THE DISTRIBUTION, COMPOSITION AND ABUNDANCE OF FISH SPECIES IN TWO ABANDONED GOLD MINE RESERVOIRS, IGUN, OSUN STATE, NIGERIA.

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ABSTRACT

Fish composition and abundance of two Gold mine reservoir were investigated between May, 2008 and May, 2009. Seven fish families comprising of twelve species of fish were caught during the period of study. The families of fish caught included Anabantidae, Channidae, Clariidae, Cichlidae, Melanopluridae, Mormyridae and Hepsetidae. The family Cichlidae with six species dominated the collection while other families had one species each. The cichlids had 86.2% of the total catch. All the fishes were available throughout the seasons except *Mormyrus rume* in the rainy season and *Ctenopoma kingsleyae*, *Tillapia melanoplurae* in the dry season. A relatively very low abundance of fish species in the habitat might probably be as a result of high level of pollution in the environment.

Keywords: Igun, Gold-Mine Reservoir, Fish Composition, Distribution, Relative Abundance, Diversity

INTRODUCTION

Nigeria had a vast expanse of inland freshwater, which increased greatly as more reservoirs and ponds are built for diverse purposes (Olaosebikan and Raji, 1998).Nigerian waterbodies which were known to have the richest fish abundance in West Africa (Meye and Ikomi, 2008) generally suffered a decline in yields due to environmental degradation, improper or poor management of fisheries resources and over exploitation (Komolafe and Arawomo, 2008). Sustainable exploitation of the fisheries requires knowledge of the fish faunistic composition in the waterbodies. Accurate fisheries statistics of the rivers and adjourning flood plains is a vital tool for provision of information for a sound fisheries management programme and for development of a plan for fishing industry (Solomon *et al.,* 2012). Species richness and relative abundance are some of the elements used to describe biodiversity (Solomon *et al.,* 2012).

Species richness which is a fundamental unit for assessing the homogeneity of an environment is commonly used in conservation studies to determine ecosystems sensitivity and the resident organisms. Fish abundance is used to describe how common or rare a species is relative to other species in a given community, and are usually described for a single trophic level (Lawson and Olusanya, 2010).The richness and distribution of fish species in freshwaters have been reported by various researchers (Balogun, 2005; Fapohunda and Godstates, 2007; Komolafe and Arawomo, 2008; Ibrahim *et al.,* 2009). Two hundred and sixty eight different fish species in thirty four major waterbodies of Nigeria had been documented by Ita (1993) with at least eighteen of such freshwater species regarded as being endangered. Odo *et al.* (2009) also reported fifty-two species of fish belonging to seventeen families in specimens caught from Anambra River in Nigeria. The distribution and composition of fish species in the abandoned gold mine reservoirs of Igun has not been reported. This study therefore, assessed the fish species distribution, composition and abundance in two reservoirs at Igun as a platform for continuous research to monitor the well-being of the species encountered.

MATERIALS AND METHODS

Study Area

The six gold mining reservoirs in Igun are located in Atakunmosa West Local Government Area, Osun State within Longitudes 0040 30'E to 0040 45'E and Latitudes 070 35'N to 070 38'N (Figure 1).Three streams Oika, Eleripon and Osun which serve the community for domestic and agricultural purposes were impounded in 1941 to form the reservoirs to meet the needs of the Nigerian Mining Corporation. The climate over the reservoir catchment is typically that of

