

## Impact of habitat change on physico-chemical characteristics of Awba dam tourism centre reservoir, University of Ibadan, Southwest Nigeria

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### ABSTRACT

Reservoirs are natural or artificial lakes that provide habitat for several species of wildlife as well as spots for tourist attraction, Awba dam inclusive. Hence, an assessment of the effects of dredging on the physico-chemical characteristics of Awba dam water and avian composition within the dam was done during the wet and dry seasons of 2013-2014. Physico-chemical parameters such as transparency, total dissolved solids [TDS] dissolved oxygen [DO] were investigated. Bird survey carried out using line transect method (Bibby *et al.*, 2002), birds heard and seen were recorded morning (6:00-10.30hrs) and evening (16:00-18.30hrs). Data obtained were analysed using descriptive statistics and ANOVA at  $P < 0.05$ . Values of physicochemical parameters of the dam observed ranged as follows: water temperature, 24-26°C, transparency 0.0-0.3m, TDS 143.2-151.5mg/L, conductivity, 289.2-391.5µmhos/cm respectively. The mean rainfall for 2013-2015 was 1550mm, while mean air temperature was at 22-23°C respectively. Zn was (-0.641), Cu was (0.788) while Fe was (0.797) respectively. A total of 18 species of birds comprising of 11 families and 6 orders were recorded during this survey. These are seven (7) carnivores (38.8%), three (3) frugivores (16.6%), five (5) granivores (27.7%), two (2) insectivores (11.1%), and one (1) nectarinivores (5.55%) respectively. The impact of the dredging has taken a heavy toll on the physico-chemical parameters as well as on the flora and fauna species diversity. Environmental Impact Assessment (EIA) is highly necessary if such massive habitat change is required in the future to forestall species loss.

**Keywords:** Awba dam, Dredging, Physico-chemical parameters, Species loss.

### INTRODUCTION

Reservoirs are very large natural or artificial lakes that provide habitat for several species of wildlife (Dinar *et al.*, 1995). They are constructed for domestic use especially where large natural lakes are sparse and unsuitable for human exploitation. The location and topography of such dams can sometimes require a mechanical dredging to enable them maintain their depth as well as their volume capacity. Over the past few decades, research has been conducted on aspects of the ecology of Awba reservoir e.g. trace metal levels (Mombeshora *et al.*, 1981, 1982), reproductive biology of the fish (Omotosho, 1985), food and feeding relationships (Ugwumba and Adebisi, 1992). Presently, there is an on-going major construction and face-lift in Awba dam in order to develop the place into an ecotourism site. This massive construction work brought about the destruction of the fragile vegetation around the reservoir, as well as loss of localized mammal, reptilian and avian species found around the site. The outright dredging of the main basin of the dam as brought about a deterioration in water quality of the reservoir due to effluent discharge and eutrophication (Oduwole, 1990).

This paper assessed the effects of dredging on the present physico-chemical characteristics of the water, trace metal levels, as well as avian composition

within the dam site. This is important because the perceived irreversible damages might have happened to the water quality as well as severe flora and fauna loss considering its initial ecotourism potentials for activities like sport fishing, birding as so on.

### METHODOLOGY

#### Description of the study area

The dam is located (as shown in Figure 1) in the southern area of the university of Ibadan campus (Akin-Oriola, 2003). It lies between the latitude N 07 26 544 to 560 and longitude E 003 53 177 to 236. It is situated at an altitude of about 185 meters above sea level. It was created by damming the Awba stream in April 1964 with the sole aim of storing water for domestic consumption, laboratory use and table fish culture. It is also used for hydrobiology and fisheries research purposes. The area of the dam occupied by water varies with seasons and in accordance with the rainfall regime. The water is still with occasional multidirectional current which is moderate and due to the effect of the wind. Turbidity is minimal and the water is entropic (Hassan 1974). The Reservoir has a surface area of 6 ha. According to Ugwumba (1990), the Reservoir is 8.3 m high, 110 m long with a crest of 12.2 m high. It has a maximum depth of 5.5 m and a maximum length of 700 m (Akin-Oriola, 2003). It can hold about 230 million

