



Wildlife for Sustainable Development

Nig. J. of Wildl. Mgt., 2020, 4(1): 66 - 79

©2020 Copyright Wildlife Society of Nigeria

<https://wildlifesocietyng.org/ojs/index.php/wildlifesocietyng-journal/index> ISSN 2735-9298 (PRINT) ISSN 2735-928x (ONLINE)

Nigerian Journal of Wildlife Management

Composition of Fish Species caught during sport fishing in Ibuya Pools and Ikere Gorge – Lake, Old Oyo National Park, Nigeria

¹*Olorunpomi, G.S., ²Ndome, C. B., ³Enin, U. I. and ⁴Oluwaseun, O. V.

¹Multi – Foods, Wildlife, Fisheries and Aquaculture Ventures, Oyo, Oyo State, Nigeria

²Department of Zoology and Environmental Biology, University of Calabar, Calabar, Nigeria

³Institute of Oceanography, University of Calabar, Calabar, Nigeria

⁴Department of Water Resources and Environmental Engineering, University of Ilorin, Ilorin, Nigeria

*golorunpomi@gmail.com

ABSTRACT:

Large water bodies are usually a big asset to nature tourism. The Old Oyo National Park takes advantage of the Ibuya Pools and Ikere Gorge-Lake to handle most of its water recreational activities. The study was conducted in ten sampling stations, five each at Ibuya Pools and Ikere Gorge-Lake. The study revealed that 2,391 fish was caught in Ibuya Pools and only 592 were obtained in Ikere Gorge-Lake. The rich fish diversity obtained in Ibuya Pools was significantly higher ($p \leq 0.05$) than in Ikere Gorge-Lake. The physico-chemical parameters (temperature - 28.0°C; Dissolved Oxygen - 6.70 mg/lit.; Hydrogen-Ion Concentration -7.05 and Total Dissolved Solids -375.50 ppm) were within the tolerable ranges at the two study sites.

Keywords: Baits, composition, diversity, National Park.

INTRODUCTION

Sport fishing, was described by Olorunpomi (2015) as fishing for pleasure or competition. These enable fish anglers spend their leisure hours gainfully at the various vacations destinations and actively engage in sport fishing to keep the body fit (Olorunpomi, 2015). This is different from commercial fishing, which is fishing for profit and subsistence fishing, which is fishing for survival. Sport fishing is usually carried out with a rod, reel, line, hook, and any one of a wide range of baits, natural or artificial (Olorunpomi, 2015). This plays a vital role in water – based tourism which is an example of a nature tourism involving traveling to locations such as natural/artificial lakes or dams, reservoirs, water parks beaches, waterfalls, and so on (Ayodele, 2017).

Nature tourism, ecological tourism or alternative tourism as it is sometimes called, is the practice of travelling to relatively undisturbed or uncontaminated natural areas to study, admire or enjoy the scenery, its flora and fauna components as well as any existing historical – cultural manipulations in the area (Olorunpomi, 2015). Sport fishing is as old as over two hundred years in the world; it has being practiced in countries such as north and south of America, Europe, Asia and Australia. This is a means of recreation over two centuries ago (Cowx, 2002). Eyo and Ahmed (2010) stated that in Africa, sport fishing is undergoing gradual development and at a faster rate too, as a means of leisure and recreation. This has been embraced by various governments of the countries, particularly in Nigeria.

Sport fishing has been accepted worldwide and its adoption has led to the formation of sport fishing associations or recreational fishing associations to develop fishing for sport and boost the economy of each region. Such associations include the American Sport Fishing Association (ASFA), Australian National Sport Fishing Associations (ANSA), East African Sport Fishing Association (EASFA), European Anglers Alliance (EAA), Polish Anglers Associations (PAA) and Sport Fishing Asian Forums (SAFs) (Olorunpomi, 2015).

Natural baits are nature given baits found naturally in the wild. Samples are obtained from the wild which are commonly used each time for sport fishing by fish anglers. These are of fauna and or flora origins. Animal baits may include varieties of worms, snails, fish, frogs, maggots, grasshoppers, ants, flies and various animal's intestines were used as either live or dead baits in sport fishing to catch fish (Berners, 2008; Olorunpomi, 2015). The plant baits origin may include several varieties of cooked yam, beans, sweet potatoes maddened with red oil and crimson. When these are used as baits, it attracted fish to it and they are often caught by the hooks or rods (Horrox & Ormrod, 2006; Olorunpomi, 2015). The synthetic forms made as camouflage to resemble the natural baits are the artificial baits used by the fish anglers. These are produced in the factories and turned out into the fishing market for sales to the fish anglers. The artificial baits range severally from artificial worms, snails, fish, frogs, maggots, fleas and varieties of lures. They are used as camouflages to catch fish in sport fishing (McCully, 2000; Olorunpomi, 2015).

Ibuya Pools are series of pocket pools found along the course of River Ogun in the heart of the Old Oyo National Park joined by many rivers tributaries such as the Rivers Tessi, Ayinta, Wawa, Woro and Owu etc. drains into the Ikere Gorge – Lake. Obot, Nchor, Eniang, Waari and Stopfords (2010) reported that the water quality status at Ibuya Pools was observed to be intact. In their studies, they concluded that there were no forms of pollution or stressor noticed to have negative effect on the aquatic lives of the river system. The Ikere Gorge –Dam is an expanse of water formed by a man-made Lake on River Ogun in the southern part of Old

Oyo National Park. This was created by Ogun – Osun River Basin Authority, Water Resources and Rural Development in the year 1982/83. The Lake was impounded mainly to provide water for irrigational purposes to develop agriculture and fisheries resources to boost food sufficiency in the nation. This in turns is capable to be used for all water – based tourism and recreation, a treasure asset, when fully harnessed to boost the ecological tourism of the Old Oyo National Park.

Materials and Methods:

The study was conducted on the Ibuya Pools and Ikere Gorge – lake, both on the course of River Ogun within the Old Oyo National Park (Figures 1 and 2). The park is located between Latitude 8° 15' - 9°00' N and Longitude 3°35' - 4°41' E. It has a total land mass of 2,512 square kilometres and is situated within the southern guinea savannah belt of Nigeria (Geerling, 1973).