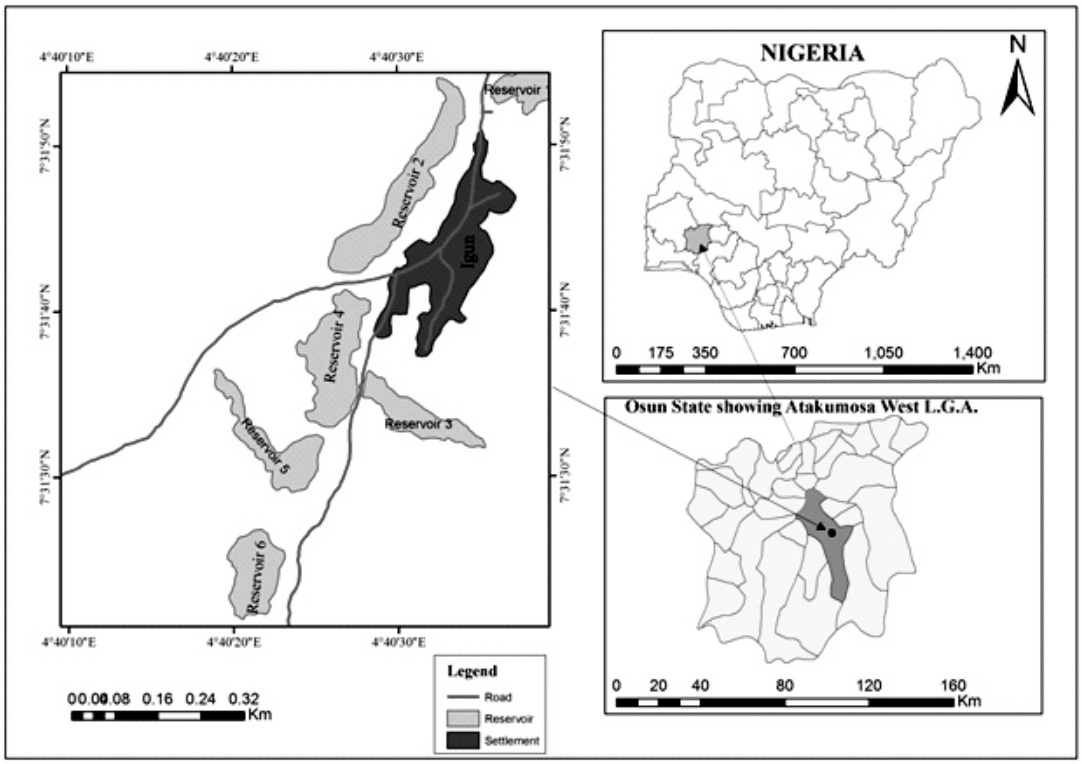

Figure 1: Map of Igun reservoirs showing the catchment area

equatorial rain forest which is hot and humid all the year round. The temperature over the area was between 23^{0}C and 33^{0}C and characterized by dry and rainy seasons. The reservoirs which receive high discharge of water during the rainy season usually become turbid as a result of sediments carried from catchment area and wastes from illegal local miners. The fifth and sixth reservoirs (Figure 1) were used for this study because of the on-going illegal mining activities. Reservoirs one, two and three which had been completely eutrophied as observed during the period of study were not sampled for fish. Reservoir four which was being used by the community for core services and almost covered by macrophytes was not sampled for fish during the period of study.

Fish Collection and Analysis

Fish samples were collected monthly for a period of a year between May, 2008 and May, 2009. The fishing gears employed was gill net and fish traps. The gill net which measured 50 m in length and 3.4 m deep with a mesh of 2.5 cm was set in the evening between 6.00 pm and 7.30 p.m. Fish caught were collected in the following morning between 7.00 am and 8.30 a.m. Ten fish traps made of *Eremozpatha sp.* were also set under sedges on sampling days. The fish caught by gill net and the traps were removed, transferred into an ice chest and brought into the laboratory for processing. Fish specimens were identified using identification keys prepared by Fish Base (2000), Paugy *et al.* (2003) and Adesulu and Sydenham (2007). The number of each fish species and morphometric measurements were recorded.

DATA ANALYSIS

The mean abundance of each fish species collected at the landing sites of the fishermen was calculated. The percentage composition by number of every fish taxa during dry and rainy seasons as well as for the entire period of study were computed and Paired T-test was also used to determine if there existed significant differences between the rainy and dry season mean total abundance of fish.

RESULTS

A total of 297 fish specimens were collected throughout the sampling period from the reservoirs. Twelve fish species belonging to seven families were identified. The families include; Anabantidae, Channidae, Mormyridae, Malapteruridae, Hepsetidae, Clariidae and Cichlidae. The fish species are *Ctenopoma kingsleyae*, *Parachanna obscura, Mormyrus rume, Malapterurus*

electricus, Hepsetus odoe and Clarias gariepinus. Others are *Tilapia zillii, Tilapia mariae, Tilapia melanoplurae, Sarotherodon galilaeus, Chromidotilapia guntheri* and *Hemichromis fasciatus* (Table 1). The relative abundance and composition of the fish species of Igun reservoirs (Table 2) showed that *Tilapia zillii* was the most abundant species making up 26.6% of the total catch. This is followed by *Hemichromis faciatus* (19.87%) *C. guntheri (*17.7%) and *T. Mariae* (9.09%). Other fish species with appreciable relative abundance were *C. kingsleyae* (4.38%) *T. melanoplurae* (3.37%) and *P. obscura* (3.03%). *M. electricus, Hepsetus odoe, C. gariepinus and M. rume* which were other species that made the population with 2.36%, 2.02%, 1.68% and 0.34% of the total catch respectively. The family Cichlidae was the most diversified with six species while *T. zillii* was the most abundant. Other six families of fish had a representative each in their family (Table 2).

