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Quantitative analysis of planktonic biota of Owalla Reservoir, Osun State, Nigeria

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ABSTRACT

To provide baseline data on the phytoplankton flora and zooplankton fauna of Owalla Reservoir, Osun State, Nigeria, the planktonic community of the reservoir were examined. The research was conducted in seven sampling stations over the course of one annual cycle, from October 2012 to November 2013. Samples were taken every three months. 50 L of water were filtered through a 50 µm-mesh plankton net at the designated locations to get a net plankton sample. After reducing the volume of water to 30 ml, it was preserved in 5% formalin. Under a light compound microscope, the preserved net plankton samples were examined and both descriptive and inferential, were used to analyze the collected data. From the sample stations, 39 species of net zooplankton and 109 species of net phytoplankton were identified. Twelve species of Cyanophyta, eight species of Euglenophyta, three species of Dinophyta, two species of Rhodophyta, one species of Haptophyta, and twenty-two species of Bacillariophyta made up the phytoplankton flora. Respectfully, Rotifera > Cladocera > Copepoda > Insecta > Protozoa represented the zooplankton fauna. While zooplankton dropped approaching the dam area, the mean abundance of most phytoplankton groups increased along the reservoir's horizontal pattern of fluctuation. Additionally, the dry season was associated with a higher quantity of planktonic biota. In conclusion, Owalla Reservoir has a high biodiversity of phytoplankton and zooplankton, which is necessary for the survival of aquatic life and the production of fisheries.

Keywords. Phytoplankton, zooplankton, dam, reservoir, biodiversity, Owalla Reservoir

1. Introduction

Plankton is a crucial biotic element found in aquatic environments and they do ascertain the water's trophic state and purity. The majority of the lake food web is based on phytoplankton. For fish, zooplankton, and other aquatic creatures make up the majority of their diet. As a result, it is crucial to conduct both qualitative and quantitative research in order to evaluate the water quality. Phytoplankton and zooplankton biodiversity is crucial to preserving the balance between abiotic variables and living things (Rajlaxmi and Zade, 2018). A pertinent and practical way to concentrate research on the mechanism of eutrophication and its detrimental effects on an aquatic ecosystem is through the study of phytoplankton (Sedyaaw, 2024). However, by transferring energy from phytoplankton to the highest trophic level in the aquatic food web, the zooplankton community serves as a crucial intermediary link in the pelagic food web (Prasannatha *et al*., 2019). The structure, abundance, and seasonal succession of phytoplankton and zooplankton communities serve as vital indicators of the aquatic environment. They are highly susceptible to environmental factors, and their sensitivity to the hydrological environment can effectively indicate changes in water quality and the health of aquatic ecosystems (Dong et al., 2021). The primary goal of the 1989 impoundment of Owalla Reservoir in Osun State, Nigeria, from the Erinle River was to supply potable water to several towns within the state, including Osogbo, Ede, Ile-Ife, Gbongan, Erin-Osun, Ilobu, and Ifon-Osun. The reservoir's development as a fishery is a significant secondary benefit. A significant barrier to a correct understanding of the life process of the Owalla Reservoir limnology is a lack of comprehensive knowledge of the plankton community, particularly their biodiversity, population dynamics, and primary productivity of this reservoir. The aim of this work is therefore to provide baseline information on the taxonomic and population dynamics of Owalla reservoir.