Five sampling stations were located in each of Ibuya Pools and Ikere Gorge – Lake where fish samples from sport fishing activities were collected fortnightly for a period of twenty – two months. This cut across two periods of wet and dry seasons. Ten numbers of standard rods, hooks and lines and reels with the specifications “Daiwa Ball Bearing Carbon Components ST750B, Long Cast Spool: 6lb (2.7kg) – 210yds (190m); 8lb (3.6kg) – 140yds (130m)” sampling gears were used throughout the study. Five natural baits and their reciprocals (synthetic artificial baits) of earthworms (*Lumbricus terrestris*), snails (*Viviparous viviparous*), fish (*Alestes baremose.*), frogs (*Hyperolius guttulatus*) and maggots (House fly larvae - *Musca domestica*) were employed in the study. The artificial baits are in synthetic forms which were manufactured in the fishing materials industries and procured from markets stalls in Lagos. Measurements of the total length (head tip to the tail end) and standard length (head tip to the pedicle of the tail) of the morphometric features of some selected sampled fishes were taken and recorded to aid the identification process. Also, counting of rays and spines of some selected sampled fishes based on their meristic features were carried out during the study. These were used to classify the fish species obtained in the study into their binomial nomenclatures (FAO, 1995a). Fish samples were

preserved in ten per cent formalin solution (FAO, 1995b).

Selected water quality parameters were analyzed of water samples taken in each of the sampling stations. These include parameters like temperature (t°), Dissolved Oxygen (DO), Hydrogen ions concentration (pH) and Total Dissolved Solids (TDS). These were monitored using dry mercury bulb thermometer (Temperature $-t^{\circ}\text{C}$), pH – meter model Aquatic Ecosystem Inc. Florida (Hydrogen ions concentration – pH), Oxy Guard Handy MK11 meter (Dissolved Oxygen – DO) and Ultra Violet Visible Absorption Spectrometer in the laboratory (Total Dissolved Solids – TDS). Fish composition, abundance and diversity were found based on the test carried out using PAST statistical package version 3. Descriptive statistical tools such as pie – charts, frequencies and percentages were used to describe the data. The classification used based on the aquatic ecological survey by Slack, Shield, Knight and

Cooper (1992) was adopted and used in this study.

The efficiency of baits as catch – per – unit effort of fish caught for effective sport fishing anglers was established for the two study sites. A simple equation was derived to calculate the frequency of catch obtained based on efforts over time in accordance to Slack *et al.* (1992).

$\text{FC} = \text{TFC} \times \text{TT} \dots\dots\dots(i)$ Where:

FC = Frequency of Catch,

TFC = the total fish catch in each sampling point and

TT = the overall total time used in the sport fishing operation.

Therefore: $\text{CPUE} = \text{FC} \times 20 \text{ min.} \dots\dots\dots(ii)$

Where:

CPUE = the catch – per – unit effort,

$\text{FC} \times 20$ = frequency of fish catch multiplied by 20 minutes time set to test each of the fish bait (natural/artificial) in the fishing operation.

The various types of fishes caught were identified using the basic taxonomic keys (FAO, 1990).

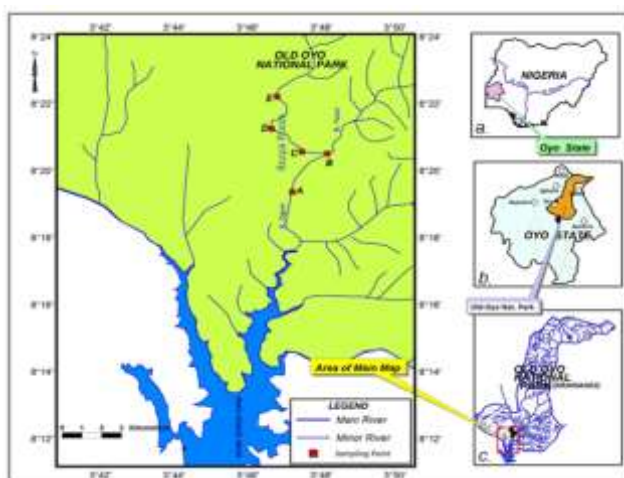


Figure 1: The five major locations in Ibuya Pools where sport fishing was carried out.
Source: Olorunpomi, 2015.

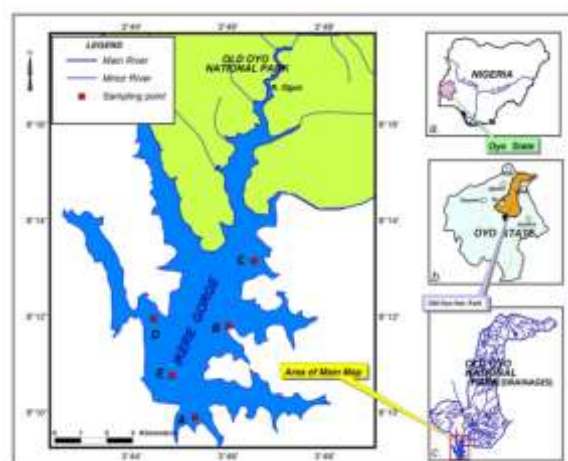


Figure 2: The five locations in Ikere Gorge - Lake where sport fishing was carried out.
Source: Olorunpomi. 2015.

RESULTS

The fish species caught in both Ibuya Pools and Ikere Gorge -Lake at Old Oyo National Park are as listed in Table 1. The checklist comprised of 45 fish species belonging to 34 genera and 17 families. Four fish species had been found during the study which have not been identified or come across by past studies. Though, these were not

new to fisheries science in the ecological region. These additional fish species found were used to update the existing checklist in the Park. These species are *Parachanna obscura*, *Brycinus nurse*, *Raiamas nigeriensis*, and *Chiloglanis niger* respectively. The percentage composition of fish species caught in Ibuya Pools and Ikere Gorge – Lake are recorded in Tables 2 and 3.

Table 1: Fish – species caught during the sport fishing study in Ibuya Pools and Ikere- Gorge Lake, River Ogun, at Old Oyo National Park.