Table 1: Checklist of Fishes in Igun Reservoir

Family	Species	English Name
Anabantidae	*Ctenopoma kingsleyae*	Perch
Channidae	*Parachanna obcura*	Snake head
Cichlidae	*Tilapia mariae,*	Spotted Tilapia
	Tilapia melanoplurae	-
	Tilapia zillii	Red belly Tilapia
	Sarotherodon galilaeus	Mango Tilapia
	Chromidotilapia guntheri	Guenther's mouth brooder
	Hemichromis fasciatus	Banded jewel fish
Clariidae	*Clarias gariepinus*	African catfish
Hepsetidae	*Hepsetus odoe*	African pike
Malapteruridae	*Malapterurus elecrticus*	Electric fish
Mormyridae	*Mormyrus rume*	Elephant nose

Table 2: Percentage Composition, Relative Abundance and Distribution of Fish Species in Igun Reservoirs

Sampling Location	**Family**	**Species**	**Total No Caught**	**Percentage (%)**
Reservoir Five	Cichlidae	*Tilapia mariae*	30	10.10
		Tilapia melanoplurae	10	3.37
		Tilapia zillii	79	26.60
		Sarotherodon galilaeus	27	9.09
		Hemichromis fasciatus	51	19.87
		Chromidotilapia guntheri	59	17.17
Reservoir Six	Anabantidae	*Ctenopoma kingsleyae*	13	4.38
	Channidae	*Parachanna obscura*	09	3.03
	Clariidae	*Clarias gariepinus*	05	1.65
	Hepsetidae	*Hepsetus odoe*	06	2.02
	Malapteruridae	*Malapterurus electricus*	07	2.35
	Mormyridae	*Mormyrus rume*	01	0.34

Table 3: Monthly Distribution of the fish Species caught in Igun reservoirs during the period of Study

Sampling point	Fish sample	2008								2009					Total no of fish	% of fish
		May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May		
Reservoir Five	*Tilapia mariae*	08	04	01	04	02	-	-	-	-	09	02	-	-	30	10.10
	Tilapia melanoplurae	-	10	-	-	-	-	-	-	-	-	-	-	-	10	3.37
	Tilapia zillii	08	-	11	01	06	04	06	14	10	02	03	03	11	79	26.60
	Sarotherodon galilaeus	02	04	-	04	02	07	03	-	-	01	04	-	-	27	9.09
	Hemichromis fasciatus	-	01	-	-	-	01	02	04	02	02	31	12	04	59	19.87
	Chromidotilapia guntheri	-	06	-	-	-	01	04	15	10	05	01	03	06	51	17.17
Reservoir Six	*Ctenopoma kingsleyae*	-	13	-	-	-	-	-	-	-	-	-	-	-	13	4.38
	Parachanna obscura	-	01	01	-	-	04	-	01	-	-	-	02	-	09	3.03
	Clarias gariepinus	-	-	-	03	-	-	-	-	-	01	-	-	01	05	1.68
	Hepsetus odoe	01	01	01	-	-	-	-	-	-	01	02	-	-	06	2.02
	Malapterurus electricus	-	01	-	-	-	-	-	-	-	-	02	04	-	07	2.36
	Mormyrus rume	-	-	-	-	-	-	01	-	-	-	-	-	-	01	0.34
Monthly total no of fish		**19**	**41**	**14**	**12**	**10**	**17**	**16**	**34**	**22**	**21**	**45**	**24**	**22**	**297**	**100**
Species richness		**4**	**9**	**4**	**4**	**3**	**5**	**5**	**4**	**3**	**7**	**7**	**5**	**4**		

