

Preliminary Observations on Fish Species in a Newly Impounded Osinmo Reservoir

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Abstract

The present study examines the diversity of fish species in the recently impounded Osinmo reservoir. Fish samples were caught by cast netting, gill netting and trapping. Four families of fish comprising seven species were identified. The family Cichlidae comprises 59.6% of all the fish caught in the reservoir, while the least of 6.3% was Hepsetidae. The relative abundance of fish species showed that *Tilapia zillii* had 28.8% of all fish caught. Except for *Hemicromis fasciatus*, the males of all other fish species showed abundance over the females. The abundance of males over females was only significant in *Channa obscura*, *Sarotherodon galilaeus* and *Clarias gariepinus*. High water parameters observed in the reservoir is an indication of stability which augurs well for better reproductive activities and a high production of plankton which is a source of food for fish.

Key words: Fish diversity, relative abundance, sex ratio and water quality.

Introduction

Osinmo reservoir in Ejigbo Local Government area of Osun State was created late in 2005 by the impoundment of Ataro River which took its source from Iware in Oyo State. Many streams unite to form the river. The catchment area is about 102 km². It is from longitude 04°21.2' E to 04°21.7' E and Latitude 07°52.8' N to 07°53.2' N. The surface area of the reservoir is about 0.78 km², while the mean maximum depth was 3.2 m. The area occupies an undulating terrain with the highest altitude of about 365.76 m above sea level. The area has a mosaic forest and savannah region. There is heavy rainfall between July and September of each year with annual rainfall of 52.35 inches. The substratum of the reservoir is muddy, scattered logs of wood with various dimensions.

Fish are important vertebrates which contribute as much as 17% of the world's animal protein. Inland fisheries play important role in the provision of protein to Nigerians, most especially when imported fish species are becoming very expensive to the common people. With a high population of about 130 million people in Nigeria, it is observed that the downward trend in fish intake might probably be due to poor management practices and over-exploitation of our inland waters.

In Osun State of Nigeria, Osinmo reservoir is one of the newly impounded reservoirs mainly for domestic water production for the rural dwellers. In this water body, few fishermen are engaged probably due to lack of permit to fish and secondly because the water body has many submerged logs of wood which constitute obstruction to fishing.

The main objective of the present study is to get information on diversity of fish species. This information will be useful in the development of management strategies for the fisheries of the water body.

Materials and Methods

Sampling for fish samples started in April 2006 and extended till June 2007. The fishing methods employed were cast-netting, gill-netting and trapping. Standard morphometric parameters of each fish were measured in the laboratory. Specimens of fish caught were identified using the keys (Boulenger, 1909-1916; Reed *et al.*, 1967; Holden and Reed, 1991). Each fish specimen was slit open ventrally from the anus to the pectoral fin and the sex and stage of gonad maturity were determined by visual inspection (Kesteven, 1960; Roberts, 1989). Surface water temperature, dissolved oxygen content, hydrogen ion concentration (pH), transparency and total alkalinity were the parameters determined.

Mercury-in-glass thermometer was used to take surface water temperature. Dissolved oxygen content was determined by a modified version of the Winkler's titrametric method between 8.00 am and 9.00 am. The pH was measured using a colour comparator to get a colour match in a water sample treated with wide range pH indicator. Water transparency was determined using a Secchi disc measuring 15cm (Quayle, 1988). Total alkalinity was measured by titrating water samples with sulphuric acid standard solution, using a drop of phenolphthalein solution and one sachet of bromocresol green-methyl red as indicator until the

sample changed from blue green to pink. Total alkalinity which is expressed in mg/L is the total number of drops of sulphuric acid solution used multiplied by 17.1 (Fish Farmers' Water Quality Testing Kit Manual, 1990).