S/no	Family/species	S/n	Family/species
1.	<u>Bagridae</u> <i>Auchenoglanis occidentalis</i> <i>Bagrus bayad</i> <i>Chrysichthys nigrodigitatus</i> <i>Clarotes laticeps</i> <i>Parauchenoglanis fasciatus</i>	8.	<u>Cyprinidae</u> <i>Labeo cubie</i> <i>L. petersii</i> <i>L. senegalensis</i> <i>*Raiamas nigeriensis</i>
2.	<u>Centropmidae</u> <i>Lates niloticus</i>	9.	<u>Distichodontidae</u> <i>Distichodus rostratus</i>
3.	<u>Channidae</u> <i>*Parachanna obscura</i>	10.	<u>Gymnarchidae</u> <i>Gymnarchus niloticus</i>
4.	<u>Characidae</u> <i>Alestes baremose</i> <i>A. brevis</i> <i>A. chapter</i> <i>A. dentex</i> <i>A. macrocephalus</i> <i>*Brycinus nurse</i> <i>Hydrocynus brevis</i> <i>H. forskalis</i> <i>Micralestes accutidens</i>	11.	<u>Hepsetidae</u> <i>Hepsetus odoe</i>
5.	<u>Cichlidae</u> <i>Chromidotilapia guntheri</i> <i>Hemichromis bimaculatus</i> <i>H. fasciatus</i> <i>Oreochromis niloticus</i> <i>Pelmatochromis guntheri</i> <i>Sarotherodon galilaeus</i> <i>Tilapia mariae</i> <i>T. zilli</i>	12.	<u>Malapteruridae</u> <i>Malapterurus electricus</i>
6.	<u>Citharinidae</u> <i>Citharinus citharus</i>	13.	<u>Mochokidae</u> <i>*Chiloglanis niger</i> <i>Synodontis schall</i>
7.	<u>Clariidae</u> <i>Clarias anguillaris</i> <i>C. gariepinus</i> <i>Heterobranchus bidorsalis</i> <i>H. longifilis</i>	14.	<u>Mormyridae</u> <i>Gnathonemus petersii</i> <i>Mormyrops deliciosus</i> <i>Mormyrus rume</i>
		15.	<u>Osteoglossidae</u> <i>Heterotis niloticus</i>
		16.	<u>Schilbeidae</u> <i>Eutropius niloticus</i>
		17.	<u>Tetraodontidae</u> <i>*Tetraodon fahaka</i>

* Additional fish species that have not been recorded by past studies.

Table 2: Percentage composition of fish species obtained during the sport fishing study in Ibuya Pools.

Families / Species	Total Number	Total Weight	Percentage (%)	*Slack <i>et al.</i> classification
Bagridae				
<i>Auchenoglanis occidentalis</i>	85	0.30	3.56	A
<i>Baarus bavad</i>	80	0.68	3.36	A
<i>Chrystichthys nigrodaitatus</i>	12	0.08	0.50	A
<i>Clarotes laticeps</i>	99	1.56	4.14	A
<i>Parauchenoglanis fasciatus</i>	1	0.01	0.04	VR
Total	277	2.63	11.59	
Centropomidae				
<i>Lates niloticus</i>	93	4.19	3.89	A
Total	93	4.19	3.89	
Channidae				
<i>Parachanna obscura</i>	9	0.08	0.38	A
Total	9	0.08	0.38	
Characidae				
<i>Alestes baremose</i>	271	1.36	11.33	A
<i>A. brevis</i>	72	0.16	3.01	A
<i>A. chapter</i>	37	0.05	1.55	A
<i>A. dentex</i>	160	0.38	6.69	A
<i>A. macrocephalus</i>	37	0.07	1.55	A
<i>Brycinus nurse</i>	13	0.10	0.54	A
<i>Hydrocynus brevis</i>	57	0.34	2.38	A
<i>H. forskahlis</i>	106	1.38	4.43	A
<i>Micralestes accutidens</i>	66	0.11	2.76	A
Total	819	3.95	35.25	
Cichlidae				
<i>Chromidotilapia guntheri</i>	53	0.08	2.22	A
<i>Hemichromis bimaculatus</i>	29	0.24	1.21	A
<i>H. fasciatus</i>	21	0.04	0.88	A
<i>Oreochromis niloticus</i>	33	0.99	1.38	A
<i>Pelmatochromis guntheri</i>	32	0.03	1.34	A
<i>Sarotherodon aalilaeus</i>	38	0.61	1.59	A
<i>Tilapia mariae</i>	19	0.03	0.79	A
<i>T. zillii</i>	72	0.06	3.01	A
Total	297	2.08	12.42	
Citharinidae				
<i>Citharinus citharus</i>	7	0.07	0.29	A
Total	7	0.07	0.29	
Clariidae				
<i>Clarias ananularis</i>	108	2.38	4.52	A
<i>C. aarepinus</i>	152	4.26	6.36	A
<i>Heterobranchius bidorsalis</i>	59	1.06	2.47	A
<i>H. lonafilis</i>	52	1.61	2.17	A
Total	371	9.31	15.52	
Cyprinidae				
<i>Labeo cubie</i>	17	0.09	0.71	A
<i>L. petersii</i>	12	0.05	0.50	A
<i>L. senegalensis</i>	8	0.04	0.33	A
<i>Raiamas niaerensis</i>	2	0.003	0.08	VR
Total	39	0.18	1.63	
Distichodontidae				
<i>Distichodus rostratus</i>	1	0.12	0.04	VR
Total	1	0.12	0.04	
Gymnarchidae				
<i>Gymnarchus niloticus</i>	21	0.50	0.88	A
Total	21	0.50	0.88	
Hemisetidae				
<i>Hemisetus odoe</i>	120	2.28	5.02	A
Total	120	2.28	5.02	
Malapteruridae				
<i>Malapterurus electricus</i>	124	0.25	5.19	A
Total	124	0.25	5.19	
Mochokidae				
<i>Chiloalanis niaer</i>	22	2.29	0.92	A
<i>Synodontis schall</i>	15	0.04	0.63	A
Total	37	2.33	1.55	
Mormyridae				
<i>Gnathonemus petersii</i>	116	0.29	4.85	A
<i>Mormyroops deliciosus</i>	9	0.13	0.38	A
<i>Mormyrus rume</i>	16	0.28	0.67	A
Total	141	0.70	5.90	
Osteoglossidae				
<i>Heterotis niloticus</i>	13	0.11	0.54	A
Total	13	0.11	0.54	
Schilbeidae				
<i>Eutropius niloticus</i>	9	0.02	0.38	A