The distribution pattern of fish species in the two sampled reservoirs of Igun showed that 86.20% of the catch, which belong to the Cichlid family were caught in Reservoir five while the remaining 13.80% of the total catch caught in reservoir six belonged to the other six families. Monthly catch distribution of the fish species showed that fishes were caught in all the months during the period of sampling (Table 3). The highest number of fish caught was forty-five in March 2009, followed by forty-one samples in June, 2008 and thirty four fish samples in December, 2008. The least number of fish caught was ten in September, 2008. However, fish samples caught in June 2008 had the highest number of nine fish species while the least species of fish recorded was three in September 2008 and January 2009 catches. *T. melanoplurae, C. kingsleyae* and *Mormyrus rume* were the only fish species caught once throughout the period of sampling. *T. melanoplurae* and *C. kingsleyae* were caught in June while *Mormyrus rume* were only caught once in November. *T. zillii* was the only fish species representative in all the monthly catch distributions except in June catches where they were not represented.

Table 4: Seasonal variations of fish species in Igun reservoirs

Family	Fish Species	Rainy Season		Dry Season	
		No Caught	%	No Caught	%
Anabantidae	*C. kingsleyae*	13	8.17	-	-
Channidae	*P. obscura*	08	5.03	01	0.73
Cichlidae	*T. mariae*	19	11.32	11	7.97
	T. zillii	44	27.67	35	25.36
	S. galilaeus	19	11.95	08	5.80
	T. melanoplurae	10	6.29	-	-
	C. guntheri	16	10.06	35	25.36
	H. fasciatus	18	11.32	41	29.7
Clariidae	*C. gariepinus*	04	2.52	01	0.73
Hepsetidae	*H.odoe*	03	1.89	03	2.17
Malapteruridae	*M. electricus*	05	3.15	02	1.45
Mormyridae	*M. rume*	-	-	01	0.73

As shown in Table 4, seasonal distribution of the fish species showed that one hundred and fifty nine fishes were caught during the raining season of which 78.61% were from cichlids family. *T. zillii* had the highest percentage of 27.67% in rainy season and *T. melanoplurae* had the lowest percentage of 6.29% while 21.39% of the total catch was from the other families of fish. *M. rume* of the family Mormyridae was the only fish species that was not caught in the rainy season. During the dry season, cichlids were the most abundant species representing 94.19% of the total catch. This value was higher than the catch for the raining season. *H. fasciatus* had the highest percentage 29.71% of total fish caught during the dry season. This was followed by *T. zillii* and *C. guntheri* each comprising 25.36% of the total catch. *P. obscura, C. gariepinus* and *M. rume* were the least fish species caught during the dry season with 0.73% of the total catch for each family respectively. *C. kingsleyae and T. melanoplurae* of the family Anabantidae and Cichlidae respectively were not caught during the dry season. In Reservoir five, during the period of study, one hundred and twenty six fish samples belonging to family Cichlidae were caught during the raining season while one hundred and thirty fish samples were caught in the dry season. In reservoir six comprising six families, thirty three fish samples were caught in the rainy season and eight fish samples in the dry season.

Table 5: Morphometrics of the sampled fishes from Igun reservoir based on sexual variation