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2. Methodology

2.1. Area of study

The water body under study is Owalla Reservoir, one of the largest surface waterbodies in Osun State and one of the largest in South West Nigeria. The reservoir, which has a surface area of 12 km^2, or 1200 acres, is located in the Irepodun Local Government area of Osun State. It is situated between latitudes $07^{o}55^{1}$ N and $07^{o}60^{1}$ N and longitudes $004^{o}30^{1}$ E and 004^{o} 35^{1} E. It is located around 17 km upstream of the existing Erinle/Ede reservoir. The reservoir was established in 1989 as an impoundment of the River Erinle inside the Nigerian Ogun Osun River Basin's Osun River subbasin by the old Oyo State (now Oyo and Osun States) to serve as a water storage area for the riparian zones. The villages and towns served by the reservoir are Osogbo (07^{o} 46 N^{1}; $004^{o}33$ E^{1}), Ede (07^{o} 45^{1} N; 004^{o} 26^{1} E), Ile-Ife (07^{o} 28^{1} N; 004^{o} 33^{1} E), Gbongan (07^{o} 28^{1} N; 004^{o} 20^{1} E), Erinle Osun ($07^{o}57^{1}$ N; 004^{o} 47^{1} E), Ilobu ($07^{o}50^{1}$N; 004^{o} 29^{1} E), and Ifon Osun ($07^{o}52^{1}$N; 004^{o} 29^{1} E), with a total population of 1,145,468 (based on the results of the 2006 Nigerian Population Commission Census).

Illie ($07^{o}58^{1}$N; 004^{o} 32^{1} E), Oba ($07^{o}54^{1}$ N; 004^{o} 34^{1} E), Okinni ($07^{o}50^{1}$N; 004^{o} 31^{1} E), Owalla ($07^{o}53^{1}$ N; 004^{o} 32^{1} E), and Ore ($07^{o}57^{1}$ N; 004^{o} 34^{1} E) are the fishing settlements that surround the Owalla Reservoir. There are perhaps 10 sites at the Owalla end of the reservoir, compared to about six fish landing locations at the Ore end. Although there are no obvious agricultural operations near the reservoir, the people typically use it for different household tasks like bathing and washing. Cattle also graze on the surrounding greenery near the reservoir. The vegetation along the shoreline consists of raffia palms, aquatic macrophytes (such as Commelina diffusa and Amaranthus zizanoides), and grasses. The reservoir stretches 1.6 km from an Otin River tributary and around 12 km northward toward the Erinle River. The reservoir extends to the Otin River's toe near Eko-Ende at normal water levels. The reservoir spans approximately 12.0 km^2 at normal operating levels and 15 km^2 at its maximum water level. Its maximum width is 3.5 km. The dam is 27.5 m high and 667 m long.

With a peak discharge predicted at 2,100 m^3/s, the dam spillway was built to withstand the likely flood of the Erinle River and its tributary, the Otin. Three radial gates, each 8 m wide and 6 m high, are used to discharge floodwaters. According to Tahal Consultant Ltd. (1982), the reservoir has a gross capacity and a safe yearly output of 94 million cubic meters (MCM).

2.2. Choosing and Outlining Sampling Stations

Seven sampling sites (sites 1, 2, 3, 4, 5, 6, and 7) were set up for this study along the reservoir's horizontal axis (Fig. 1). The middle basin had stations 2 and 5. While Stations 1, 3, 4, and 6 were situated along the reservoir's riverbank, Station 7 was situated close to the deepest part of the reservoir, near the dam. To make it easy to identify each of the seven sampling stations later on, a permanent floating substance was employed to mark their locations. A Global Positioning System (GPS) device was used to measure and record each station's grid coordinates (Table 1).

2.3. Plankton Collection and Analysis

A plankton net with a mesh size of 50 μm was used to filter 50 liters of water to extract net plankton, which was then reduced into 30 ml universal bottles and preserved in 5% formalin solution and Lugol's solution for analysis and identification. A light compound microscope was used in the laboratory to examine the preserved plankton samples. Using an ocular micrometer, scaled representations and an enumeration of the plankters that were observed were made.