Total	9	0.02	0.38	
Tetraodontidae				
<i>Tetraodon fahaka</i>	13	0.05	0.54	A
Total	13	0.05	0.54	
Grand Total	2,391	28.84	100.00	

≥ 5 = Abundance $\geq 3 \leq 4$ = Rare $\geq 1 \leq 2$ = Very Rare $0 < 1$ = Very-Very Rare

A = Abundance R = Rare VR = Very Rare VVR = Very-Very Rare

* Slack *et al.* (1992).

Table 3: Percentage composition of fish species obtained during the sport fishing study in Ikere Gorge – Lake

Families / Species	Total Number	Total Weight (Kg)	Percentage (%)	*Slack <i>et al.</i> -classification
Bagridae				
<i>Auchenoglanis occidentalis</i>	40	0.12	6.76	A
<i>Baqrus bayad</i>	23	0.15	3.89	A
<i>Chrysichthys nigrodigitatus</i>	2	0.01	0.34	R
<i>Clarotes laticeps</i>	42	0.56	7.09	A
<i>Parauchenoglanis fasciatus</i>	0	0.0	0.00	VVR
Total	107	0.84	18.07	
Centropomidae				
<i>Lates niloticus</i>	14	0.31	2.36	A
Total	14	0.31	2.36	
Channidae				
<i>Parachanna obscura</i>	0	0.00	0.00	VVR
Total	0	0.00	0.00	
Characidae				
<i>Alestes baremose</i>	64	0.16	10.81	A
<i>A. brevis</i>	31	0.05	5.25	A
<i>A. chapter</i>	0	0.00	0.00	VVR
<i>A. dentex</i>	43	0.10	7.26	A
<i>A. macrocephalus</i>	0	0.00	0.00	VVR
<i>Brycinus nurse</i>	5	0.05	0.84	A
<i>Hydrocynus brevis</i>	24	0.11	4.05	A
<i>H. forskalis</i>	16	0.09	2.70	A
<i>Micralestes accutidens</i>	26	0.03	4.39	A
Total	209	0.59	35.30	
Cichlidae				
<i>Chromidotilapia guntheri</i>	10	0.12	1.69	A
<i>Hemichromis bimaculatus</i>	3	0.002	0.51	R
<i>H. fasciatus</i>	14	0.03	2.36	A
<i>Oreochromis niloticus</i>	5	0.003	0.84	A
<i>Pelmatochromis guntheri</i>	7	0.007	1.18	A
<i>Sarotherodon galilaeus</i>	11	0.044	1.86	A
<i>Tilapia mariae</i>	7	0.023	1.18	A
<i>T. zillii</i>	25	0.088	4.22	A
Total	82	0.31	13.85	
Citharinidae				
<i>Citharinus citharus</i>	1	0.01	0.17	VR
Total	1	0.01	0.17	
Clariidae				
<i>Clarias anguillaris</i>	16	0.19	2.70	A
<i>C. gariepinus</i>	25	0.41	4.22	A
<i>Heterobranchius bidorsalis</i>	7	0.10	1.18	A
<i>H. longifilis</i>	6	0.05	1.01	A
Total	54	0.75	9.12	
Cyprinidae				
<i>Labeo cubie</i>	1	0.01	0.17	VR
<i>L. petersii</i>	0	0.00	0.00	VVR
<i>L. senegalensis</i>	0	0.00	0.00	VVR
<i>Raiamas nigeriensis</i>	0	0.00	0.00	VVR
Total	1	0.01	0.17	
Distichodontidae				
<i>Distichodus rostratus</i>	0	0.00	0.00	VVR
Total	0	0.00	0.00	
Gymnarchidae				
<i>Gymnarchus niloticus</i>	1	0.12	0.17	VR
Total	1	0.12	0.17	
Hepsetidae				
<i>Hepsetus odoe</i>	25	0.11	4.22	A
Total	25	0.11	4.22	
Malapteruridae				
<i>Malapterurus electricus</i>	38	0.7	6.41	A
Total	38	0.7	6.41	
Mochokidae				
<i>Chiloqlanis niger</i>	8	0.01	1.35	A
<i>Synodontis schall</i>	0	0.00	0.00	VVR
Total	8	0.01	1.35	
Mommyridae				

<i>Gnathonemus petersii</i>	38	0.04	6.41	A
<i>Mormyrops deliciosus</i>	8	0.12	1.35	A
<i>Mormyrus rume</i>	6	0.08	1.01	A
Total	52	0.24	8.78	
Osteoglossidae				
<i>Heterotis niloticus</i>	0	0.00	0.00	VVR
Total	0	0.00	0.00	
Schilbeidae				
<i>Eutropius niloticus</i>	0	0.00	0.00	VVR
Total	0	0.00	0.00	
Tetraodontidae				
<i>Tetraodon fahaka</i>	0	0.00	0.00	VVR
Total	0	0.00	0.00	
Grand Total	592	4.00	100.00	
≥ 5 = Abundance	$\geq 3 \leq 4$ = Rare	$\geq 1 \leq 2$ = Very Rare	$0 < 1$ = Very Very Rare	
A = Abundance	R = Rare	VR = Very Rare	VVR = Very Very Rare	
*Slack <i>et al.</i> (1992).				

Diversity indices of fish species in the study sites

The Diversity Indices or Species Abundance Relation Test of fish species carried out in the study is shown in Table 4. The Shannon diversity index for Ibuya Pools was 3.40 while Ikere Gorge – Lake had 3.20; Margalef value was 7.20 in Ibuya Pools and Ikere Gorge – Lake had 6.22. The species evenness was higher in Ibuya Pools (0.48) than in Ikere Gorge – Lake (0.55), while

Simpson's Dominance of fish species was 0.94 for both study areas.