litres of water (Omosho, 1981). The mean daily air temperature is 24.6°C. Surface water samples were collected monthly from the reservoir on a seasonal basis. The physicochemical parameters determined were pH, conductivity, total dissolved solids dissolved oxygen alkalinity and salinity. Temperature and transparency were measured *in situ*. Air and surface water temperature was determined using a centigrade thermometer of range 10-110°C and results were expressed in degree Celsius (°C). The hydrogen ion concentration (pH) was determined in the laboratory using simple titration techniques. Salinity, TDS and conductivity were measured using EXtech meter Model ExStik Ec400. Transparency was measured using a secchi disc. Dissolved oxygen concentration was determined using the Azide modification of the Iodometric method as reported by Greenberg *et al* (1998). Alkalinity was measured with LaMotte Freshwater Aquaculture Test Kit Model AQ-2. The results were expressed as mg/L. Trace metals were analysed according to methods in APHA (Anonymous, 1985) using a Phillips Pye-unicam Sp 9 atomic absorption spectrophotometer

### Accessibility

The dam is accessible all year round. The *Barth* road leading from *Queen Idia/ Abdulsalam Hall* leads the new stadium and the junction to right leads to the dam. Also the dam can be accessed through *Ekwuno* and *Imo* crescent. The roads are paved and averagely maintained. There are Taxi cabs plying the route and most often times a visitor can take a drop at an affordable cost.

### Drainage and Topography

The Awba stream flows through the university via the *Emmanuel College* area along a steadily depressed gradient. It then flows through the *University Fish Farm* onward through the zoological gardens. It later flows behind the faculty of science; the point where the lake begins from. The stream later exits the university, forming a tributary of the *Eleyele* Lake.



**Plate 1: Awba dam before reconstruction**

**Source: Field survey (Reconnaissance), 2013**

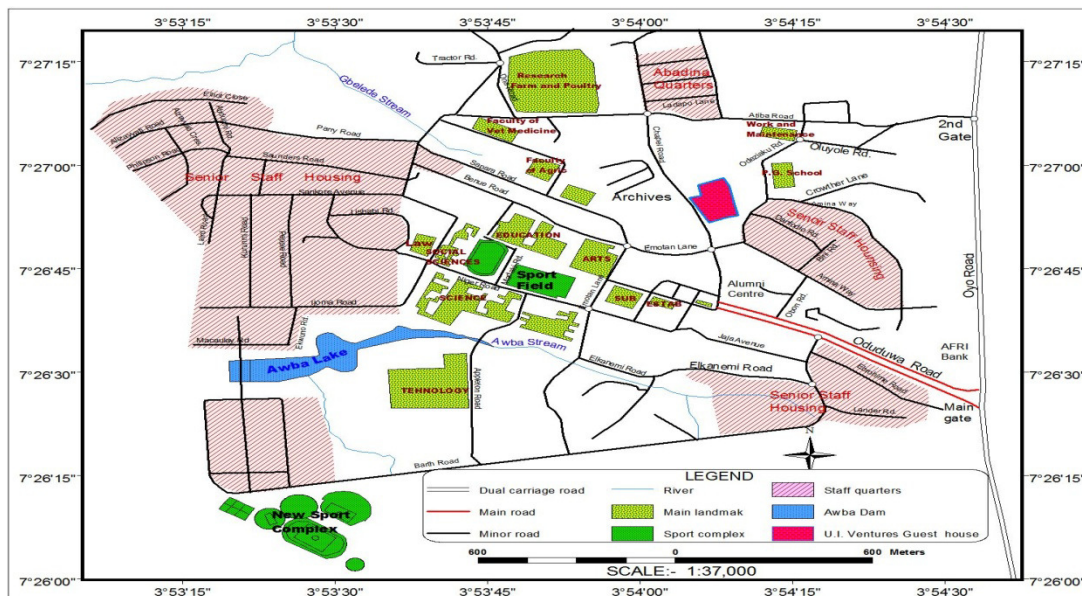


Fig 1: The Map of the University of Ibadan campus showing the Awba dam

Results and discussion

Table 1: The Mean Standard Error and Range of Physicochemical Parameters of Awba Dam Reservoir

