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Fin-Fish Assemblage and Catch Composition of Federal University of Agriculture Abeokuta Reservoir

Adeosun, F.I., A.A. Akinyemi, I.O. Taiwo, D.O. Odulate, A.A. Idowu, B.T. Adesina, I. Abdulraheem, O.C. Ojelade, M.O. Amrevuawho, O.T. Onafeso

Abstract

The fin fish assemblage of the Federal University of Agriculture Abeokuta Reservoir was investigated. Gill nets, and cast net were used for the collection of fish samples. A total of 5 species belonging to 4 families were encountered. Station 3 has highest in biomass (275kg) accounting for 23 while station 5 had least in biomass (209kg) The most abundant species were *Tilapia zillii* some of the species *Heterotis niloticus*, *Clarias gariepinus* were common. Others were rarely few. The physical and chemical parameter determined were dissolved oxygen, transparency, nitrate, phosphate, surface water temperature, alkalinity, total dissolved solid and depth. The water quality parameters were favourable for fish production.

Key words: Reservoir, Water quality, Fish Assemblages, Checklist.

Introduction

Rivers and lakes are very important part of our natural heritage. They have been widely utilized by mankind over the centuries, to the extent that very few, if any, are now in a natural" condition. About a billion people, mostly in developing countries depend on fauna as a primary source of animal protein and flora as a source of healing (FAO,1999).

Fauna and flora are destined to play an important part in feeding the rapidly growing population of Africa. With the ever increasing need for cheap sources of animal and plant protein, more attention is being focused on fauna and flora both from natural waters and from fish and plant farming (Knalil and Polling, 1997). Global fauna and flora production reached 122million tonnes in 1996, of which 90million tonnes were used for human consumption (FAO, 1999). It was estimated that by the year 2011, demand for fish increase by 13.5-18.0% or to about 110-135 million tonnes (FAO 1999). Fauna are known as animal that can be found in water while flora are all series of plant that can be found in water or they are sum total of all the plant species found in water (Paperna 1996). Climates have changed, often drastically: continents have shifted their positions, isolating plant group and animal species. Thus, the world today does not have a uniform flora and fauna: (Roberts, 1998). The rich soil fauna and flora of the brown earth soil types is responsible for the constant movement downwards of humus in the soil (Olufemi, 1998).

Fauna and flora are beneficial in the conversion of litter supply to soil in two stages. First, the primary decomposer (millipedes, beetles and earthworm) and (macula) which attack the litter and their faeces are important in producing a good comb structure as well as providing the food for the secondary decomposers (Olufemi, 1998).

Materials and Methods

Federal University of Agriculture Abeokuta (FUNAAB) reservoir is located at the Fisheries section of the University farm. The 3-hectare reservoir was constructed by damming a seasonal stream (Alabata stream) in 1997. Alabata lies within the south Western region of Nigeria around latitude 7°10'N and longitude 3°2'E, with a prevailing tropical climate and annual rainfall of about 1037mm. the ambient temperature lies within 28°C in June and 36°C in February with an average annual temperature of 34°C. The vegetation presents is an inter-phase between a tropical rainforest and a derived savannah. The reservoir is to provide water for other earthen ponds downstream, serve as a fishing ground and for research and educational purpose. The dominant families of fish found in the reservoir include *Clariidae, Cichlidae, Osteoglosidae and Cyprinidae*.

Surface water temperature and pH, were measured *in situ* using Hanna portable pH/Temperature combined water proof tester model HI 98129. The following factors selected as water quality

parameters were measured using the methods described for each factor as follows. Transparency was determined by extinction method using the secchi disc by measuring the mean of the depths at which the secchi disc disappears and at which it reappears, dissolved oxygen was determined by Azide modification of the Winkler method. Nitrate-Nitrogen (NO_3-N) and phosphate (PO_4-P) were measured according to APHA (1995) standard procedures using Hach spectrophotometer model DR-EL/2. All the chemical analyses were done at the Fisheries laboratory of FUNAAB immediately after the sample collection.

Data on fish species composition and abundance were collected on bi-monthly bases using multi-fleet gillnet sampling techniques. Five sampling stations were randomly selected. This technique involved sampling of each station for the fish composition and abundance using a fleet of eight graded experimental gillnets (mesh sizes of 25.4 to 177.8mm) and cast net (50.8mm) of similar surface area, which were done simultaneously in the various sampling stations. However, fleets of gill nets were set at dusk and retrieved at dawn in all stations, the investigation were carried out from landing site. Collection of fish samples was between March and June, 2003 from the five stations. Sample fishes were counted, sorted out and identified using monographs descriptions, checklist and keys prepared by Boulenger, (1916), Reed *et al.* (1967), Holden & Reed (1972) and Adeosun, *et al.*(2011) sorted into species and families, and each fish was weighed to the nearest 0.1g using the mettler balance.