Fish Species	Sex	TL Range (cm)	Mean ±SD	SL Range (cm)	Mean ±SD	Weight Range (g)	Mean ±SD
T. mariae	**Male**	16-20.7	18.71 ±1.84	12.3 – 16.1	14.53 ±1.43	104 – 215	161.44 ±44.03
	Female	15.8 – 18.8	17.38 ±0.75	12.6 – 14.5	13.55 ±0.68	100 – 200	143.3 ±25.37
T. zillii	**Male**	9.1 – 27.7	16.00 ±6.05	7.0 – 22.0	12.95 ±4.83	13 - 375	123.70 ±118.06
	Female	9.8 – 27.0	18.59 ±4.56	7.5 – 20.8	14.43 ±3.54	21 - 346	142.79 ±92.88
S. galilaeus	**Male**	11.3 – 33.6	25.08 ±6.91	8.5 – 26.3	19.24 ±5.40	127 – 800	399.83 ±257.11
	Female	10.5 – 34.2	27.45 ±3.67	7.0 – 27.1	21.45 ±3.15	105 – 770	471.92 ±172.82
T. melanoplurae	**Male**	8.0 – 17.6	10.57 ±3.04	6.4 – 13.8	8.29 ±2.39	10 – 134	34.22 ±42.53
	Female	15.4 – 15.5	-	12.0 – 12.3	-	102 -104	-
C. guntheri	**Male**	9.7 – 16.8	13.04 ±1.75	7.5 – 12.8	10.04 ±1.42	13 – 84	38.00 ±16.45
	Female	10.8 – 16.2	13.24 ±1.69	8.4 – 13.0	10.22 ±1.32	18 – 84	41.67 ±18.83
H. fasciatus	**Male**	9.3 – 15.7	11.8 ±1.57	7.5 – 12.5	8.88 ±1.24	12 – 78	24.63 ±14.83
	Female	9.2 – 15.3	11.87 ±1.79	7.0 – 12.2	9.06 ±1.43	13 – 75	30.06 ±17.16
C. gariepinus	**Male**	54.5	-	46.0	-	1050	-
	Female	37.1 – 53.2	45.15 ±6.22	31.0 – 46.3	37.43 ±8.74	350 – 1000	682 ±366.92
C. kingsle ya e	**Male**	11.1 – 19.0	15.70 ±0.70	9.75 – 17.20	14.45 ±0.35	30 – 185	89.72 ±6.75
	Female	10.6 – 17.4	13.30 ±0.57	8.1 – 15.5	12.24 ±0.58	23 – 130	74.85 ±9.63
P. obscura	**Male**	28.1 – 38.0	31.85 ±1.32	21.5 – 33.00	26.47 ±1.22	162 – 421	259.25 ±30.57
	Female	22.00 – 36.56	30.63 ±1.29	16.3 – 31.80	24.40 ±1.95	105 – 387	201.00 ±33.00
H. odoe	**Male**	31.80 – 39.90	34.95 ±1.72	26.50 – 32.50	28.62 ±1.32	240 – 575	367.50 ±62.63
	Female	29.7 – 37.1	31.23 ±1.97	22.06 – 30.78	25.48 ±1.68	190 – 486	320.00 ±93.08
M. electricus	**Male**	7.9 – 23.50	20.13 ±0.85	5.66 – 21.80	16.85 ±0.72	76 – 152	113.86 ±13.16
	Female	6.8 – 20.5	17.85 ±1.12	4.30 – 17.72	14.96 ±1.05	60 – 136	101.01 ±14.33
M. rume	**Male**	-	-	-	-	-	-
	Female	61.2	-	53.3	-	1250	-

TL – Total Length
SL – Standard Length

The fish morphometric based on sexual variation is as shown in Table 5. In the Cichlids, the mean total length and mean standard length of the male *T. mariae, T. zillii* and *T. melanoplurae* was recorded to be 18.71 ±1.84 cm and 14.53 ±1.43 cm; 16.00 ±6.05 cm and 12.95 ±4.83 cm; and 10.57 ±3.04 cm and 8.29 ±2.39 cm respectively with the mean weight values of 161.44 ±44.03 g, 123.70 ±118.06 g and 34.22 ±42.53 g respectively while in the females of *T. mariae* and *T. zillii* the mean total length and mean standard length was recorded to be 17.38 ±0.75 cm and 13.55 ±0.06 cm; 18.59 ±4.56 cm and 14.43 ±3.54 cm with the mean weight of 143.30 ±25.37 g and 142.79 ±92.88 g respectively.

The remaining Cichlid fishes sampled – *S. galilaeus, C. guntheri* and *H. fasciatus* had a mean total length and mean standard length to be 25.08 ±6.91cm and 19.24 ±5.40 cm; 13.04 ±1.75 cm and 10.04 ±1.42 cm; and 11.18 ±1.57 cm and 8.88 ±1.24 cm in males with the mean weight value of 399.83 ±257.11 g, 38.00 ±16.45g and 24.63 ±14.83 g respectively. The female specimens of these fish species had their mean total length and mean standard length values to be 27.45 ±3.67 cm and 21.45 ±3.15 cm; 13.04 ±1.75 cm and 10.04 ±1.42 cm; and 11.87 ±1.79 cm and 9.06 ±1.43 cm respectively with the mean weight value of 471.92 ±172.82 g, 41.67 ±18.83 g and 30.06 ±17.16 g also respectively.