Parameters	Mean ± S.E	Range
Dissolved oxygen (mg/L)	1.02±0.360	0.7-0.8
Alkalinity (mg CaCO <sub>3</sub> /L)	1.26±0.4230	0.8-1.90
Conductivity (µmhos/cm)	347.53±36.90	290.65-391.7
Total dissolved solid 9mg/L)	156.56±5.61	143.7-157.5
Salinity (ppt)	0.10±0.0001	0.11-0.18
pH	7.97±0.390	7.3-8.5
Air temperature (°C)	22.95±0.68	22-23.7
Water temperature (°C)	25.14±1.00	24-26.5
Transparency (m)	2.70±0.659	0.2-0.5

Source: Field survey 2013-2014

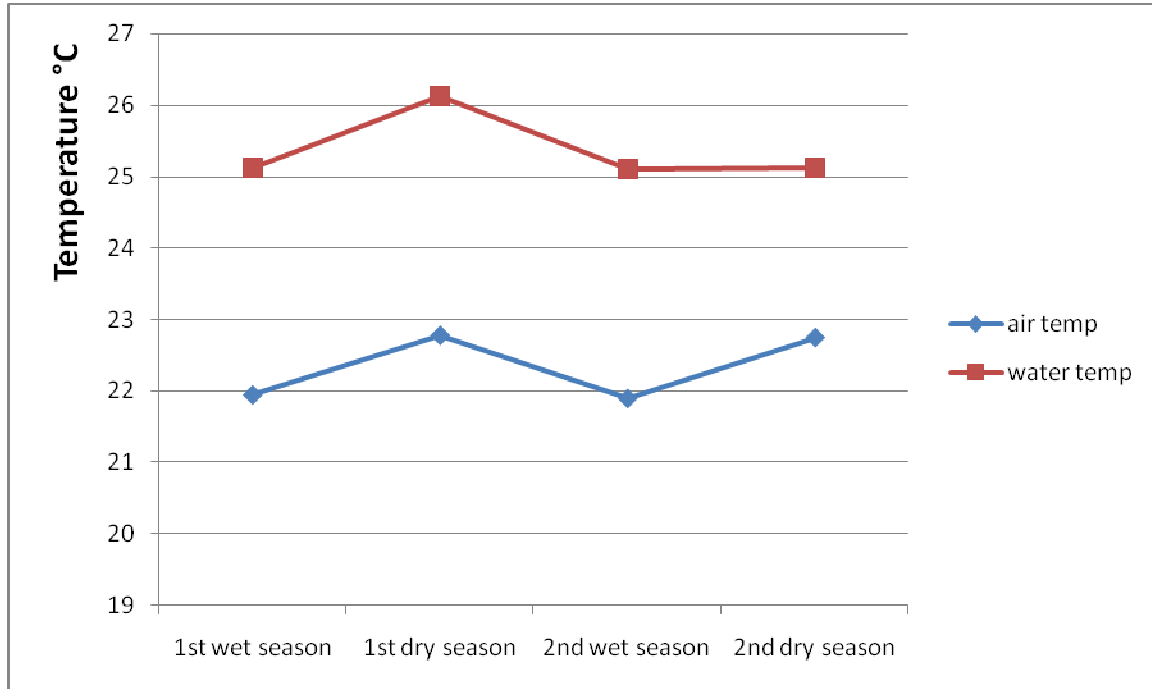


Figure 2: Seasonal variation of temperature

Source: Field survey 2013-2014

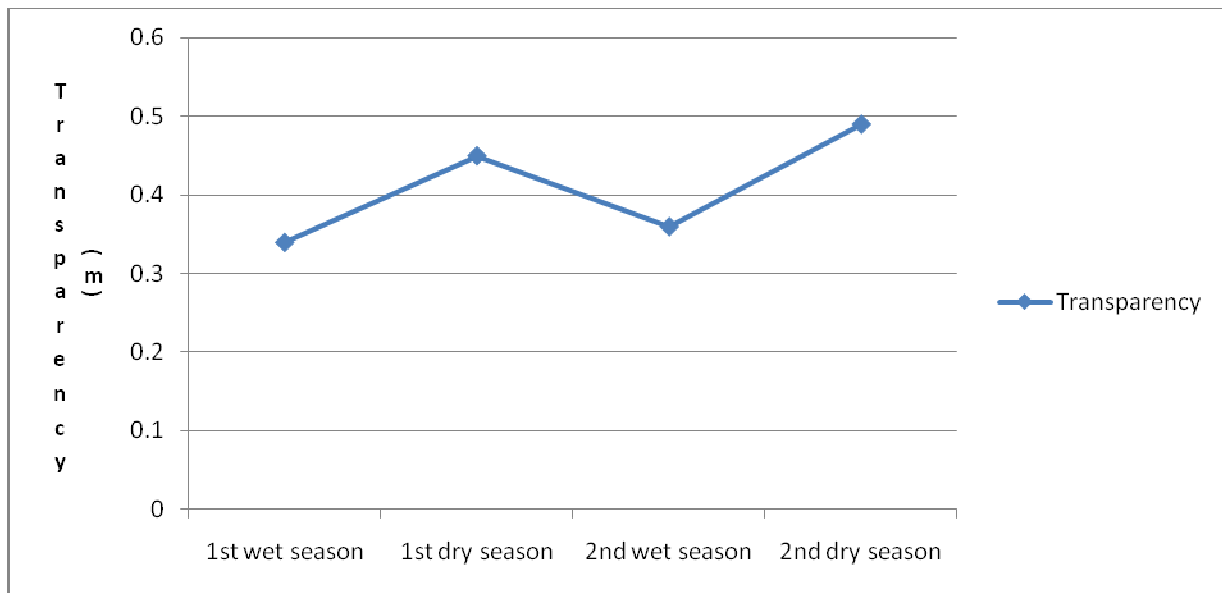


Figure 3: Seasonal variation of transparency (m)