The T – test analysis of the diversity of fish species in the two study areas is presented in Table 5. The result showed that the diversity of fishes in Ibuya Pools was significantly higher (t – test = 0.0001); that is 99.99 per cent higher than in Ikere Gorge – Lake. However, the Kolmogorov – Smirnov test revealed that there was significant difference ($p \leq 0.05$) in the diversity of fishes in the two areas.

Table 4: Diversity Indices or Species Abundance test of fish species in Ibuya Pools and Ikere Gorge-Lake.

	Ibuya	Lower	Upper	Ikere Gorge - Lake	Lower	Upper
Taxa_S	62.00	62.00	62.00	45.00	45.00	45.00
Individuals	4782.00	4782.00	4782.00	1184.00	1184.00	1184.00
Dominance_D	0.06	0.05	0.06	0.06	0.06	0.07
Simpson_1-D	0.94	0.94	0.95	0.94	0.93	0.94
Shannon_H	3.40	3.36	3.43	3.20	3.14	3.25
Evenness_e^H/S	0.48	0.47	0.50	0.55	0.51	0.57
Brillouin	3.37	3.33	3.39	3.12	3.06	3.17
Menhinick	0.90	0.90	0.90	1.31	1.31	1.31
Margalef	7.20	7.20	7.20	6.22	6.22	6.22

Table 5: T-test Analysis of fish diversity in the two study sites.

Tests for equal means			
IBUYA		IKERE GORGE	
N:	62	N:	62
Mean:	77.129	Mean:	19.097
95% conf.:	(45.86 108.4)	95% conf.:	(10.772 27.421)
Variance:	15161	Variance:	1074.5
Difference between means:		58.032	
95% conf. interval (parametric):		(25.998 90.066)	
95% conf. interval (bootstrap):		(23.887 85.79)	
t :	3.5862	p (same mean):	0.00048367
Uneq. var. t :	3.5862	p (same mean):	0.00061895
Monte Carlo permutation:	p (same mean):	0.0001	
P<0.05			

The comparison of the total number of fish catch in kilograms at Ibuya Pools n = 2,391 (28.84kg) forming 87.82 per cent and Ikere

Gorge – Lake n = 592 (4.00kg) forming 12.18 per cent is presented in Figure 3.

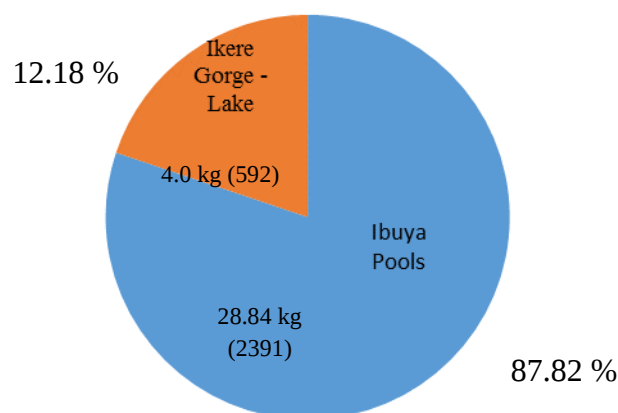


Figure 3: Comparison of the total number of fish – catch in (Kg) at Ibuya Pools and Ikere Gorge – Lake.

The comparison of the summary of the total number of fishes caught by the natural (n = 1342: 56.13%), artificial (n = 1049: 43.87%) baits in Ibuya Pools and natural (n = 326: 55.07%), artificial (n = 266: 44.93%) baits in Ikere Gorge – Lake are presented in Figures 4 and 5 respectively.

The physico – chemical conditions at the two study areas were within the tolerable ranges 27.10 – 28.90°C, mean 28°C for Temperature (t°); 6.50 -6.90mg/lit., mean 6.70mg/lit. for Dissolved Oxygen (DO); 363 – 388ppm, mean 375.50ppm for Total Dissolved Solids (TDS) and 6.6 – 7.5, mean 7.05 for Hydrogen – ions concentration (pH).

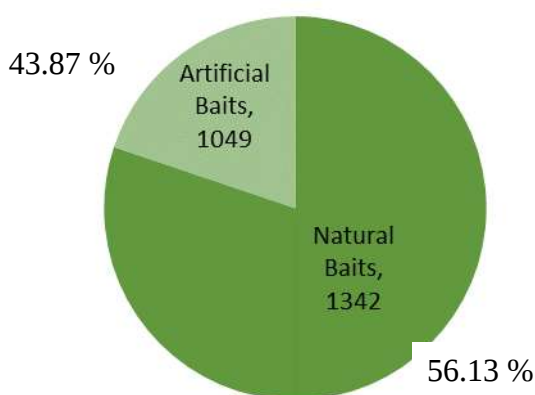


Figure 4: Comparison of the summary of the total number of fish caught by the natural and artificial baits during this study in Ibuya Pools.

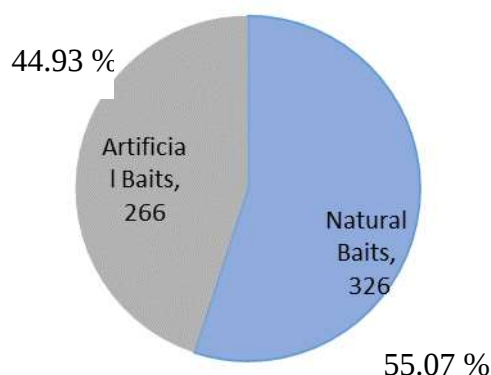


Figure 5: Comparison of the summary of the total number of fish caught by natural and artificial baits during this study in Ikere Gorge - Lake.

Features of some selected specimen obtained during the study are presented in Tables 6 and 7.

While the efficiency of catch – per – unit effort of natural baits and artificial baits in the two study areas are shown in Tables 8 and 9.

Table 6: Meristic features of some selected fish caught during the sport fishing study in Ibuya Pools and Ikere Gorge - Lake.

