AN APPRAISAL OF THE CURRENT STATUS OF THE FISHERIES OF ELEIYELE RESERVOIR BY ITS FISHERIES COOPERATIVES

By

JEJE,C.Y., ONOGBOSELE, C.O & ALADEOJEBI, E.A.
Department of Zoology, University of Ibadan, Nigeria

ABSTRACT

In a study undertaken to evaluate the status of the fisheries of Eleiyele Reservoir between 1995 and 1997, thermal stratification was observed to breakdown between December and March. Of the physico-chemical variables, Transparency was positively correlated ($p<0.05$) with primary productivity, conductivity and dissolved oxygen concentration. Primary productivity ranged between 0.38mgC/m^2 /d and 3.0mgC/ m^2 /d, being lowest in April. BOD values ranged between 1.3mg-2.2mg0 /1 indicative of clean unpolluted water. Nine fish species belonging to the families Cichlidae, Centropomidae and Mochokidae were identified. Cichlids were the most abundant with Hemichromis species being predominant. Fishing was only carried out in the reservoir during the dry season months of November to April. Fish landing data for the reservoir, obtained from the Fisheries Division of the Ministry of Agriculture and Natural resources, Oyo State, in conjuction with comparative data from the Cooperative fishermen was low. It demonstrated a decreasing trend from January to April and over time between 1985 and 1996 when compared with data collected in 1985 and 1986 from a previous similar study. Reasons for the low fish yield from the reservoir are discussed and compared with other Nigerian reservoirs.

INTRODUCTION

Eleiyele reservoir was constructed by the Water Corporation of the old Western Region in 1939 primarily to supply water to Ibadan city by daming of the river Ona which itself covers a distance of 62km from its source to the dam. Hydrological data on the dam has been provided by Imevbore (1965). It has a surface area of 152.76ha and a storage capacity of 1550million gallons; a maximum depth of 12m, and a mean depth of 6.5m. Its basing is long and narrow and divided into two main stretches, with the narrowest part slightly over 20m and the widest slightly above 250m. The dam receives water during the rainy season principally from the River Ona and other associated small streams, in addition to water from run-offs.
The control of the fisheries of Eleiyele reservoir resides in the Oyo State Ministry of Agriculture and Natural resources acting through its Department of Fisheries. The Department of Fisheries exercises its powers under the relevant laws to formulate by-laws and regulations for the development, exploitation, management and protection of the fishery resources. According to information supplied by the Department of Fisheries, management of the fisheries of the reservoir commenced in 1976. Presently, due to a faulty switch valve (pers. Comm. Fisheries Officer, MANR, Oyo State, 1997), the water body is nearly stagnant, remaining at a height of approximately 12m throughout the year.

In Nigeria, although there are 12 major reservoirs with an estimated surface area of 303,6ooha, in addition to numerous smaller reservoirs with an estimated surface area of 98,900ha (Ita, 1993), Kainji reservoir with a surface area of 1,280km^2 is both the largest and most intensively studied. Conversely, Eleiyele reservoir has been with fewer works which include Imevbore (1965; 1967) on the plankton and hydrology; Akinyemi (1986) on stock assessment of the post impoundment

fisheries along with a host of University of Ibadan final undergraduate year and Masters programme projects.
This study was conducted to evaluate the current status of the exploitation of the fisheries of Eleiyele reservoir by its Fisheries Cooperatives outside its reserved no – fishing area delineated by the Oyo State Ministry of Agriculture and Natural Resources.

METHODS

Three sampling locations were selected (Fig. 1). Water samples were collected weekly for physico-chemical analyses from November 1995 to October 1997 for surface water temperature; transparency; PH; conductivity; dissolved exygen; Biological oxygen demand and primary productivity. Ryder's (1965) Morpho-edaphic Index was calculated.

Fish landing and species composition data for 1995 and 1996 (1997 not available at the time), were collected from the fisheries officer, Fisheries Unit, MANR, Oyo State. Complementary information on fish species composition were obtained from direct observation of landings by the Cooperative fishermen. Identification of fish were made using Holden & reed (1978) and the taxonomic guide of ORSTOM (1988). Data generated were compared with a previous study conducted by the first author in 1985/86.
Fishermen Cooperatives and the fishing craft and gear used were also identified.