Source: Field Survey 2013-2014

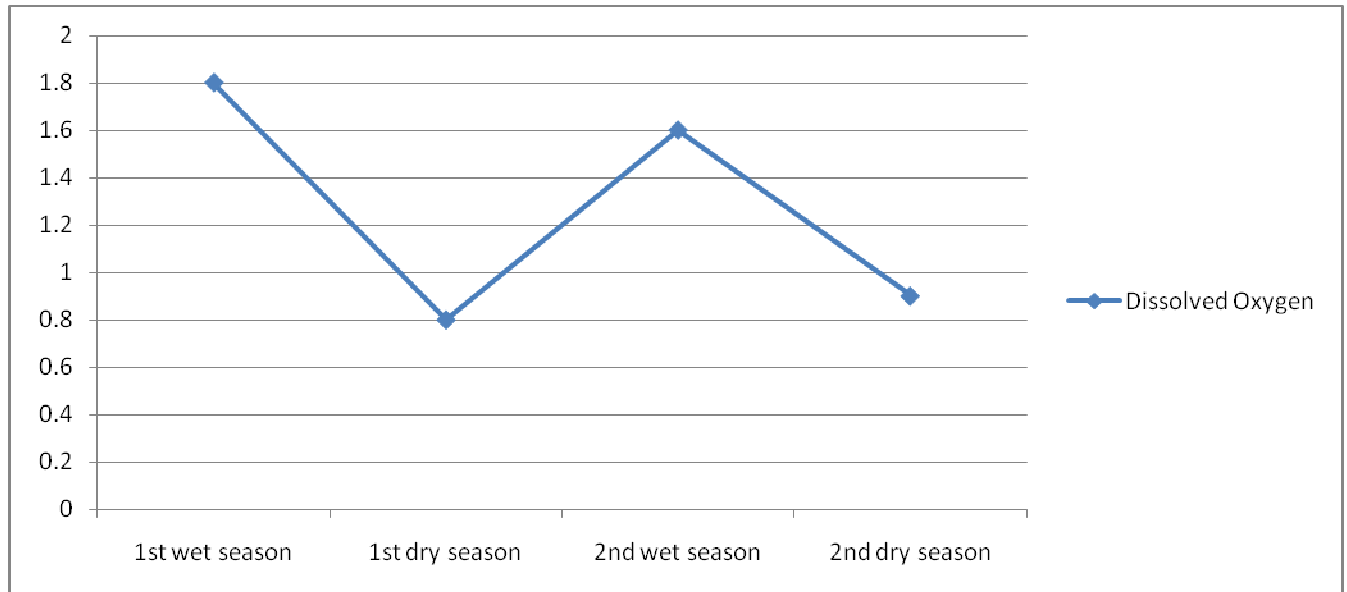


Figure 4: Seasonal variation of Dissolved Oxygen (mg/L)

Source: Field Survey 2013-2014

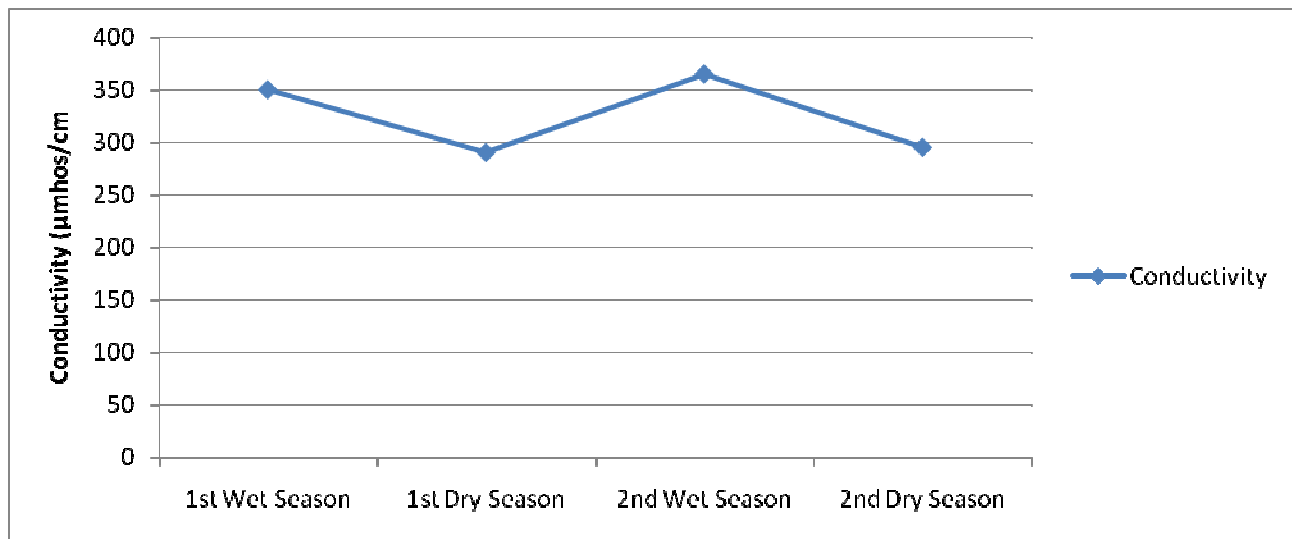


Figure 5: Seasonal variation of Conductivity (µmhos/cm)