3. Results

3.1. Occurrence, Distribution and Abundance (Org/M^3) of net phytoplankton

One hundred and nine (109) species of net hytoplankton belonging to major groups:

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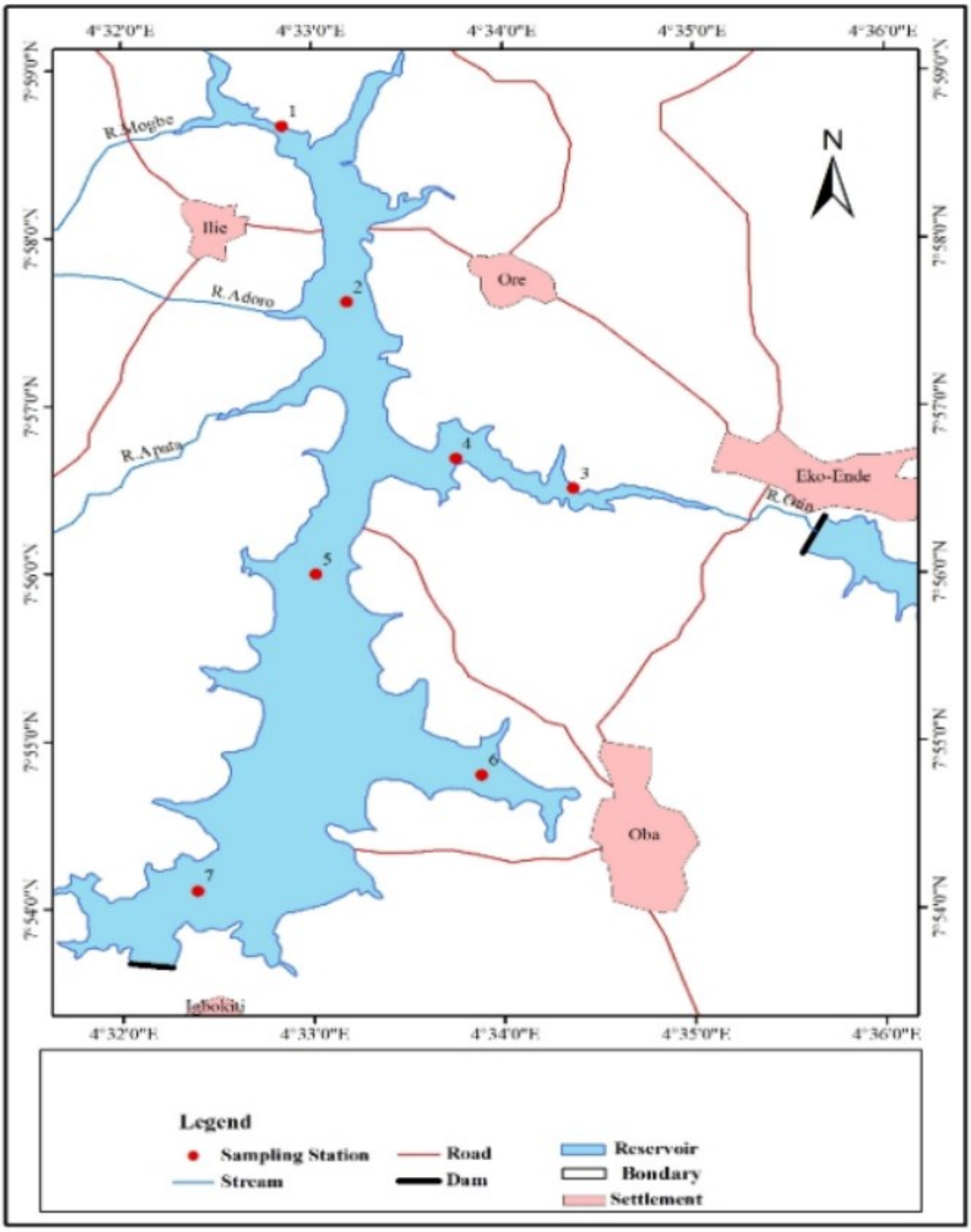

Figure 1: Map of Owalla Resevoir showing the investigated Sampling Station (Ikpe, 2012)

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Table 1: Grid Co-ordinates and Morphometric Characteristics of the Sampling Stations