RESULTS

Physico-chemical Variables
The range of values for the physico-chemical variables monitored in the reservoir during the study period are presented in Table 1.
Minimum values were recorded in April for transparency, conductivity, dissolved oxygen and primary productivity with maximum records for the same variables between November and January. Conversely, maximum records for surface water temperature, pH and biological oxygen demand were made in April. High significant correlation coefficient values ® were recorded for conductivity, transparency, primary productivity and dissolved oxygen content at $p<0.05$ (Table 1). Ryder's Morpho-edaphic index ranged between 18.7 and 23.6. BOD values ranged between 1.3-2.2mg0 / 1 indicative of clean unpolluted water. Primary productivity ranged between 0.38-3.0mgC/m^2 / d.

Fishermen Cooperatives
Three groups were identified to fish in the fishing area delineated by the Oyo State Ministry of Agriculture and Natural Resources. These were:
(1). Surulere-Ijokodo group comprising 56 fishermen;
(2). Kajola Cooperative comprising 56 fishermen, and
(3). Ifelodun-Apete Cooperative comprising 23 fishermen.
Women made up approximately 12% - 13% of the fisherfolk, while most of them acted as middle-men to prospective buyers.

Fishing Craft and Gear used
A total of 20 plywood canoes propelled manually by wooden paddles were in operation on the reservoir by Cooperative fishermen. These were of two sizes based on dimensions:
(1) Length of canoe 5.3m; beam 0.7m and depth 0.2m. Capacity: 3-5 persons
(2) Length of canoe 3.3m; beam 0.75m and depth 0.3m. Capacity: 1-2 persons

Table 1:Ange of Physico-Chemical variables Recorded from Eleiyele Reservoir between 1995 and 1997.

Parameter	Range	Maximum (Month)	Minimum (Month)
Surface water temperature (^{0}C)	28.2-29.8	April	January
Transparency (m)	0.53-0.81	December	April
PH	7.3-7.9	April	November
Conductivity (uS)*	223-273	December	April
Dissolved oxygen (mg/1)*	2.2-6s.0	January	April
BOD (mg/1)	1.3-2.2	April	January
Primary Productivity ($mgC/m^2/d$)*	0.38-3.0	November	April
Morpho-edaphic Index	18.7-23.6		

*Coefficient of Correlation ®
Transparency: Conductivity r=)0.89
Transparency: Dissolved oxygen r=0.71
Transparency: Primary productivity r=0.66

Four types of commonly employed fishing gear were identified (in decreasing order of usage):
- Gill nets (mesh 3-4" when stretched)
- Cast nets (mesh 2.5-3"), and
- Drag nets (mesh 3-7"),
- Traps made out of bamboo and palm fronds or of wire mesh sizes 50mm-75mm.
- Hooks were used occasionally by children.

Fish Landing Data

Fishing was observed in the reservoir only during the dry season months of November to April. From visual observation and identifications of fish landing made by cooperative fishermen, a species list was generated and compared with previous records from the reservoir (able 2). The Cichlidae were most abundant and were dominated by *Oreochromis niloticus, tilapia Zillii* and *Hemichromis fasciatus.*

In most cases, species of *Hemichromis bimaculatus* and H. fasciatus were observed to be thrown back into the reservoir by the fishermen whenever they were encountered in the catch.

Data on fish landing were similarly derived from the fishermens catch for 1995 and 1996 obtained from the Fisheries division of the MANR, Oyo State and compare with previous data collected by the first author in 1985 and 1986 (Table 3). The quantity of fish landed demonstrated a decreasing trend from January to April and from 1985>1986>1995>1996. The total weight of the entire catch demonstrated a similar trend and was highest in 1985 (114.3kg) and lowest in 1996 (20.0kg).

Table 2: Fish species composition of Eleiyele Reservoir from present study (1995-1997) compared with previous studies.