However, in the other families of the sampled fishes, the female mean total length values of the *C. gariepinus, C. kingsleyae, P. obscura, H. odoe* and *M. electricus* were reported to be 45.15 ±6.22 cm, 13.30 ±0.57 cm, 30.63 ±1.29 cm, 31.23 ±1.97 cm, and 17.85 ±1.12 cm respectively while the only female *M. rume* caught had the total length of 61.2 cm. The mean standard length and the mean weight value 14.96 ±1.05 cm and 101.01 ±14.33 g; 25.48 ±1.68 cm and 320.00 ±93.08 g; 24.40 ±1.95 cm and 201.00 ± 33.00 g; 12.24 ±0.58 cm and 74.85 ±9.63 g; and 37.43 ±8.74 cm and 682 ±366.92 g were recorded for the female *M. electricus, H. odoe, P. obscura, C. kingsleyae,* and *C. gariepinus* respectively. The male specimens of *C. kingsleyae, P. obscura, H. odoe* and *M. electricus* were recorded to have 15.70 ±0.70 cm and 14.45 ±0.35 cm; 31.85 ±1.32 cm and 26.47 ± 1.22 cm; 34.95 ±1.72 cm and 28.62 ±1.32 cm; and 20.13 ±0.85 cm 16.85 ±0.72 cm as their mean total length and mean standard length respectively. However, the mean weight value of the male fish specimens respectively was reported to be 89.72 ±6.75 g, 259.25 ±30.57 g, 367.50 ±62.63 g and 113.86 ±13.16 g.

DISCUSSION

Igun reservoir showed a relatively high diversity of fishes with a total of twelve species belonging to seven families. This can favourably be compared with the findings in Opa, Osinmo and lower Usman reservoirs in Nigeria where fifteen, fourteen and eleven species, belonging to seven, eight and five families were recorded respectively by Komolafe and Arawomo (2003; 2008) and Dan-Kishiya *et al* (2012). In Oyun reservoir, a total number of eighteen species belonging to fourteen families were recorded by Mustapha (2008). Also fourteen fish species belonging to seven families were reported for Owena reservoir by Fapohunda and Godstates (2007). In all these reported reservoirs, the family Cichlidae was the most abundant species. In this present study, the family Cichlidae was also the most dominant family with 86.20% of the total catch. High percentage of Cichlid species in Igun reservoir like other water bodies could be attributed to prolific breeding with good parental care which gave the species a considerable advantage in the colonization of their chosen habitat. This agrees with the findings of Komolafe and Arawomo (2003, 2008; 2011) in Opa, Osinmo reservoirs and Erinle lake where the cichlids had been recorded with high abundance over other species of fish. Similarly, the present study agrees with the report of Mohammed and Omoregie (2004) and Adesulu and Sydenham (2007) that fresh water systems in Nigeria were dominated by the family Cichlidae.

The Cichlidae was the most diversified in all the families of fishes sampled in this study with six species viz: *T. zillii, T. mariae, T. melanoplurae, C. guntheri, S. galilaeus and H. fasciatus.* This study compared favourably with the observation of Taiwo (2008) who reported with seven Cichlid species in both Eko-Ende and Owalla reservoirs comprising *T. zillii, S. galilaeus, C. guntheri, T. mariae, O. niloticus and T. dageti.* In Osinmo Reservoir, Komolafe and Arawomo (2008) also reported five species while Obadiah and Waltia (2003)

encountered five Species in Tono Dam. In this present study, *Tilapia zillii* which is a substrate spawner was the most abundant species which constituted 26.60% of the total catch. Similarly, this was the observation of Mustapha (2009) in Oyun Reservoir, Komolafe and Arawomo (2003; 2008 and 2011) in Erinle Lake (27.37%), Osinmo reservoir (36.3%) and Opa reservoir (43%) respectively.

In Igun reservoir five, all the fish species were available throughout the seasons during the period of sampling except *T. melanoplurae* in the dry season. However *M. rume* was not caught in the rainy season and *C. kingsleyae* was also not caught in dry season in Igun reservoir six. The relatively low level of abundance of fish in reservoir six might be attributed to high level of pollution because the reservoir is directly flooded with mine tailings in the rainy season and is also excessively loaded with nutrients which might have adverse effect on the fish species as reported by Dell' Anno *et al.* (2002) and Lawal and Komolafe (2012) in this habitat.

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