Results and Discussion

Tables 1and 2 represent the results of fish species composition in FUNAAB reservoir. A total of 5 species from four families were caught during the study period. FUNAAB reservoir contained different kinds of fish species. The variation in number of species may be explained in three ways, differences in the physico-chemical conditions cause variations in species composition

Table 1: Fish assemblage in sampling stations

Fishes	1st Sampling	2nd Sampling	3rd Sampling	4th Sampling	5th Sampling
Sarotherodon galilaeus	148	249	173	256	214
Barbus occidentalis	132	121	66	96	75
Oreochromis niloticus	111	100	88	106	80
Clarias gariepinus	93	61	83	71	122
Prawn	67	54	47	67	62
Hemichromis fasciatus	121	157	93	84	81
Total	753	712	550	680	634

Table 2: Biomass and Number of Fish caught in FUNAAB Reservoir

Sampling Station	Number of fish	Composition (%)	Biomass of Fish (Kg)	Percentage Biomass
Station 1	753	23	250	21
Station 2	712	21	237	20
Station 3	550	17	275	23
Station 4	680	20	227	19
Station 5	634	19	209	17
Total	3329	100	1201	100

Higher valued of dissolved oxygen concentration were observed at the peak of the rainy season (Table 3) when nutrients and sediments are flushed into reservoir, from nearby rivers. This direct increase in the two variables however, depends upon the time of the day water sample were collected. This result showed that the dissolved oxygen production in the reservoir during the study period was not mainly to the physical factor but also on the biological factors. The fairly stable oxygen concentration during the sampling period was an indication of the absence of significant polluting material.

Table 3: Physico - Chemical Characteristics of FUNAAB Reservoir

Parameters	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
pH	6.80	6.53	6.67	6.93	6.8
Dissolve Oxygen (mg/l)	7.20	7.10	7.10	7.0	7.20
Transparency(cm)	0.35	0.30	0.28	0.42	0.41
Nitrate (mg/l)	14.00	13.44	12.88	12.99	13.75
Temperature (^{0}C)	45	30	35	26	36
Alkalinity (mg/l)	56.80	72.80	83.20	87.20	82.40
Depth (cm)	2.95	2.45	2.30	2.46	2.84

The fairly uniform water temperature readings recorded during the study period may be minced to shallowness of the reservoir and regular influx of water from the rivers which ensure the complete mixing of the water. This observation agrees with Ajao (1990) and Oyewo (1998) in their worked on the temperature of the Lagos lagoon. In dry-season, the effect of cloud cover was minimal and the flow of water from the fresh water becomes almost effect of insulation reaching the maximum level of 30°C as observed in the dry season. However, the biological ecosystem cannot be overlooked Alkalinity is an important ecological parameter having a great effect on the biotic life in the ecosystem as different organisms have the optimum alkalinity level at which they perform best. The direct fertilization as the development of eggs of some fishes occurred at certain range of alkalinities and any variation from these ranges will have serious effects on the growth and development of the fishes (Blaber, 1997).

The alkalinity of water normally reflects carbonate content of rocks and soils of watersheds, and bottom mind. The total alkalinity level for natural waters may range from less than 5mg/l to several

hundreds mg/l (Boyd, 1979), however, water containing more than 40mg/l or more of total alkalinity is considered useful for biological purposes (Dublin Green, 1990). The relatively lower values of alkalinity recorded during the study period may be attributed to the dilution effect of the rain during this period. This conforms to the observation of Dublin-Green (1990) in her study of the bonny estuaries.

Nitrate is an essential nutrient but at high concentration, it becomes toxic and capable of disturbing the aquatic environment less than 0.5mg/l will not pollute the water. It is generally the product of organic matter decomposition by bacteria. Under normal condition, the nitrate content of the surface water occurs in trace amount but the value is enhanced by the inputs from either sources(Bilger and Akinson, 1997). Generally, the nitrate value of 0.21mg/l to 0.6mg/l means values obtained within the study period are common to a fairly polluted coastal system. This is especially true as there is suspended sediments transportation with the fresh water influx into the study area within the study periods. The phosphate is also of great important as an essential nutrient in aquatic system. Phosphate values of 40 to 120mg/l are high and can load to an environment being polluted. This agrees with the report of Ajao (1990), which linked this largely to the inputs of domestic and industrial effluent as the Lagos received a lot of this effluent.

Conclusion and Recommendations

The study provided baseline information on the biotic parameters of the study area in relation to the various environmental factors both physical, chemical factors and the ecosystem as regards the aquatic biodiversity. Also, it provided information on the factors aforementioned, how it affect the water body and current state of fish production in the reservoir respect to the ecosystem. The study equally served as an eye opener on the need to have a good knowledge of the physical and chemical factors of the environment and the complex eco-biological interactions in aquatic environment in order to make good and sound management decisions towards the effective and wise use of the aquatic environment.