Source: Field Survey 2013-2014

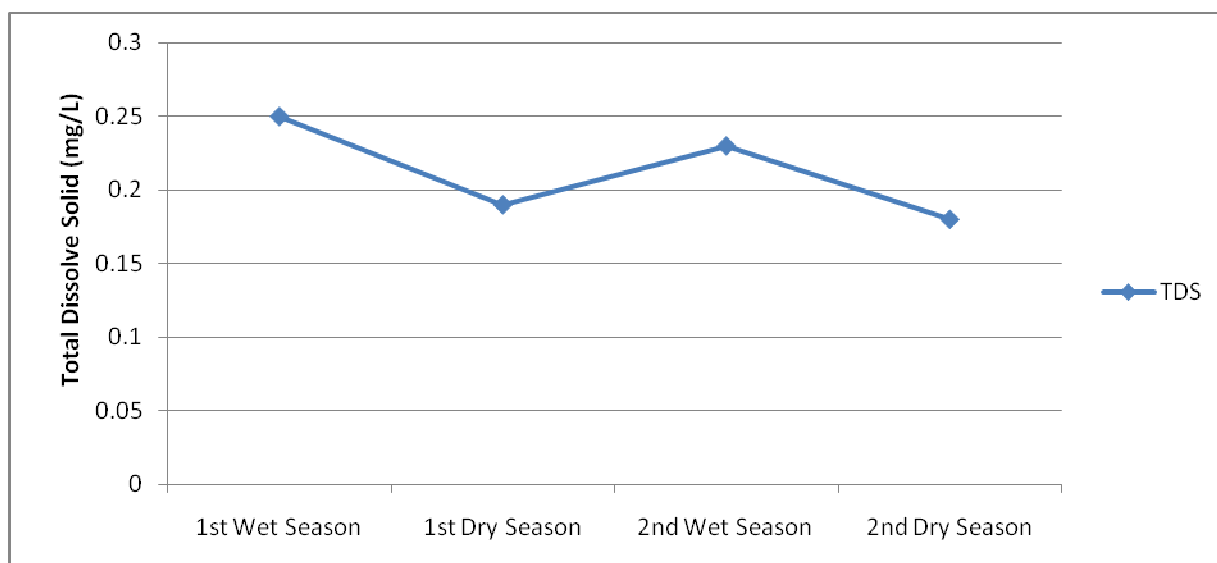


Figure 6: Seasonal variation of Total Dissolved Solid (mg/L)

Source: Field Survey 2013-2014

Table 2: Correlation co-efficient (r) matrix for the physico-chemical parameters during the study period

	DO	Alkalinity	Conductivity	TDS	pH	Air	Water
<b>DO</b>							
<b>Alkalinity</b>	0.859						
<b>Conductivity</b>	-0.081	0.138					
<b>TDS</b>	0.805	0.819	-0.278				
<b>pH</b>	-0.283	-0.093	0.916	-0.536			
<b>Air</b>	-0.572	-0.471	0.814	-0.684*	0.884		
<b>Water</b>	-0.757	-0.738	0.556	-0.912	0.748	0.911	
<b>Transparency</b>	-0.441	-0.495	0.269	-0.731	0.453	0.465	0.614*

Source: Field survey 2013-2014

Table 3: Trace metal components in Awba reservoir

Parameter	Component 1	Component 2	Component 3
Zinc	-0.641	0.204	0.272
Copper	0.788	-0.037	0.212
Iron	0.797	-0.291	-0.249
% contribution	44.5	35.6	19.9

Source: Field survey 2013-2014

**Avian species**

A total of 18 species of birds comprising of 11 families and 6 orders were recorded during this

survey; 7 carnivores (38.8%), 3 frugivores (16.6%), 5 granivores (27.7%), 2 insectivores (11.1%) and 1 nectarinivores (5.55%)