S/N	Grid co-ordinate		Altitude (m) amsl	Distance& Direction from dam (km)	Depth range (m)	Mean depth ± S.E (m)	Description of Sampling Station
	Latitude (N)	Longitude (E)					
1.	07° 58.644'	004° 32.889'	336	9.26 (north)	0.98 – 4.24	3.04±0.57	River Erinle inflow (upper section
2.	07° 58.620'	004° 33.177'	332	7.47 (northeast)	3.93 – 7.05	6.05±0.60	River Erinle inflow (lower section
3.	07° 56.664'	004° 33.758'	334	5.96 (northeast)	4.15 – 9.60	6.40±1.06	River Otin inflow (upper section
4.	07° 56.515'	004° 34.361'	336	5.98 (northeast)	2.71 – 6.81	4.76±0.73	River Otin inflow (lower section
5.	07° 55.994'	004° 33.033'	334	4.51 (northeast)	4.07 – 6.73	5.58±0.47	Middle Basin
6.	07° 54.796'	004° 32.879'	338	2.99 (northeast)	6.90 – 9.12	8.06±0.44	River Aleri Inflow
7.	07° 54.089'	004° 32.403'	341	0.87 (north)	12.70–17.26	14.25±0.81	Near the Dam

Table 2: The Abundance of Phytoplankton and Zooplankton of Owalla Reservoir in October, 2012 (Org/M^3)

Plankton Group	Stations							Total Abundance	Mean Abundance
	1	2	3	4	5	6	7		
Phytoplankton									
Chlorophyta	17180	740	180	440	340	380	240	19500	2786
Cyanophyta	260	480	260	20	100	720	140	1980	283
Dinophyta	20	0	20	20	0	0	0	60	9
Rhodophyta	0	0	100	0	0	0	20	120	17
Bacillariophyta	20	120	20	0	20	20	160	360	51
Euglenophyta	20	60	0	20	20	0	40	160	23
Haptophyta	0	0	0	100	20	0	0	120	17
Total Abundance	17500	1400	580	600	500	1120	600		
Mean Abundance	2500	200	83	86	71	160	86		
Zoooplankton									
Rotifera	320	160	40	20	80	160	200	980	140
Cladocera	20	20	140	20	20	0	40	260	37
Copepoda	380	300	820	500	140	280	180	2600	371
Total Abundance	720	480	1000	540	240	440	420		
Mean Abundance	240	160	333	180	80	147	140		
Simpson Diversity Index	0.5378	0.8559	0.7705	0.6956	0.8416	0.632	0.9333		
Shannon Diversity Index	0.9174	2.46	1.797	1.548	2.13	1.598	2.829		
Margalef Diversity Index	1.638	2.899	1.414	1.094	1.77	1.567	2.814		
Fisher-Alpha Diversity Index	1.858	3.706	1.717	1.304	2.212	1.877	3.736		
Barger Parker Diversity Index	0.4834	0.3143	0.3793	0.5	0.28	0.5893	0.1333		

Chlorophyta, Cyanophyta, Dinophyta, Rhodophyta, Bacillariophyta, Euglenophyta, Haptophyta was recorded in Owalla Reservoir. In October, Station 1 had the highest abundance (17500 Org/M^3) (Table 2) and the least diverse. Station 1 was dominated by *Staurodesmus* sp. (8460 Org/M^3), *Staurastrum chaetoceras* (8360 Org/M^3). The most occurring species were *Pediastrum* sp., *Staurodesmus* sp. *Arthrospira jenneri.* Station 7 (dam site) was the most diverse station during the study period.