Families / Species	No of Fishes	D Fin	A Fin	C Fin	P Fin	V Fin
Bagridae						
<i>Auchenoglanis occidentalis</i>	10	i(6)	(12)	i(1)	iii(3)	i(3)
<i>Bagrus bayad</i>	10	ix(8)	(12)	(32)	i(16)	(14)
<i>Chrysichthys nigrodigitatus</i>	10	i(9)	(14)	i(19)	i(7)	(4)
<i>Clarotes laticeps</i>	10	i(2)	i(8)	(18)	iv(4)	ii(7)
<i>Parauchenoglanis fasciatus</i>	1	ii(2)	(6)	ii(12)	iii(3)	(6)
Centropomidae						
<i>Lates niloticus</i>	10	v(36)	i(24)	(32)	(28)	i(14)
Channidae						
<i>Parachanna obscura</i>	9	xiv(14)	(8)	(18)	(6)	(4)
Characidae						
<i>Alestes baremose</i>	10	i(18)	i(22)	(28)	(12)	(6)
<i>A. brevis</i>	10	i(12)	iii(8)	(24)	(6)	(4)
<i>A. chapter</i>	10	i(14)	(16)	(30)	(7)	(4)
<i>A. dentex*</i>	10	i(16)	i(17)	(19)	(8)	(6)
<i>A. macrocephalus</i>	10	i(15)	i(18)	(28)	(7)	(6)
<i>Brycinus nurse</i>	10	i(10)	i(8)	(18)	(8)	(5)
<i>Hydrocynus brevis</i>	10	i(14)	i(10)	ii(24)	(6)	(4)
<i>H. forskahlis</i>	10	i(12)	i(8)	ii(26)	(6)	(6)
<i>Micralestes accutidens</i>	10	i(8)	i(6)	(16)	(6)	(4)
Cichlidae						
<i>Chromidotilapia guntheri</i>	10	xvi(14)	ii(9)	(26)	(10)	i(8)
<i>Hemichromis bimaculatus</i>	10	xiv(12)	i(8)	(24)	(9)	i(6)
<i>H. fasciatus</i>	10	xiii(10)	i(6)	(22)	(8)	i(5)
<i>Oreochromis niloticus*</i>	10	xvii(14)	iii(10)	(27)	(10)	i(8)
<i>Pelmatochromis guntheri</i>	10	xiv(10)	i(6)	(18)	(8)	i(6)
<i>Sarotherodon galilaeus</i>	10	xvi(12)	ii(6)	(26)	(9)	i(7)
<i>Tilapia mariae</i>	10	xv(11)	ii(6)	(24)	(8)	i(6)
<i>T. zillii</i>	10	xiv(10)	iii(6)	(22)	(8)	i(5)
Citharinidae						
<i>Citharinus citharus*</i>	7	i(26)	i(26)	ii(29)	i(14)	i(12)
Clariidae						
<i>Clarias anguillaris</i>	10	(82)	(38)	(14)	(8)	(7)
<i>C. gariepinus*</i>	10	(75)	(32)	(10)	(6)	(5)
<i>Heterobranchius bidorsalis</i>	10	(56)	(24)	(8)	i(6)	(5)
<i>H. longifilis</i>	10	(64)	(34)	(12)	v(8)	(6)
Cyprinidae						
<i>Labeo cubie</i>	10	i(30)	i(19)	(32)	(9)	(12)
<i>L. petersii</i>	10	i(24)	i(16)	(28)	(8)	(10)
<i>L. senegalensis</i>	8	i(28)	i(18)	(34)	(12)	(10)
<i>Raiamas nigeriensis</i>	2	i(16)	i(10)	(26)	(8)	(6)
Distichodontidae						
<i>Distichodusro stratus</i>	1	iii(8)	(8)	(34)	(10)	(8)
Gymnarchidae						

<i>Gymnarchus niloticus</i>	10	(164)	(32)	(0)	(8)	(6)
Hepsetidae						
<i>Hepsetus odoe</i>	10	i(8)	i(16)	(28)	(10)	(8)
Malapteruridae						
<i>Malapterurus electricus</i>	10	(0)	i(12)	(26)	(8)	(6)
Mochokidae						
<i>Chiloglanis niger</i>	10	i(6)	ii(6)	i(16)	i(5)	(7)
<i>Synodontis schall</i>	10	v(5)	(0)	(24)	ii(0)	(4)
Mormyridae						
<i>Gnathonemus petersii</i>	10	xvi(14)	i(10)	(22)	(12)	(10)
<i>Mormyrops deliciosus</i>	9	(166)	(18)	(26)	(14)	(8)
<i>Mormyrus rume</i>	10	(42)	(18)	(28)	(9)	(5)
Osteoglossidae						
<i>Heterotis niloticus</i>	10	(62)	(84)	(26)	(12)	(8)
Schilbeidae						
<i>Eutropius niloticus</i> *	9	i(6)	i(28)	i(26)	i(12)	i(8)
Tetraodontidae						
<i>Tetraodon fahaka</i>	10	(14)	(6)	(22)	(14)	(10)

Roman Figures represent numbers of Spines. Numerals represent numbers of Rays. D Fin = Dorsal Fin; A Fin = Anal Fin; C Fin = Caudal Fin; P Fin = Pectoral Fin; & V Fin = Ventral Fin. *Species that had differences in spines and rays counts during the laboratory studies.

Table 7: Morphometric features of some selected fish caught during the sport fishing study in Ibuya Pools and Ikere Gorge - Lake.