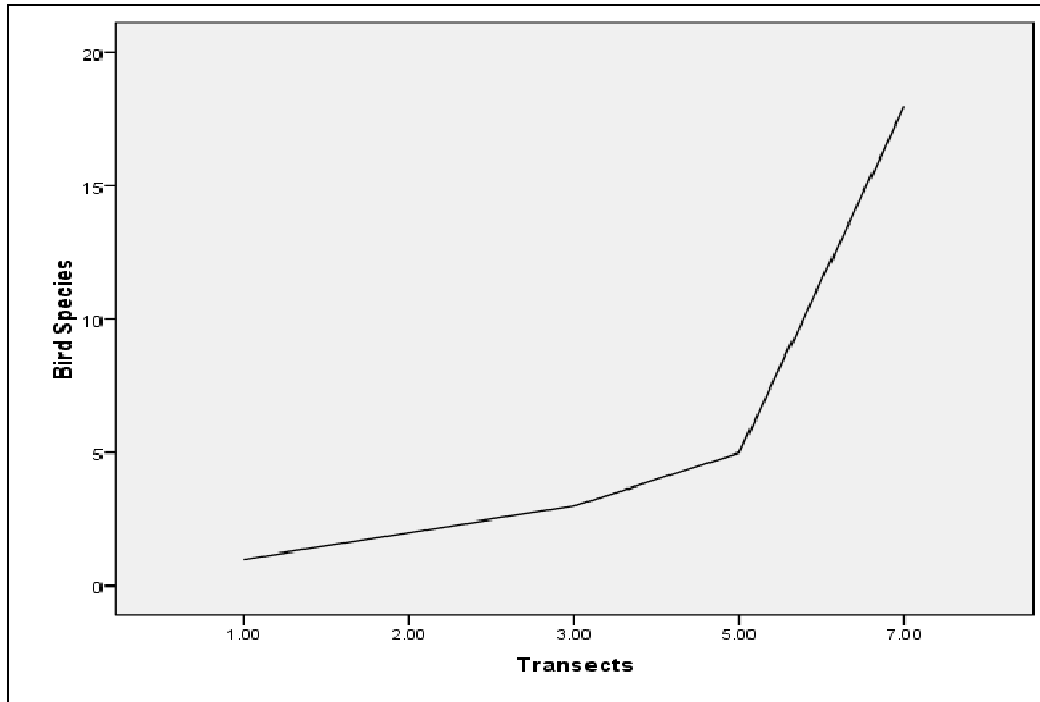


Fig. 3: Species effort curve

Source: Field Survey 2013-2014

Table 1 shows the mean, standard error and range of physicochemical parameters of Awba Dam measured during the study period. Figure 2 to 3 shows the seasonal variation of the measured physicochemical parameters for the study period. The lowest mean air and water temperatures were recorded in the 1st wet season while the highest mean temperature was in the 2nd dry season. Transparency was highest in the 1st dry season and lowest in the 2nd wet season. Dissolved oxygen was lowest in the 1st dry season and highest in the 2nd wet season. The highest alkalinity level was recorded during the 1st dry season. The lowest TDS value was recorded during the 2nd dry season while the highest was during the 1st wet season. The salinity value of 0.1ppt (parts per thousand) was obtained during the study period and this value remained constant with a small increase to 0.19 during the 2nd wet season.

**Parameters** showed that the reservoir has a PH range of 7.6 – 7.8 at room temperature.

The temperature is between 35C – 35.8C while the alkalinity ranged between 76.5 – 93.5mg/l. The total dissolved solid was also 2.0 – 4.0mg/l.

Correlation co-efficient (r) values for physicochemical parameters are presented in table 4.2. Air temperature correlated negatively with TDS ( $r = -0.684$ ;  $p < 0.05$ ) while transparency correlated significantly with water temperature ( $r = 0.614$ ;  $p < 0.05$ ).

The impact of the dredging has taken a heavy toll on the physicochemical parameters as well as on the flora and fauna specie diversity. More than sixty (60%) of the species are lost due to the noise of bulldozer and other heavy equipments. The diversity of niches available in the dry seasons is low, compared to the wet seasons. Awba dam environs hold a significant number of bird species, the swampy part of the dam area holds the highest number of bird species richness than other parts. Although more than fifty (50%) of the tree cover of the banks of the dam have been felled due to the dredging and mass reconstruction for the place for tourism development, Proper management of ground cover and tree cover will have an effect on bird species and if the former are replanted and maintained. This will in turn create research ground. Selective felling of trees, planting of indigenous trees to replace felled trees or bare spaces is strongly recommended. The assessment of Environmental

Impact Assessment(EIA) is highly necessary if such massive habitat change is of requirement later in the future to forstall species loss. That is why collaborative work is needed to be carried out between departments involved in the management of Awba dam. Proper training in Ornithology will also help in improving bird identification, ecotourism and provide better opportunity to compare long term data.

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