Results

A total of 2,758 fish specimens were collected in Osinmo reservoir. There were seven species belonging to four families, viz. Hepsetidae, Clariidae, Cichlidae and Channidae. Except for the family Cichlidae, with the greatest diversity all other fish families have one species each (Table 1). The family Cichlidae comprising four species constituted the largest percentage (59.6%) of fish caught. This is followed by families Clariidae, Channidae and Hepsetidae. Of the seven species comprising the four families, *T. zillii*, *C. gariepinus* and *S. galilaeus* were very prominent in the catches constituting 28.8%, 21% and 16.7% respectively. The relative abundance of other species were *C. obscura* 13.1%, *H. faciatus*, 8.6%, *H. odoe* 6.3% and *P. taeniatus* 5.5% (Table 2).

The fish specimen in each species ranged between 153 and 794 individuals (Table 3). Sex ratio of *C. obscura*, *S. galilaeus* and *C. gariepinus* were significantly different between the male and female with χ^2 value between 20.79 and 43.19. The males of these species showed preponderance over females. In *H. faciatus*, the females were more abundant than the males but the number is not significant. The number of males to females was also not significant in *P. taeniatus* and *T. zillii*, while the males were fewer in *H. odoe* and *P. taeniatus*. Surface water temperatures ranged between 25.5°C and 29.2°C during the period of study. Water transparency values also ranged between 97 cm and 102 cm. The minimum value for dissolved oxygen content recorded in the rainy season was 2.42 mg/L and the maximum was 3.87 mg/L in the dry season. The mean hydrogen ion concentration (pH) of 7.5 and 7.6 were recorded in rainy and dry seasons while total alkalinity values ranged between 84.5 mg/L and 88.5 mg/L respectively. The means of all the parameters during the rainy and dry seasons are as shown Table 4.

Table 1. Checklist of fish species in Osinmo reservoir

Family	Species
Hepsetidae	<i>Hepsetus odoe</i> (Swainson)
Clariidae	<i>Clarias gariepinus</i> (Burchell)
Cichlidae	<i>Hemichromis faciatus</i> (Peters)
	<i>Pelmatochromis taeniatus</i> (Boulenger)
	<i>Sarotherodon galilaeus</i> (Artemi)
	<i>Tilapia zillii</i> (Gervais)
Channidae	<i>Channa obscura</i> (Gunther)

Table 2. Relative abundance and size distribution of fish species

Species	No. caught	SL (cm) range	Mean SL (cm)	Weight (g) range	Mean wt (g)
<i>H. odoe</i>	174	17.8-32.1	29.3	70-408	443
<i>C. gariepinus</i>	578	20.6-30.5	28.9	91-344	260
<i>T. zillii</i>	794	11.8-19.4	15.8	66-325	197
<i>S. galilaeus</i>	462	10.0-19.5	16.7	60-300	163
<i>H. faciatus</i>	236	7.9-9.3	8.1	21.0-30.2	26.8
<i>P. taeniatus</i>	153	7.5-8.2	7.9	11-13	13
<i>C. obscura</i>	361	21.0-28.3	26.1	148-420	347.6

Table 3. Sex ratio of fish species in Osinmo reservoir.

	Sample size	No of males	No of females	Sex ratio M : F	χ^2 value	P(0.05)
<i>H. odoe</i>	361	241	120	1 : 0.5	40.56	S
<i>C. gariepinus</i>	236	109	127	1 : 1.2	1.37	NS
<i>T. zillii</i>	153	78	75	1 : 0.96	0.06	NS
<i>S. galilaeus</i>	462	280	182	1 : 0.7	20.79	S
<i>H. faciatus</i>	794	441	353	1 : 0.8	9.75	NS
<i>P. taeniatus</i>	578	368	210	1 : 0.6	43.19	S
<i>C. obscura</i>	174	90	84	1 : 0.9	0.21	NS

S = Significant

NS = Not Significant

Table 4. Water quality summary of Osinmo reservoir

Parameters (mean)	April-October (Rainy season)	November – March (Dry season)
Temperature (°C)	26.5	28.8
Transparency (cm)	97	99
Dissolved O ₂ content (mg/L)	3.7	3.8
pH	7.5	7.6
Total alkalinity (mg/L)	84.7	88.5

Discussion

Diversity of fish species in Osinmo reservoir presently is low. There are four families and seven species, while Opa, another inland water body, have seven families and fifteen species (Komolafe and Arawomo, 2003). There is the probability that more fish species will be encountered as the water body matures. High values of total alkalinity observed in the water body lend further support to this assertion. Both Osinmo and Opa reservoirs are on the same axis and with vast catchment areas flowing into Osun River which flows into Lagos lagoon. Cichlid species constituted more than half of the population of Osinmo reservoir, while 98% of Opa reservoir fish population comprise cichlids. It is also observed that *T. zillii* a substrate spawner with a population of 28.5% in Osinmo reservoir also constituted 27% of Opa reservoir population (Komolafe and Arawomo, 2003).

The relatively low population of the cichlids presently might be due to high population of predators which constituted 35.9% of the population. The mean standard length of the smallest fish was 7.9cm and mean weight was 13 g as observed in *P. taeniatus*, while the biggest was *H. odoe* with a mean standard length of 29.3 cm and a mean weight of 443 g. The length-weight relationship of the various species corresponds to what was observed in other water bodies (Abayomi, 1995; Fawole, 1995; Komolafe, 2004). Absence of large fish specimens might also be attributed to the reservoir being impounded in less than two years. The presence of cichlid species in the reservoir confirmed the report of many cichlid species in East African lakes and in Opa reservoir (Lowe-McConnell, 1975; Komolafe, 1995). High percentage of cichlid species (59.9%) in Osinmo reservoir and other water bodies is attributed to good parental care which gives a considerable advantage in the colonization of their chosen habitat. Sex ratio of fish species in Osinmo reservoir varies. The sex ratio of *H. fasciatus* is 1:1.2 (male to female), while the same species had a higher sex ratio of 1: 2.75 (male to female) in the Tono reservoir (Obadia and Waltia, 2003). However, all other species have the number of males greater than the females. The sex ratios of *P. taeniatus* and *H. odoe* are 1: 0.96 and 1: 0.9 (male to female), respectively. The nearness of these sex ratios to unity 1:1 shows reproductive efficiency towards optimum (Obodia and Waltia, 2003). However, other

fish species have greater sex ratios of males to females which are an indication of a growing population (Komolafe, 1995).

Osinmo reservoir from all indications is characterized by a limited wind fetch. It is surrounded by a mixture of rainforest tree and savannah shrubs. The surface temperature was the highest (29.2°C) in December and January which was the dry season periods. Also the lowest temperature of 25.5°C recorded in August coincided with the peak of rainy season. The reservoir receives a high discharge of water during rainy season. Its water becomes turbid and transparency during this time was low. The lowest transparency of 83 was recorded in August and the highest was 98 in December. The mean pH of 7.5 and 7.6 in the rainy and dry seasons was moderately alkaline and was within the range of 6.5 to 8.5 known for most lakes and streams of the world (Welch, 1952). A relatively low level of dissolved oxygen with little variation in Osinmo reservoir was also noted by Akinbuwa (1988) in Opa reservoir where oxygen production by photosynthesis is reduced by turbidity because of suspended particulate matters brought into the reservoir by flood. Total alkalinity of the reservoir is high and along with other parameters, suggests a high stability of habitat all the year round.

Opa reservoir and Tono reservoir have high stability of water quality parameters as in Osinmo reservoir. This augurs well for better reproductive activities and subsequent development of the fishery resources of the habitat (Akinbuwa, 1988; Obodai and Waltia, 2003). Total alkalinity as observed in Osinmo reservoir is an indication of high natural food production to support fish development. The future of this recently impounded reservoir is bright for fish production; because plankton and fish production levels have been found to increase where total alkalinity increases (Hayes and Anthony, 1964).

Osinmo reservoir is presently inhabited by seven fish species. As the lake matures, there is the possibility that the reservoir can be colonized by more fish species. Management strategies have to be introduced so as to guarantee the abundance and survival of the fish species. These will include fish gear restriction and the protection of breeding sites. Selective cropping can also be carried out so as to guarantee the survival of a large proportion of the breeding population. There are high prospects of the lake being colonized by a high cichlid population which will support a viable fishery.

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