Family/species	Zelibe (1982)	Jeje (1985/86) *et al* (1986)	Akinyemi (1995/96)	Present
CICHLIDAE				
Sarotherodon galilaeus	*	*	*(4)	
Tilapia zillii	*	*	*(2)	
Oreochromis niloticu	*	*	*(1)	
Hemichromis fasciatus	*	*	*(3)	
Hemichromis bimaculatus	*	*	*(4)	
Chromidotilapia guenther	*	*	*(7)	
CENTROPOMIDAE				
Lates niloticus		*	*(5)	
MOCHOKIDAE				
Synodontis nigrita			*	*(7)
Synodontis eupterus			*	*(6)
OSTEOGLOSSIDAE				
Heterotis niloticus			*	
HEPSETIDAE				
Hepsetus odoe			*	
CYPRINIDAE				
Barbus callipterus	*		*	
CLARIDAE				
Clarias gariepinus		*	*	
Clarias anguillaris				
CHANNIDAE				
Channa obscura		*	*	
BAGRIDAE				
Bagius domac			*	
ANABANTIDAE				
Ctenopomis kingsleyae			*	
TOTAL number recorded	6	6	17	9

*Present

1 Predominant
2,3 Very common
4, 5 Less common
6, 7 Ocassional/Rare

Table 4: Fish Landing data from catch of Cooperative fishermen of Eleiyele Reservoir between 1985 and 1996.

Year	Total No. of	Fish Species Occurrence	Frequency of (%)	Weight entire catch (kg) (kg)	Total weight of Catch
1985	526	1+2+3+6	98.7	N/A	114.3
			1.3	N/A	
1986	201	1+2+3+6+7	91.7	N/A	
		8	8.3	N/A	60.4
1995	162	1+2+3	92.5	34.2	44.2
		4	3.8	4.0	
		5	3.7	6.0	
1996	70	1+2+3	97.1	15.0	20.0
		5.0	5	2.9	5.0

1	Oreochromis niloticus	2	Tilapia zillii
3	Hemichromis fasciatus (discarded)	4	Synodontis eupterus
5	Lates niloticus	6	Sarotherodon galilaeus
7	Clarias gariepinus	8	Channa obscura

*Fish catch by cooperative fishermen could not be accurately determined.
So: Department of Fisheries, Ministry of Agriculture and Natural Resources, Oyo State.

DISCUSSION

The range of values recorded for physico-chemical variables are typical for tropical fish production (Hickling 1962; Ackerman *et al* 1973; Huet 1972;
Bhukaswan 1980; Boyd 1982; welcomme 1983). Low water temperatures recorded between November and January have similarly been reported by Green (1960) on the River Sokoto which was attributed to the effect of the harmattan winds. PH values recorded indicated that the water was generally alkaline. If waters are more acidic than pH 6.5 or more alkaline than 9.5 for long periods, fish growth and reproduction will diminish (Swingle 1961; Mount 1973). It has also been demonstrated that the pH of a perennial reservoir is either neutral or slightly alkaline and remains so throughout the year.

The suspension of organic and inorganic matter is the major factor affecting transparency (Daget 1957; Holden & Green 1960). The lowered transparency in April was brought about by the re-suspension of inorganic and organic matter caused by the onset of rains. The high positive correlation (r=o.89) between transparency and conductivity appear to indicate that the concentration of suspended matter influenced the availability of chemicals in solution possibly through adsorption-desorption effects of the ions on the surface of the finely divided matter (White 1965). The higher the concentration of suspended matter, the greater the number of ions absorbed

and vice-versa. During the commencement of the rains in March/April, a heavy discharge of allochtonous materials from incoming streams, rivulets and the watershed will occur, resulting in an increase in turbidity (Moreau & Desilva 1991). Gradually, the input of nutrients result in an increase in primary production which was demonstrated in this study by the positive correlation between transparency and primary productivity (r=0.66) of Eleiyele Reservoir during the study period. Under comparable climatic and hydrological conditions, transparency will be a reasonably good indicator of primary productivity and sometimes of fish yield (moreau & Desilva 1991).