Families / Species	No of Fishes	TL	SL	HL	BL	BG
Bagridae						
<i>Auchenoglanis occidentalis</i>	10	180	150	60	90	70
<i>Baqrus bayad</i>	10	240	200	50	190	100
<i>Chrysichthys nigrodigitatus</i>	10	225	205	70	140	90
<i>Clarotes laticeps</i>	10	250	200	50	195	95
<i>Parauchenoglanis fasciatus</i>	1	250	220	60	230	80
Centropomidae						
<i>Lates niloticus</i>	10	220	200	70	150	130
Channidae						
<i>Parachanna obscura</i>	9	230	195	45	185	60
Characidae						
<i>Alestes baremose</i>	10	235	200	50	90	70
<i>A. brevis</i>	10	140	120	40	80	50
<i>A. chapter</i>	10	130	110	40	70	45
<i>A. dentex</i>	10	248	222	60	80	70
<i>A. macrocephalus</i>	10	300	240	50	70	60
<i>Brycinus nurse</i>	10	150	130	40	60	50
<i>Hydrocynus brevis</i>	10	220	150	60	140	100
<i>H. forskahlis</i>	10	210	175	50	160	90
<i>Micralestes accutidens</i>	10	92	80	25	60	40
Cichlidae						
<i>Chromidotilapia guntheri</i>	10	185	163	40	90	40
<i>Hemichromis bimaculatus</i>	10	200	170	40	80	45
<i>H. fasciatus</i>	10	120	105	40	60	30
<i>Oreochromis niloticus</i>	10	196	171	30	100	40
<i>Pelmatochromis guntheri</i>	10	85	70	40	50	40
<i>Sarotherodon qallilaeus</i>	10	205	185	45	95	40
<i>Tilapia mariae</i>	10	170	145	40	80	40
<i>T. zillii</i>	10	220	180	45	90	45
Citharinidae						
<i>Citharinus citharus</i>	7	199	156	70	100	90
Clariidae						
<i>Clarias anguillaris</i>	10	230	215	65	80	120
<i>C. gariepinus</i>	10	220	195	62	62	130
<i>Heterobranchius bidorsalis</i>	10	193	175	60	120	90
<i>H. longifilis</i>	10	230	210	60	130	120

Cyprinidae						
<i>Labeo cubie</i>	10	210	190	80	80	70
<i>L. petersii</i>	10	205	173	40	100	90
<i>L. senegalensis</i>	8	190	170	40	120	100
<i>Raia nigeriensis</i>	2	140	110	45	80	50
Distichodontidae						
<i>Distichodus rostratus</i>	1	180	145	40	140	100
Gymnarchidae						
<i>Gymnarchus niloticus</i>	10	360	310	60	305	110
Hepsetidae						
<i>Hepsetus odoe</i>	10	237	178	50	182	120
Malapteruridae						
<i>Malapterurus electricus</i>	10	235	200	50	160	140
Mochokidae						
<i>Chiloqlanis niqer</i>	10	146	127	80	110	100
<i>Synodontis schall</i>	10	210	155	45	135	90
Mormyridae						
<i>Gnathonemus petersii</i>	10	139	110	40	90	60
<i>Mormyrops deliciosus</i>	9	340	290	60	180	80
<i>Mormyrus rume</i>	10	240	190	70	140	80
Osteoglossidae						
<i>Heterotis niloticus</i>	10	230	220	60	150	
Schilbeidae						
<i>Eutropius niloticus</i>	9	148	127	60	80	90
Tetraodontidae						
<i>Tetraodon fahaka</i>	10	180	150	40	100	90

All measurements are in millimeters (mm): TL = Total Length; SL = Standard Length; HL = Head Length; BL = Body Length; & BG = Body Girth.

Table 8: Efficiency of natural and artificial baits in the catch – per – unit effort of fish in the study in Ibuya Pools.

IBUYA POOLS					
Baits	Total Time Set	Total Fish Catch	Frequency of Fish Catch	No. of Fish Catch/20mins.	Total Sampling Occasion
Natural Earthworm (A ¹)	920	609	0.66	13.2	46
Artificial Earthworm (A ²)	920	441	0.45	9.0	46
Natural Snail (B ¹)	920	110	0.12	2.4	46
Artificial Snail (B ²)	920	89	0.10	2.0	46
Natural Fish (C ¹)	920	208	0.23	4.6	46
Artificial Fish (C ²)	920	180	0.20	4.0	46
Natural Frog (D ¹)	920	113	0.12	2.4	46
Artificial Frog (D ²)	920	92	0.10	2.0	46
Natural Maggot (E ¹)	920	302	0.35	7.0	46
Artificial Maggot (E ²)	920	247	0.27	5.4	46

Table 9: Efficiency of natural and artificial baits in the catch – per – unit effort of fish in the study in Ikere Gorge – Lake

Baits	IKERE GORGE – DAM				
	Total Time Set	Total Fish Catch	Frequency of Fish Catch	No. of Fish Catch/20mins.	Total Sampling Occasion
Natural Earthworm (A ¹)	920	125	0.14	2.8	46
Artificial Earthworm (A ²)	920	111	0.12	2.4	46
Natural Snail (B ¹)	920	36	0.04	0.8	46
Artificial Snail (B ²)	920	24	0.03	0.6	46
Natural Fish (C ¹)	920	41	0.04	0.8	46
Artificial Fish (C ²)	920	36	0.04	0.8	46
Natural Frog (D ¹)	920	34	0.04	0.8	46
Artificial Frog (D ²)	920	23	0.03	0.6	46
Natural Maggot (E ¹)	920	90	0.10	2.0	46
Artificial Maggot (E ²)	920	72	0.10	2.0	46

DISCUSSION

This study was conducted to determine the species composition, abundance and diversity; and as well compare the sport fishing catches between the Ibuya Pools and Ikere Gorge –Lake at Old Oyo National Park. The significantly higher fish diversity of fishes obtained in Ibuya Pools over Ikere Gorge – Lake could be explained as a result of Ibuya Pools enjoys maximum protection under conservation area and relatively undisturbed ecosystem compared to Ikere Gorge – Lake which is at the buffer zone of the Park and is opened to severe exploitations by licensed commercial fishermen authorized by the Ogun – Osun River Basin Authority, Water Resources and Rural Development. These observations made on the two study sites were similar to that recorded by Ayodele and Ojo (1998) and Olorunpomi (2015). Fish caught such as high classed fishes like the Elephant Pike fish (*Lates niloticus*), African bonytongue fish (*Heterotis niloticus*), Mudfish (*Clarias anguillaris*), Catfish (*Heterobranchus bidorsalis*), Electric fish (*Malapterurus electricus*), Grasscarp fish (*Distichodus rustratus*), mentioned just a few, obtained during the sport fishing operations in Ibuya Pools suggested that the site is very rich in fisheries resources and therefore will be viable for the development of sport fishing for ecotourism in Old Oyo National Park. This result was similar to the observations made by Olorunpomi (2015). The overall 45 species of fishes obtained during the study at both study sites demonstrated fish diversity and richness of aquatic fisheries resources most especially in

Ibuya Pools of the Park because of the effectiveness of conservation efforts. This result obtained in Ibuya Pools was similar to the findings of Marta *et al.* (2001) in Portugal, in their works on Gardiana River Basin which enjoys maximum protection and the site is being utilized for human recreational activities. This is a welcome development and a good attribute for the effective take off of sport fishing that will take care of the curiosities of fish anglers' tourists who may plan their vacation's visit to the Old Oyo National Park. The efficiencies of natural baits performed better than the artificial baits in the study. This suggested that fish species in aquatic environment preferred natural baits, perhaps due to their natural perceived odors either death or alive. This finding in the study was in agreement with the observations made by Marta *et al.* (2001) and Olorunpomi (2015). Though further laboratory studies were carried out on the examinations of the meristic and morphometric features of some selected sample specimens to properly classify them into their binomial nomenclatures, the results recorded in the study was in consonant with the guidelines keys laid down by FAO (1990), FAO (1995a), and FAO (1995b) respectively.

Although low catches of fish species observed in Ikere Gorge – Lake which may not support active sport fishing, suggests other usefulness of the destination to water sports and recreational activities. The expanse of the water fill will provide for tourist leisure's and comforts in Old Oyo National Park. Such additional recreational

activities may include boating/Lake Cruise, safari and regalia. The operators' business may include renting of boats/outboard engines for Lake Cruise, selling of games, toys, sport fishing equipment, rods, reels, hooks, baits and other related materials that the holiday makers may require at the eco-tourism destination. Sport fishing is viable and should be developed and encouraged in Ibuya Pools of the Old Oyo National Park. Where undersized fishes are caught, and they are not severely wounded to cause threat to their lives, the sport fishing anglers should be encouraged to release them back to the wild (Ibuya Pools).

REFERENCES

- Ahmed, Y.B. & Eyo, A.A. (2010): *Management of inland capture fisheries and challenges to fish production in Nigeria*. A technical report series No. 26 produced as a guide for the use of the inland fisheries managers by the Federal College of Freshwater Fisheries Technology New – Bussa, Nigeria. 12pp.
- Ayodele, I. A. & Ojo, S. O. (1998): Sport fishing potential at Ibuya River Valley of Old Oyo National Park, Nigeria. *Journal of West Africa Fisheries*, 2: 1 – 5.
- . (2012): Brochure of Ogun – Osun River Basin Authority, Water Resources and Rural Development, Abeokuta. 12p.
- Ayodele, I. A. (2017): *Tourism: Gateway to good health and good life*. An inaugural lecture No. 415th was delivered at the University of Ibadan on 12th October, 2017. Ibadan University Press, Publishing House, University of Ibadan, Nigeria. 110p.
- Berners, D. J. (2008): Sport fishing as a recreation. In *Encyclopedia Britannica*. Retrieved June, 2008, from *Encyclopedia Britannica online*
- Cowx, I. G. (2002): *Hand book of fish biology and fisheries*. Blackwell Publishing, London. 29p.
- FAO (1990). FAO species identification sheets for fishery purpose: *Field Guide to Commercial Marine Resources of the Gulf of Guinea* by Wolfgang Schemeider. 160: 1 – 248.
- FAO (1995a): Precautionary approaches to fisheries. Part 1: Guidelines on the precautionary approach to capture fisheries and species introductions: *FAO Fisheries Technical Paper*. 350 (1) Rome: FAO. pp 116 – 128.
- FAO (1995b): Precautionary approaches to fisheries. Part II Scientific Papers. *FAO Fisheries Technical Papers* 350 (2) FAO, Rome. 108p.
- Geerling, C. (1973): *1:50,000 Vegetation map of Borgu Game Reserve*. Working Document, FAO Forestry Department FAO, Rome. 27p.
- Horrox, R. & Ormrod, W. M. (2006): *A social history of England, 1200 – 1500*. Cambridge <https://www.scribd.com/doc/211710918/1MSC2013-Proceedings>. (Accessed on 10th Sept. 2013).
- Marta, P., Bochsechas, J. & Colares-Pereires, M. J. (2001). Importance of recreational fisheries in the Guadiana River Basin in Portugal. *Fisheries Management and Ecology*, 8:4-15.
- McCully, C. B. (2000): *The language of fly – fishing*. Taylor & Francis, Cape Town. 41p.
- Obot, E. A., Nchor, A. A., Eniang, E. A., Waari, M. & Stopfords, G.P.E. (2010): *Participatory Management plan of Old Oyo National Park, 2010 – 2014*. Global Tree Planters Limited, Abuja. 153p.
- Olorunpomi, G. S. (2015): *Studies on the viability of sport fishing using natural and artificial baits in Ibuya Pools and Ikere Gorge – Lake Old Oyo National Park, Nigeria*. Ph. D Thesis Department of

CONCLUSION

Findings from the present study indicated low fish catch in the Ikere Gorge – Lake. This informed that the activity of sport fishing may not be viable in the water body. The results in the Ibuya Pools proved otherwise. This therefore demonstrated clearly that sport fishing is viable in that site of the Park. The development and management of sport fishing like stocking and restocking practices can now be embarked upon by the management of the Old Oyo National Park. Subsequently, this may be opened to tourists and visitors to accrue the receipts of the much-needed revenue for the Park.

Zoology and Environmental Biology,
University of Calabar, Nigeria. 233p.

Slack, L. T.; Shield, F. D.; Knight, S. S. (Jnr.); &
Cooper, C. M. (1992): *Water – quality
and bottom – material – chemistry data
for the Yazoo River Basin Demonstration
Erosion Control Project*. North – Central,
Mississippi, February, 1988 – September,
1989. U. S. Geological Survey, Jackson.
198p. University Press, London. pp174 –
179.