In February, Station had the highest abundance (35280 Org/M^3) (Table 3) and the flora was dominated by *Arthrospira jenneri* (9760 Org/M^3) *Staurodesmus* sp. (8460 Org/M^3), *Staurastrum chaetoceras* (8400 Org/M^3), *Pediastrum* sp. (8360 Org/M^3). *Pediastrum* sp.*, S. Chaetoceras, Staurodesmus* sp. were the mostly recorded species. Station 2 was the least abundant with 620 individuals. Station 6 was the most diverse station as shown by diversity index in Appendix 3b. Also, in June Station 7 had the highest abundance (61700 Org/M^3) (Table 4) and was dominated by *Staurodesmus* sp. (9060 Org/M^3), *Staurodesmus dickei* (13080 Org/M^3), *Staurastrum grande* (7500 Org/M^3). Station 2 was the most diverse. *Pediastrum* sp. (21720 Org/M^3), *Cosmarium panamese* (10280 Org/M^3) dominated Station 7. The most widely occurring taxa were *Cosmarium panamese*, *Pediastrum* sp., *Staurodesmus* sp., *Microcystis flos-aquae*, *Microcystis wesenbergii*. In November, Station 7 also had the highest abundance (28040 Org/M^3) while Station 1 had the least abundance (9080 Org/M^3) (Table 5). The most diverse station was Station 5. *Phacus longiremis, Coscinodiscus granii*, *Microcystis flos-aquae*, *Microcystis wesenbergii, Anabaena* sp., *Staurastrum polymorphm*, *Staurodesmus* sp. *Pediastrum* sp., *Actinastrum* sp., *Sphaeroplea pouchetii*, *Eurodina* sp., *Euastrum* sp. had the highest percentage occurrence.

Horizontal variation showed that cyanophyta mean abundance increased towards the dam area while Dinophyta decreased towards the dam site. Chlorophyta, Euglenophyta, Bacillariophyta had the highest mean abundance at the dam site (Table 6). Also, seasonal variation in the mean abundance indicated that all groups except Rhodophyta had their highest mean abundance during dry season (Table 7).

3.2. Occurence, Distribution and Abundance (Org/M^3) of net zooplankton

In October, Station 3 had the highest abundance (1020 Org/M^3) and was dominated by *Eucyclops titicacae* (420 Org/M^3), Nauplius lavae (300 Org/M^3). Mostly occurred species were *Temora longiremis*, *Eucyclops titicacae*, Nauplius lavae. Diversity index showed Station 1 as the most diverse and Station 4 as the least diverse. *Brachionus falcatus*, *Tricocerca* sp., Nauplius lava had the highest percentage occurrence in the month of February. Station 2 had the highest abundance (17460 Org/M^3) and was dominated by *Temora longiremis* (17160 Org/M^3). Station 6 was the most diverse but the least abundance. In June Station 7 had the highest abundance (3560 Org/M^3) and was dominated by *Tricocerca similigrandis* (3460 Org/M^3). Station 3 was the least in abundance of species (80 Org/M^3) and the least diverse.

In November, Station 7 had the highest abundance (24,800 Org/M^3) and Station 1 had the least abundance (2000 Org/M^3) (Table 5). Station 7 was dominated by *Temora longiremis, Limnocalanus macrurus*, *Tricocerca ruttneri, Keratella cochlearis, Brachionus calyciflorus*. The horizontal variation of the mean abundance of the planktonic group indicated that Rotifera had the highest mean abundance at the dam area. Cladocera had the highest mean abundance at the upper basin while Copepoda had the highest mean abundance at the mid basin (Table 6). Also, the seasonal variation showed that all the zooplankton groups had the higher mean abundance during the dry season than in the rainy season (Table 6). There was significant difference in the mean abundance

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Table 3: The Abundance of Phytoplankton and Zooplankton of Owalla Reservoir in February, 2013 (Org/M^3)

Plankton Group	Station 1	2	3	4	5	6	7	Total Abundance	Mean Abundance
Phytoplankton									
Chlorophyta	25440	580	1140	17660	17660	700	25440	88620	12660
Cyanophyta	60	0	120	20	100	40	9760	10100	1443
Dinophyta	0	0	0	20	0	0	0	20	3
Rhodophyta	0	20	0	0	0	0	0	20	3
Bacillariophyta	20	20	100	20	140	140	60	500	71
Euglenophyta	0	0	0	0	0	20	0	20	3
Haptophyta	0	0	20	20	20	40	20	120	17
Total Abundance	25520	620	1380	17740	17920	940	35280		
Mean Abundance	3646	89	197	2534	2560	134	5040		
Zoooplankton									
Rotifera	8880	160	160	380	220	420	120	10340	1477
Cladocera	40	0	60	80	60	40	0	280	40
Copepoda	440	17300	16820	8560	5940	340	8660	58060	8294
Protista	0	0	0	0	20	0	0	20	3
Total Abundance	9360	17460	17040	9020	6240	800	8780		
Mean Abundance	2340	4365	4260	2255	1560	200	2195		
Simpson Diversity Index	0.6702	0.768	0.8792	0.5362	0.1247	0.9253	0.7531		
Shannon Diversity Index	1.137	1.788	2.377	0.8985	0.3742	2.755	1.437		
Margalef Diversity Index	0.8869	1.244	2.213	1.124	1.021	2.629	1.051		
Fisher-Alpha Diversity Index	0.9839	01.492	2.73	1.256	1.138	3.372	1.163		
Barger Parker Diversity Index	0.3378	0.4194	0.1884	0.4859	0.9353	0.1489	0.2766		
Simpson Diversity Index	0.6702	0.768	0.8792	0.5362	0.1247	0.9253	0.7531		

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Table 4: The Abundance of Phytoplankton and Zooplankton of Owalla Reservoir in June 2013 (Org/M^3)

Plankton Group	Station 1	2	3	4	5	6	7	Total Abundance	Mean Abundance
Phytoplankton									
Chlorophyta	8100	240	280	340	160	280	61640	71040	11
Cyanophyta	120	60	60	60	40	100	40	480	69
Dinophyta	0	20	0	0	0	0	0	20	3
Rhodophyta	0	0	0	40	0	0	0	40	6
Bacillariophyta	40	160	0	40	40	60	20	360	51
Euglenophyta	0	0	20	40	0	0	0	60	9
Haptophyta	20	0	0	0	0	0	0	20	3
Total Abundance	8280	480	360	520	240	440	61700		
Mean Abundance	1182.9	69	51	74	34	63	8814		
Zoooplankton									
Rotifera	1580	100	0	100	60	80	3480	5400	771
Cladocera	40	0	80	0	20	20	20	180	26
Copepoda	1260	40	0	20	20	40	60	1440	206
Total Abundance	2880	140	80	120	100	140	3560		
Mean Abundance	960	47	27	40	33	47	1187		
Simpson Diversity Index	0.6517	0.9376	0.9198	0.929	0.875	0.9256	0.7678		
Shannon Diversity Index	1.223	2.831	2.582	2.738	2.138	2.689	1.56		
Margalef Diversity Index	1.108	2.735	2.209	2.558	1.46	2.464	1.179		
Fisher-Alpha Diversity Index	1.25	3.654	2.899	3.369	1.846	3.256	1.3		
Barger Parker Diversity Index	0.43	0.08	0.1111	0.1154	0.1667	0.1364	0.352		

Table 5: The Abundance of Phytoplankton and Zooplankton of Owalla Reservoir in November, 2013 (Org/M^3)

Plankton Group	Station							**Total Abundance**	**Mean Abundance**
Phytoplankton	1	2	3	4	5	6	7		
Chlorophyta	8600	3700	1320	4880	920	26880	29780	76080	10,869
Cyanophyta	260	400	540	280	1140	460	1160	4240	606
Dinophyta	0	1120	0	40	320	40	60	1580	226
Rhodophyta	0	0	0	40	0	0	0	40	6
Bacillariophyta	200	120	280	160	160	460	8760	10140	1449
Euglenophyta	20	120	80	60	80	200	80	640	91
Haptophyta	0	100	0	0	20	0	0	120	17
Total Abundance	9080	5560	2220	5460	2640	28040	39840		
Mean Abundance	1297	794	317	780	377	4005	5691		
Zoooplankton									
Rotifera	840	280	320	260	620	2340	20960	25620	3,660
Cladocera	700	1620	280	360	640	160	160	3920	560
Copepoda	460	300	3380	2200	11240	140	3680	21400	3,057
Protista	0	0	0	20	0	20	0	40	6
Total Abundance	2000	2200	3980	2840	12500	2660	24800		
Mean Abundance	500	550	995	710	3125	665	6200		
Simpson Diversity Index	0.8375	0.8582	0.9175	0.6867	0.9125	0.6059	0.872		
Shannon Diversity Index	2.499	2.391	2.869	1.833	2.819	1.792	2.484		
Margalef Diversity Index	4.499	3.015	3.764	3.254	3.808	4.003	3.871		
Fisher-Alpha Diversity Index	.695	3.689	4.904	4.02	4.933	4.848	4.636		
Barger Parker Diversity Index	0.2775	0.2698	0.1892	0.5238	0.1742	0.6184	0.2811		

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Table 6: ANOVA statistics of the variation in net plankton along the main axis of Owalla Reservoir, October, 2012 - November, 2013

Taxon	Upper Basin	Mid-Basin	Lower Basin	ANOVA statistics	
	n=8	n=12	n=8		
	Mean±SE	Mean±SE	Mean±SE	F	P
Phytoplankton					
Chlorophyta	32290±27030	15107±6215	72670±44430	2.812	0.079
Cyanophyta	820±120	913±291	6210±4890	1.599	0.222
Dinophyta	580±560	140±92	50±10	0.882	0.427
Rhodophyta	10±10	60±31	10±10	1.196	0.319
Bacillariophyta	350±70	327±55	4840±4160	1.385	0.269
Euglenophyta	110±70	107±7	170±50	0.300	0.744
Haptophyta	60±40	67±29	30±10	0.283	0.756
Zoooplankton					
Rotifera	6160±5460	753±133	13880±10880	1.522	0.238
Cladocera	1220±420	587±82	220±0	1.148	0.333
Copepoda	10240±7700	16547±2840	6690±5890	0.371	0.550
Protista	0±0	13±7	10±10		

Table 7: ANOVA statistics of seasonal variation in the net plankton of Owalla Reservoir, October, 2012 - November, 2013

Taxon	Dry Season	Rainy Season	ANOVA staistics	
	n=14	n=14		
	Mean±SE	Mean±SE	F	P
Phytoplankton				
Chlorophyta	23529±6851	12934±8864	0.967	0.335
Cyanophyta	2049±1484	351±98	1.550	0.224
Dinophyta	229±154	11±4s	1.815	0.189
Rhodophyta	9±6	23±14	0.779	0.385
Bacillariophyta	15±20	103±35	1.322	0.260
Euglenophyta	94±24	31±9	3.469	0.074
Haptophyta	34±12	20±14	0.492	0.489
Zoooplankton				
Rotifera	5137±2941	911±523	1.826	0.188
Cladocera	600±190	63±27	5.132	0.032*
Copepoda	11351±3008	577±195	11.161	0.002**
Protista	9±4	0±0	-	-

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of Cladocera (P≤0.05) and Copepoda (P≤0.01) over the two seasons (Table 7).

4. Discussion

4.1. Phytoplankton

Most of the phytoplankton species found in this study are found in several freshwater ecosystems in Nigeria and are common in freshwaters in Africa (Bunza et al., 2024; Isukur et al., 2023; Edward and Ugwumba, 2010; Offem et al., 2011). Nigerian freshwater ecosystems' phytoplankton taxonomic makeup is known to be dominated by members of the main family identified in the study, Chlorophyceae (Omoboye et al., 2022). Chlorophyta dominance is consistent with Nweze's (2009) research on the Adada River, Chubado, (2021) on Bonny River. According to Ekhator (2013), Owalla Reservoir's remarkable diversity of desmids may be a sign that the water body is mainly unpolluted.

Almost all of the plankton groups had their highest mean abundance during the dry season, which may be because light intensity, temperature, and transparency were all higher during that season than during the rainy season. The highest planktonic abundance, which mostly occurred at the dam area, may have been caused by reduced water current and higher transparency in that reservoir basin. In contrast, fewer organisms are adapted to high current (Sahoo 2017; Offem et al., 2011), so the mean abundance of phytoplankton at the upper basin, which was characterized by a lotic regime, may have been lower due to the high current in the region. Likewise, a reduction in water temperature down the reservoir's column may be the cause of the majority of phytoplankton species' decline from the reservoir's surface to its bottom. It is well known that the rate of photosynthesis and the amount of dissolved oxygen present are directly impacted by temperature. Additionally, the surface had the highest levels of clarity and light intensity, both of which are critical for phytoplankton formation. Throughout the two seasons of the study period, phytoplankton species were consistently detected in the water column, indicating that the reservoir was properly mixed. Human activities (such as open space defecation, washing and bathing with detergents and soaps, and cow grazing around the water shed) were also observed, along with the presence of some potentially toxic cyanobacteria, specifically *Anabaena* spp., *Microcystis* spp., and *Aphanizomenon flosaquae*, as well as some dinoflagellates (*Peridinium* sp.) and Euglenoids. These results point to a possible public health concern and the necessity of implementing mitigation strategies in the reservoirs, such as halting activities like livestock grazing, washing, bathing, and defecating near the reservoir.

4.2. Zooplankton

Many researchers in Africa and Nigeria have documented the dominance of rotifera in the freshwater zooplankton fauna (Green 2009; Ibemenuga 2020; Phan et al., 2021; Dede 2024; Ayodele and Adeniyi 2006). This group's dominance may be due to the fact that the majority of the species are warm water acclimated, meaning they are found in tropical water bodies with high temperatures. Additionally, their broad geographic dispersion may be explained by their minimal environmental requirements. Except for Rotifera, which had their maximum mean abundance near the bottom, the vertical variation in zooplankton mean abundance showed that the highest mean abundance of zooplankton groups occurred at the top. According to Naselli-Flores and Padisák (2023), this is because the surface offers sufficient food sources (photosynthesis) to sustain the zooplankton community. Additionally, because invertebrate predators (such as clams, krill, sponges, and crayfish) migrate higher at this time of day, rotifers' migration to the bottom may be related to their requirement for cover (Dorak et al., 2013). The upper basin has the highest mean abundance of zooplankton taxa. This was most likely brought on by the area's greater detrital particle availability, higher oxygen content, higher total suspended solids, and reduced water transparency, all of which may have helped them evade predators. This is in good agreement with the research done by Ndour *et al*. (2018).

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According to the reservoir's seasonal zooplankton dispersion data, the dry season had the highest zooplankton abundance. The primary food source for zooplanktons, phytoplanktons, may have increased because of strong photosynthetic activity.

5. Conclusion

The investigation of Owalla Reservoir's net phytoplankton and net zooplankton is part of the biological characteristics study. Fish potential is intimately tied to plankton because of its important role in the ecosystem. Because different plant and animal species react differently to changes in water quality, any alteration in the physio-chemical environment has an impact on biotic communities. In terms of abundance, the seven categories that comprised phytoplankton were Chlorophyta, Bacillariophyta, Cyanophyta and Euglenophyta, Dinophyta, Rhodophyta, and Haptophyta. In contrast, the most abundant group among zooplankton was Rotifer.

In terms of quantitative data, phytoplankton species and density varied among stations, according to the results of specific richness and the cumulative abundance of the sampling sites. Seasonally, the dry season has the highest number of species abundance, while the dam site has the biggest number of species recognized.

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