The increase in the concentration of dissolved oxygen content between December and January 1997 was probably caused by the mixing of the stratified water brought about by the cold harmattan. Thermal stratification which has been previously identified to occur in the reservoir has similarly been observed to bread down at this period owing to the harmattan period (Imevbore 1967). The low oxygen content of the surface water in April resulted from the influx of flood water from the rains that occurred in that month which was very poor in oxygen content.

There are no records available on the fish species inhabiting River Ona before impoundment. In the present study, nine species of fish belonging to three families were recorded. In addition to these, Akinyemi *et al* (1986) reported the occurrence of eight other species belonging to seven families (Table 2). The standing fish stock of Eleiyele Reservoir is dominated by the Cichlidae. This has also been reported for many Nigerian reservoirs including Kainji (Ita, 1978); Bakalori (Ita & Balogun 1982); kiri (Ita *et al* 1986) and Asejire (Elliot 1986) and Jebba (Ita *et al* 1988).

Fishing was restricted to the dry season months (November to April) due to a reduction in the volume of water in the reservoir. This is because during the rainy season, the reservoir is filled to capacity, especially with the valve which discharges water from the reservoir being faulty. This flooding causes fish to move into the littoral vegetation to hide and spawn. At this time, the fishermen resort to farming. Commercially undesirable fish species such as *Hemichromis fasciatus and H. bimaculatus* were observed to be discarded back into the reservoir.

Fish landing estimates from available records obtained from the Ministry of Agriculture and Natural Resources revealed a marked decline from 1986 to 1996. Rrecords of 1997 fish landing estimates were not available for utilisation as they were incomplete. The Cichlids always dominated the catch representing between 91.7 and 98.7% of the total catch (Table 3). Between 1985 and 1996 the total weight of the entire catch for the year (from records provided) declined from 114.3kg to 20.0kg. Ryder's (1965) Morpho-edaphic Index calculated for Eleiyele reservoir ranged between 18.7 and 23.6. Maximum crops are expected at index values of between 5 and 30 (FAO 1980). Therefore, fish landing data was very low compared to available data from other Nigerian reservoirs: Kainji 11,037t; Jebba 275t; Kiri 2473t and Asejire 1029t (Ita 1993) although Eleiyele reservoir is of much smaller size than any; of these reservoirs.

It therefore appears that although the management of Eleiyele reservoir fishery has objectives to exploit the fisheries of the reservoir and to maintain and promote the activities of the fishermen cooperatives, thses objectives remain largely unfulfilled as the fisheries of the reservoir remains underexploited.

The following reasons have been identified in the under-exploitation of the reservoir fisheries:

(1) The use of low efficiency gear by the artisanal fishermen such as gillnets, castnets, traps and hooks.

(2) The use of low number of fishing craft and the lack of motorised engine craft caused by the inability of the fishermen to purchase canoes owing to their high prices.

(3) A faulty overflow valve caused the reservoir to be flooded almost throughout the year, thereby reducing the number of fish caught.

(4) Only one fisheries officer was assigned from the Fisheries Division of the MANR to collect landing data from all the cooperatives.

(5) Inaccurate or incomplete records of catch were in several cases made available to the fisheries officer by the fishermen (pers.obs) in order to increase their overall personal gain.

(6) Lack of standardization of fishing methods, thereby making it impossible to determine catch per unit effort.

(7) Data required for the assessment of fish production, such as weight, number of individual species in each catch, sex, year class, rate of growth, mortality and recruitment data, were not recorded by the fisheries officer.

In conclusion, it is noted that the fisheries of Eleiyele reservoir is grossly under-exploited. Increased exploitation may be made if more fishermen were allowed to join the cooperatives; funds made available to the fishermen through low interest loans for the purchase of standardized fishing crafts and gear, and the standardization of fishing methods in operation at the reservoir. There is also the need for accurate and reliable data on fish landings for a scientific assessment of the fish yield. Consequently, more fisheries officers need be assigned to monitor fishing operations in the reservoir to guard against under-estimation of fish landings by the fishermen.

REFERENCES

Ackerman,W.C., white, G.F. and Worthington, G.B. (1973): Man-made lakes; their problems and environmental effects. *Geophys. Monogr. Ser.* 17:847-850.

