all the water bodies}}$$

In all the three water bodies, cichlids dominated the catch composition making up 28.9%, 34.4% and 38.2% in Ajiwa dam, Jibiya dam and Zobe dam respectively. The least composed species were Momyrids (13.8%), Cyprinids (1.0%) and Characids (2.5%) in Ajiwa dam, Jibiya dam and

Zobe dam respectively. The dominance cichlids in the water bodies compares favorably with other Nigerian lakes/reservoirs such as Kainji, Tiga and Bakalori where cichlids are known to dominate (Ita and Balogun, 1982 and Balogun, 1986) [5, 2]. Seemingly, cichlids are the most targeted species because they are the most bought species by the fish mongers. The averagely biggest fishes caught in all the water bodies were bagrids measuring more than 20cm (Tables 2, 3 and 4). The catch of unrecommended size of some fish species indicates that growth over fishing is practiced in the water bodies.

3.3 Extinct species of the water bodies

According to the Ajiwa dam fishermen, the extinct species of the water body included carp and *Synodontis spp.* In Jibiya dam, as responded by the fishermen, the extinct species were *Malapterurus spp* and *Protopterus spp,* while the extinct species of Zobe dam, according to the fishermen were *Synodontis spp, Polypterus spp, Protopterus spp* and *Malapterurus spp*. This may be because of rampant over-fishing and/or lack of fishing regulations.

3.4 Introduced species of the water bodies

In Ajiwa dam, according to the fishermen, the species that were brought into existence but are not available today included *Bagrus spp,* while in Zobe dam the species included *Gymnarchus spp* and *Heterotis spp*. No species was introduced in Jibiya dam. The introduction of species in the water bodies may be as a result of the migratory nature of fishes.

3.5 Activities of the government agencies managing the fisheries of the water bodies

According to the government agencies managing the water bodies, fishing regulations are not yet implemented, as the State Fisheries Edict is still under the proposal. Furthermore, the edict is with the Ministry of Justice for legal consideration. The agencies' reluctance may be because their activities are basically on irrigation and water supply-their function on fisheries is ancillary.

4. Conclusion and Recommendations

It is observed that there is a predominant use of nets that have undersized mesh sizes. This leads to the exploitation of undersized fishes which are supposed to make up the future stock. The study reveals that the water bodies are in accordance with other Nigerian water bodies where cichlids dominate the catch composition.

The agencies managing the water bodies should urgently establish Fisheries Edict which will enable proper management and conservation of the fisheries of the water bodies. Further studies should be encouraged as the results of this research may depend on the seasons.

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