The monitoring of the parameters showed that the fluctuation in the physico-chemical factors and their consequent effect on the biotic components were not entirely nature induced as some of the alterations or variations could have been anthropogenic in nature. For instance, high rate of organic and inorganic pollutions were observed in some sections of the water body. This may have directly or indirectly influenced the organic production and equally may have affected the growth of biotic/ecology life depending on the nature, quantity and form of the effluents introduced into the environment. Based on results of the study, the following are recommended:

(a)The uncontrolled use of the water body should be checked through the enforcement of various regulations by the implementing agencies - involved in this aspect, as there will be a serious biodiversity loss if this situation should continue.

(b)Any management programme to be put in place in the system should be such that will address the issues of environmental protection, integrated management and sustainable development as well as the conservation of the eco-biological living resources of the system.

(c)There is also a need for further studies on the nature and level of contribution by man's activities to the variations in the physical and chemical variables of the water body and the ecosystem i.e. aquatic biodiversity.

(d)A detailed and regular study of the physical and chemical status of the reservoir is recommended in order to take the problem of poor environmental data base of the water body and the aquatic living resources.

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Heavy Metal Concentrations in Periwinkle (*Tympanotonus fuscatus*) and Croaker (*Pseudotolithus typus*) from Iko River Estuary, South-Eastern Nigeria

Abiaobo, N. O. and Asuquo, I. E.

Abstract

Heavy metal (HM) concentrations in Croaker (*Pseudotolithus typus*) and periwinkle (*Tympanotonus fusctuss*) from Iko River estuary, South-Eastern Nigeria were examined between June and December, 2015 using UNICAM 939 Atomic Absorption Spectrophotometer (AAS). The mean ± SD of HM concentrations viz: Cd, Cr, Cu, Fe, Pb, Ni and Zn in croaker were found to be 0.56 ± 0.22mg/kg, 0.12 ± 0.11 mg/kg, 36.87 ± 7.78 mg/kg, 7.19 ± 0.84 mg/kg, 0.54 ± 0.37 mg/kg, 0.05 ± 0.06 mg/kg and 21.82 ± 4.30 mg/kg respectively. In periwinkle, the concentrations were 4.29 ± 1.03 mg/kg, 0.42 ± 0.21 mg/kg, 65.49 ± 9.46 mg/kg, 246.76 ± 72.21mg/kg, 9.86 ± 4.10 mg/kg, 0.38±0.16 mg/kg and 54.33 ± 13.07 mg/kg respectively. The results show that Cu and Fe recorded highest concentrations in Croaker and periwinkle respectively while Ni concentrations were least in both organisms. Although, both organisms bio-concentrated considerable levels of heavy metals, however, the bio-concentrations of periwinkle were significantly higher than croaker. The concentrations of Cd, Cu and Fe in both organisms were higher than the WHO/FEPA maximum permissible limits. These generally suggest an evidence of these fauna to bio-concentrate heavy metals and possess bio-indicative attributes for monitoring metals in the aquatic ecosystems.

Introduction

Iko River estuary in the Niger Delta region habours rich collection of biotopes; dominated by vast areas of mangrove swamp forest (NDES, 2000). However, this region with its complex ecological form is being subjected to considerable environmental pollutants from agricultural, industrial and domestic activities as well as oil exploration and exploitation. This has resulted in the release of pollutants (hydrocarbons and heavy metals), capable of polluting the terrestrial and aquatic ecosystems (Ewa-Oboho, 1994). Heavy metals have been reported to have negative effect on metabolic processes in general and may influence the nutritional and biological status of aquatic resources (WHO, 1985; FEPA, 2003, Otitoju and Otitoju, 2013).

Aquatic fauna such as periwinkle and fish are rich sources of nutrients and their nutritional values may be affected based on the environment in which these organisms live (NDDC, 2004; Nsikak *et al.*, 2007). These important food sources constitute a major part of the diet in the Niger Delta region of Nigeria, and may bio-accumulate heavy metals in considerable amount in tissues over a long time which may be detrimental to the health of inhabitants of this area that consume them (APHA, 2005; ATSDR, 2005). The study of toxic and heavy metals in Iko River estuary is more important in comparison with other pollutants owing to their non-bio-degradable nature, accumulative properties and long biological half-lives. It is difficult to remove them completely from the environment once they enter into it (Ademoroti, 1996). These metals in the form of inorganic compounds from natural and anthropogenic sources continuously enter the aquatic ecosystem where they could pose serious threat to the food chain. Studies on the pollution status of some fauna in some parts of Nigeria and around Niger Delta area have been reported (Davies *et al.*, 2006; Chindah *et al.*, 2009; Olowoyo, 2011; Otitoju and Otitoju, 2013). The objective of the research was to determine the concentrations of Cd, Cr, Cu, Fe, Pb, Ni and Zn in periwinkle (*T. fuscatus*) and Croaker (*P. typus*) harvested from Iko River estuary.