Akinyemi, O., Ita, E.O.d Sado, E.K. (1986): A preliminary assessment of the post-impoundment fisheries of Lake Eleiyele and Lake Asejire, Oyo State, Nigeria. *Kainji Lake Research Institute 1985 Annual Report*: 45-50.

Bhukaswan,T. (1980): Management of Asian reservoir fisheries. *FAO Fish. Tech.Pap.* 207: 69p.

Boyd.C.F. (1982): Water quality management for pond fish culture. 1st.Edn, Elsevier Sci.Publ.Co., New York. 318p.

Elliot, O.O. (1986): Aspects of the biology of fish fauna of Asejire Lake, Nigeria. Ph.D. Thesis, University of Ibadan, Nigeria.

FAO. (1980): Comparative studies of freshwater fisheries. Report of a workshop held at the Instituto Italiano di Idrobiologia, Palianza, Italy, 4-8 September 1978. *FAO Fish.Tech. Pap* 198: 46p.

Green,S.(1960): Zooplankton of the River Sokoto: The Rotifera. *Proc.Zool. Soc.Lond.* 138: 491-523.

Hickling, C.F. (1961): Tropical inland fisheries. Longman, London. 287p.

Holden, M.J. and Green, J. (1960): The hydrology and plankton of River Sokoto. *J. Anim. Ecol.* 29: 65-84.

Holden, M.J. and Reed, W. (1978): West African fresh-water fish. 2nd edition. Longman Group Ltd., London. 68p.

Huet, M.(1972): Textbook of Fish culture: Breeding and cultivation of fish. Translated by H. Kohn. Fishing News (Books) Ltd, Farnham, Surrey, England. 436p.

Imevbore, A.M.A. (1965): A preliminary check-list of the planktonic organisms of Eleiyele Reservoir, Ibadan, Nigeria. *J.W.Afr.Sc.Ass.* 10: 56-60.

Imevbore, A.M.A. (1967): Hydrology and Plankton of Eleiyele Reservoir, Ibadan, Nigeria. *Hydrobiol.* 30: 154-176.

Ita, E.O. (1978): An analysis of fish distribution in Kainji Lake, Nigeria. *Hydrobiol* 59(3): 233-244.

Ita, E.O (1993): Inland fishery resources of Nigeria. *CIFA.Occas. Pap.* 20: 120p.

Ita, E.O. and Balogun,J.K. (1982): Planning for fisheries in new reservoirs: a case study of Bakalori and the proposed Goronyo Reservoir in Sokoto State, Nigeria. *Kainji Lake Res. Inst. Newsletter* 8(2): 1-8.

Ita, E.O., Mohammed, A., Omorinkoba, W.S., Bankole, N.O. and Awojoodu, S. (1986): A preliminary report on the immediate post-impoundment fishery survey of Shiroro reservoir, Niger State, Nigeria. *Kainji Lake Res. Inst. 1985 Annual Report* :25-29.

Moreau, J. and DaSilva, A. (1991): Predictive fish yield models for lakes and reservoirs of the Philippines, Sri-Lanka and Thailand. *FAO Fish. Tech. Pap.*319: 14-16.

Mount, D.I. (1973): Chronic effect of low pH on fathead minnow survival, growth and reproduction. *Water Res.* 7: 987-993.

ORSTOM. (1984): Guide des poissons d'eau douce dela zone du programme de lutte contre l'Onchocercose en Afrique de l'Ouest. Eds. Leveque, C et paugy, D. Convention ORSTOM-OMS 293p.

Ryder, R.A.(1965): A method of estimating the potential fish production of north temperate lakes. *Trans. Amer. Fish. Soc.* 94: 214-218.

Swingle, H.S. (1961): Relationship of pH of pond waters to their suitability for fish culture. *Proc. Pacific.Sci.Congress* 9(1957), 10: 72-75.

Welcome, R.L. (1970). River basings. *FAO.Fish.Tech.Pap.* 202:60p

White, E. (1965). The First Scientific Report of the Kainji Biological Research Team, Liverpool: