Agricultural Journal 2 (6): 721-725, 2007
ISSN: 1816-9155

Fisheries Potential Assessment of Ero Reservoir, Ekiti State, Nigeria

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Abstract: This survey studied the catch composition of the reservoir, the Socio-economic impact of the fishing activities on the locality. The catch composition of the reservoir showed three different species, *Oreochromis niloticus*, *Sarotherodon galilaeus* and clarias species with *O. niloticus* having the highest occurrence by number and weight of 83.6 and 69.2%, respectively. The potential fish yield of the reservoir with a total surface area of 450ha was predicted to be 652.97 metric tones per annum, while the post calculated annual yield give a figure of 21.06 metric tones per annum. The assessment of socio-economic impact of the fishing activities of the reservoir on the fishing locality and the state at large revealed a number of operational constraint that contributed to the under-exploitation of the reservoir and fishing profession as unprofitable in the community. These constraints in conjuction with the seasonality of the catch of the more valuable *Clarias* sp. constituted to the factors responsible for the mass-drift of 55% of the fishermen population to other fishing villages in or outside the state and urban centers for more lucrative business. Suggestions were made towards the adoption of certain strategies of improving the income generated by the fishermen at every fishing effort to a sustainable level.

Key words: Ero reservoir, *Clarias* sp., *Tilapia* sp., fish yield and gear

INTRODUCTION

Nigeria is blessed with a vast expanse of inland freshwater and brackish ecosystems. Their full extent cannot be accurately stated as it varies with season and from year to year depending on rainfall.

The country has an extensive mangrove ecosystem of which a great proportion lies within the Niger delta and are also found mostly in Rivers, Delta, Cross River, Akwa Ibom, Lagos and Ondo states. They lie between latitude 3° and 7°6" North and are estimated to cover between 500,000 and 885,000 ha. Freshwaters start at the northern limit of the mangrove ecosystem and extend to the sahel region. The major source of fish supply in Nigeria is through capture fishery. Capture fishery is oriented towards harvesting of the wild fish stock using different types of gears ranging from traditional gear like traps to the most modern sophisticated gears like trawl net. Ekiti state was created on 1st October, 1996, carved out Ondo State, the State is situated entirely within the tropics. It is located between Longitudes 4° 45^{1} East of Green Meridian and Latitude 7° 15^{1} to-8° 5^{1} North of Equator. It lies South of Kwara and Kogi State as well as East of Osun state. It is bounded in the East and in the South by Ondo State. By 1991 Census, Ekiti State population was 1,647,822 while the estimated population on creation on October 1, 1996 was put at 1.75million. The State is mainly an upland zone, rising above 250 m above the sea level. It lies within the area underlain by metamorphic rock of the basement complex. It has a generally undulating land surface with a characteristic landscape that consists of old plains broken by step-sided out-crops dome rocks that may occur singularly or in groups or ridges. Such rocks out-crops exist mainly at Efon-Alaaye, Ikere-Ekiti and Okemesi-Ekiti. The State is dotted with rugged hills. The notable ones among them are Ikere-Ekiti Hills in the southern part, Efon-Alaaye Hills in the western boundary and Ado-Ekiti Hills in the central part.

The State enjoys tropical climate with two distinct seasons. These are the rainy season (April-October) and the dry season (November-March). Temperature ranges between 21° and 28°C with high humidity. The South-Westerly wind and the North East Trade winds blow in the rainy and dry (Harmattan) seasons respectively. Tropical forest exists in the south, while Guinea Savannah occupies the northern peripheries. The State is endowed with water resources. Some of its major rivers are Ero, Osun, Ose, Ogbese, Oni etc.

Ekiti state is endowed with water resources which if well harnessed can produce a lot of fish, enough to substantially improve the protein intake of the people of the state. The effort to bridge the ever existing gap

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Table 1: Morphometric features of ero reservoir

Item	Description
Main source of River	Orin-Ekiti
Year of impoundment	1985
Location	Ikun-Ekiti
Local Government Area	Moba
Ownership	Ekiti State Government
Primary use of water	Supply of Drinking Water
Major adjoining Rivers	Out, Eran, Gbogbo omoya
Major Outflow Rivers	Ero
Water surface area (Ha)	450
Impoundment area	4.5km^2
Reservoir capacity (Volume)	20.9million m^3
Maximum embarkment length	662m
Normal water level	504.5m
Pattern of River Flow	Perennial
Vegetation type	Derived Savannah
Land use around Lake	Subsistent farming
Effluent discharge	Particulate run-offs
Access of Reservoir	Open

Source: Federal Department of fisheries

between demand and supply for fish and its products at both the state and federal levels can be successful if these potentials can be harnessed to increase domestic fish production.

Ero river, dammed primarily for the purpose of drinking water supply has turned out to be an economic asset for the state. There is, therefore, a need for the study of the fisheries resources of the reservoir as no major survey to give a comprehensive scientific information had ever been carried out to establish its potentiality or viability. The scanty information available on this subject matter is obtainable at the State Fisheries Department of the Ministry of Agriculture and Natural resources (Table 1).

This study is meant to survey the reservoir, with the purpose of providing information on the exploitation of the habitats and their resources without over exploiting or destroying them.

MATERIALS AND METHODS

The nature of this study which is predicated on the assessment of the fisheries potentials of Ero reservoirs, dictates the choice of the method of research. The descriptive or survey research method was employed in the conduct of this study.

Nine out of the 20 artisanal fishermen operating on the study site were available during the study period, while the other eleven had migrated.

The instrument used to obtain data for this study were of both primary and secondary sources (Structured questionnare were administered). The primary source consist of set of data on the catch per unit effort (c.p.u.e) of two of the nine fishermen which was obtained after landing at the period of survey. This personal observation technique was employed for the purpose of determining the actual yield of the reservoir.

The study was carried out in five months (March-July), at two sampling days per monthly visit. It was observed that there was no rain in the first three months of the study (March-May) indicating that rain started falling in June.

Two of the fishermen were employed for sampling exercise based on their level of literacy and years of fishing experience. On the sampling days, they made use of such traditional fishing gears in common use in the fishing locality as:

- Graded hooks of sizes 12, 13 and 14 set at an interval of about 7-10 cm in a long line of about 100 m. This gear is usually set along the riverbank. It was not noticed to be used with floats.
- Eight wire traps (at each fishing effort) of 0.5" and 2" mesh size and approximate dimension of 65×40×25 cm with an opening of about 20 cm in diameter; usually set along the river bank.
- Gillnet mainly multifilament of the stretched mesh sizes varying from 2" (50.8 mm)-3" (76.2 mm) with the stretched length of about 50 meters. Monofilament (synthetic) is not common. Setting was done as driftnets on the surface of the open water.
- Castnet of about 2 m in length and spread circumference of about 10m with small meshes of about 45 mm (0.5").

The setting of these gears was mostly done in the evenings by 1800 h and left overnight till 0700 h.

The catches were sorted into species and identification done directly on the farm with the help of some resident fishery expert.

Descriptive method of analysis was used for the set of primary data obtained. The species of fish that constitute the catch for the study were expressed as percentage composition of fish by number and weight.

Fish yield calculations: The potential fish yield in Kg/ha/annum was predicted through Morpho Edaphic Index (MEI) as described by Ryder (1965) and Hendersin and Welcomme (1974), while the actual annual fish yield in kilograms was post-calculated from the result of the average daily catch of the selected fishermen.

Potential fish yield: Morpho-Edaphic Index (MEI) was adopted for the prediction of the potential fish yield/annual catch of Ero reservoir.

Conductivity value multiplied by a factor of 0.65 was used to estimate Total Dissolved Solid (TDS) according to Oben (1999) and Olaniran (2000).

MEI = TDS d^{-1}
Where TDS = Total Dissolved Solids
d = Mean depth
Yield (Y) = $23.281 \times MEI^{0.447}$
Where: Y = yield in kg ha^{-1}

Actual (post-calculated) fish yield: The estimated production per annum of the nine fishermen operating regularly on the reservoir during the survey was calculated from the sample daily catches of two of them with an assumption that the fishermen avoid working during the peak period of the rainy season because of flooding and consequently fish for about 240 days a year; their production is calculated as follows:

Total Daily Catches (kg) = No. of fishermen×Average Daily Catches (kg).

Therefore, Annual Catches (240 days) = Total Daily Catches (kg) ×240.

The distribution of catch composition by number and weight is represented on graphs and charts.

The water physico-chemical parameters were analysed by the production manager of the reservoir in the analytical laboratory of the dam.

RESULTS

The catch composition of Ero Reservoir as obtained from the State Fisheries Department of Ministry of Agriculture and Natural Resources (MANR) consist of; *Clarias gariepinus*, *Heterobranchus bidorsalis*, *Oreochromis niloticus*, *Sarotherodon galilaeus* and *Channa obscura*. However, with respect to this study, the composition is found to be majorly of three fish species under two families. These are Oreochromis niloticus and Sarotherodon galilaeus of Cichlidae family and Clarias species of the Claridae family.

The occurrence by number and weight of these catches is shown in Fig. 1-4. Oreochromis niloticus had the highest occurrence by number and weight of 83.6% and 69.2% respectively (Fig. 1 and 3). The highest occurrence of the cichlids was recorded in June and July (Fig. 2 and 4). The family claridae was sparsely represented during the study period (March-July) having 1.5 and 19.5% by number and weight, respectively of the catch composition.

The physico-chemical parameters of the reservoir ranges as follows: Colour (Hazen unit) [25-200], Temperature (°C) [20-29], Turbidity (NTU) [20-42], pH [6.6-6.8], Total Dissolved Solid (mgl^{-1}) [89-122], Conductivity (µMhos) [158-202.4], Nitrate [3.2-10] and Total Hardness ($mg\ L^{-1}$) [17-65].

The fauna existing in the reservoir water besides fish include watermites, waterscorpion, back-swimmers, crabs and toads.

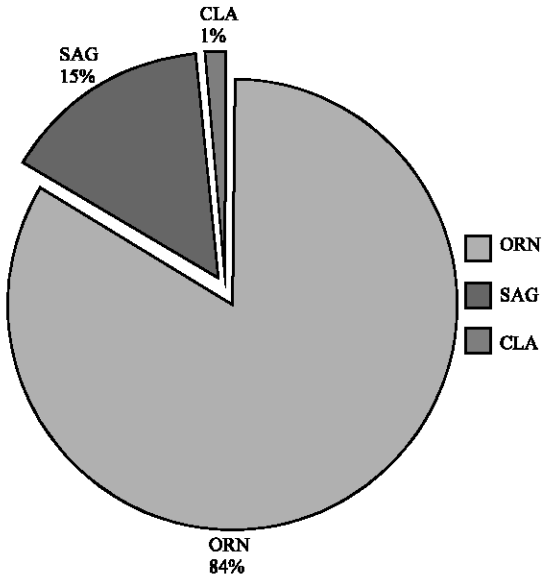

Fig. 1: Catch percentage by number. ORN: Oreochromis niloticus. SAG: Sarotherodon Galilaeus. CLA: *Clarias* sp

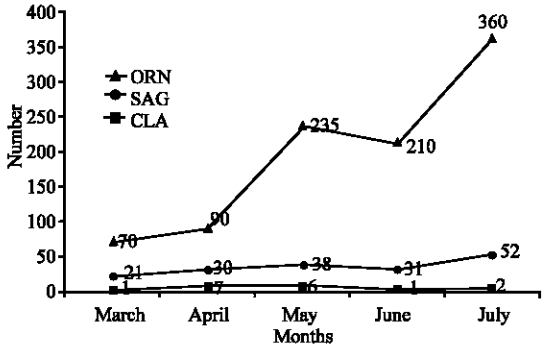

Fig. 2: Graph showing average daily catch by number

MEI calculation: The potential fish yield of Ero Reservoir is predicted through the following calculation as adopted by Olaniran (2000)

$$MEI = \frac{\text{Conductivity (µmhos cm}^{-1})}{\text{Mean Depth}}$$

Using the prediction value for estimating fish yield;
$Y = 23.281\ MEI^{0.447}$
Estimated annual Fish yield
= Average Fish yield (kg ha^{-1}) for the 5 month
= 120.92 kg ha^{-1} using Total dissolved Solid and Conductivity
Estimated Potential Fish Yield per annum for the reservoir of 450ha

$$= \frac{120.92\ \text{kg ha}^{-1} \times 450\text{ha} \times 12 = 652.97\text{metric tonnes}}{1000}$$

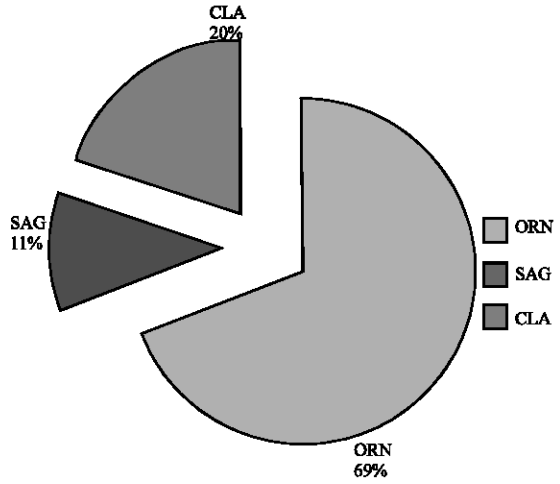

Fig. 3: Catch percentage by weight. ORN: Oreochromis niloticus. SAG: Sarotherodon galilaeus. CLA: *Clarias* sp

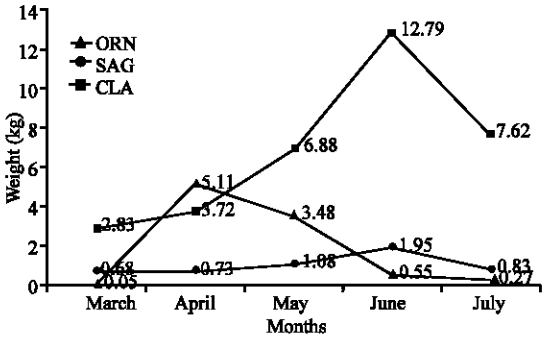

Fig. 4: Graph showing average daily catch by weigh

Post calculated annual fish yield of ero reservoir

Total Daily Catch (kg) = 9 × 9.784 = 88.06kg

88.06 × 240 = 21168kg = 21.168 metric tonnes

9.784kg derived from the average of 48.92 for 5 months

9 is the number of fishermen.

$$\% \text{ Exploited} = \frac{21.168 \text{ MT}}{652.97\text{MT}} \times 100$$

= 3.24%

% Unexploited = 96.76%

Distribution of the fishermen on the reservoir: Minority of the fishermen are unmarried (11.1%), all the fishermen are above twenty years of age, all of them are males, mainly from Apoi (Ondo State) and Idoma (Benue State), A little above half (~ 56%) of the sampled fishermen took indigenous women as wives.

More than half (66.7%) of the sampled fishermen had secondary school education, 44.4% of the sampled fishermen claimed to realize above 3,000 naira from their sales during fishing season, about 56% of the fishermen ranked gillnet the most efficient of all the fishing gears used in the fishing locality.

All the fishermen gave a declaration of *Tilapia sp.* as the prime catch of the reservoir.

DISCUSSION

The study of Olaniran (2000), Daddy *et al.* (1991) and Akinyemi (1987) all confirmed the dominance of Cichlid species in Nigeria water.

The calculated mean depth of Ero Reservoir from its volume and area parameters is given as 4.6 meters. This shallowness explains the high productivity of the water body as established in the estimated annual potential fish yield of 652.97 metric tonnes of the total reservoir area of 450ha and the post-calculated (actual) annual fish yield of 120.92 metric tonnes. This finding correlates with the established claim of Kapetsky and Petr (1984) that small or shallow lakes with mean depth between 3m and 10m support high productivity, if the dams are used for fish production. This conveniently explains the fact that the depth stratum of a shallow lake allows adequate light penetration for the growth of planktonic algae which is fish food (Boyd, 1979) and that the problem of "Nutrient sink" (which is usually associated with water bodies of high mean depth) is not encountered in shallow bodies. With shallowness as a factor the surface area of reservoir is also an influencing factor. Of the seven man-made lakes in Ekiti State, Ero Reservoir ranks the largest with a surface area of 450ha. Despite the potential fish production of the reservoir only about 3.3% of exploitation is achieved, due to the fact that Ero reservoir is majorly composed of fish species of low commercial value (the Cichlids) and sparsely of commercially valuable Catfish.

CONCLUSION

The findings of this study, have established that the reservoir is under-exploited, giving the predicted potential fish yield and the post calculated yield of the fishermen. However, the efforts in terms of fishing units combined with the inputs of low technological efficiency do not justify their catches in respect of the potentiality of the reservoir.

Therefore, the artisanal fishermen should resume an improved relationship with their regular sponsors by spelling out the binding terms of operation through which the procurement of sufficient and efficient inputs would be possible. With such gears in place, the fishermen can

break even in their volume of catch and make the venture enviable and attractive for the government to develop interest for investment.

This investment, if properly implemented and coordinated, will provide employment opportunities and adequate animal protein for people living in Ekiti State.

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