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Impact of Limnological Parameters on Zooplanktonic Diversity of Lokpal Sagar Lake in Panna District of Madhya Pradesh

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Abstract: Zooplankton succession in open lakes relies upon on the availability of vitamins, temperature, light depth and transparency. Zooplankton groups typically undergo a fairly predictable annual cycle, however a few species may additionally grow exponentially forming the blooms. Accordingly, the seasonal range and dynamics of Zooplankton and their correlation with environmental factors have been investigated in Lokpal sagar Lake, from 9 Feb. 2024 to 27April 2024. Samples were taken from 4 distinct websites of the lake; each of these sampling sites had their own particular traits. Seasonal plankton samples have been amassed then zooplankton richness, pH, water temperature, precise conductivity, saturation, overall dissolved solids, salinity and dissolved oxygen had been measured. The consequences showed that there may be enormous distinction inside the imply cost of pH across the specific seasons at the primary sampling site, season II having appreciably better cost than season I and IV. During the entire length of have a look at 18 special species of zooplankton have been recognized from the observe region. Out of them 7 species belong to the Rotifera group, 6 species belong to Cladocera group, 3 species of Copepoda organization and a couple of species of Ostracoda group. Rotifera group contain the dominant of all of the organizations constituting 39% of the whole zooplankton species, accompanied with the aid of Cladocera, Copepoda and Ostracoda. The predominant cause behind the pollutants of this perennial water frame can be the floating useless and decomposed macrophytes in it. They should be eliminated as a long way as possible at everyday intervals in order that the pollutants degree may be decreased and the water frame may be more successfully used for pisciculture practices.

Keywords: Zooplanktons, Limnological properties, Sessional variation, lokpal sagar ake.

Introduction:

Zooplankton refers to a extensive variety of very small and microscopically sized aquatic animals. Several complex and interrelating factors which includes nutrient enter, boom and density of aquatic floating and submerged macrophytes, numerous

climatic and physicochemical factors and many others. In the end put an impact on the density and distribution of zooplankton in an aquatic body. A massive quantity of environmental elements of the habitat of the zooplankton play a totally crucial position in their sustenance and survivability (1). If there's any form of main alternate in the outside environmental factor it'll without a doubt make an effect on the dominance, species variety, tolerance, abundance as well as in the whole network shape of zooplankton inhabiting the aquatic frame. These zooplankton are widely known to behave as biological indicator of any herbal aquatic water frame. Four principal zooplankton agencies viz. Rotifera, Copepoda, Ostracoda and Cladocera occupy the freshwater ponds and reservoirs (three). Zooplankton are extensively commonplace as very essential organism for fish feeding and nutrition. So, a a success aquaculture management rely to a massive volume on the species density, species range and abundance of zooplankton in an aquatic body. Although a variety of limnochemical have a look at has been performed in this water body, however zooplankton variety examine is lacking it which this gift study will fill up the lacunae (3,2). The fundamental intention of the prevailing examine is to estimate the species diversity of zooplankton and to find out the richness, evenness, of the freshwater perennial aquatic body. Besides, the have a look at also put an effort to offer an in-depth information about the circumstance of this perennial freshwater reservoir which can in addition be utilized by numerous government and non-government companies for piscicultural practices for upliftment the monetary situation of this region. The range of various kinds of plankton like, Zooplankton and zooplankton had been studied for river Narmada close to Bharuch in Gujarat. Three websites have been selected on river Narmada on its northern financial institution on the idea of utility of riverine useful resource (1-3).

The plankton had been gathered by means of a standard plankton internet from 3 exclusive websites of river Narmada. The post monsoon samples were amassed and Zooplankton and zooplankton had been diagnosed the use of general references. The Zooplankton have been represented via Bacilariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae, out of which common range of Bacilariophyceae changed into more. The zooplankton had been diagnosed in diverse phyla like, protozoa, helminthes, rotifera, annelida, arthropoda etc. Diversity of arthropods changed into highest amongst zooplankton followed via rotifera in standard (4,3). The percentage composition of numerous companies became calculated for the samples taken from one of a kind web sites. The composition of plankton as percent illustration was correlated for unique web sites with web site characteristics (4-5).

Physicochemical capabilities together with temperature, transparency, pH, alkalinity, unfastened carbon dioxide, dissolved oxygen, electrical conductivity, nitrate-nitrogen, orthophosphate and many others. Of any water frame grossly

determine the trophic repute of that water frame (6). These parameters impact the primary productivity (Zooplankton and zooplankton productivity) and in flip the growth of the fish. The primary productiveness of different water our bodies has been extensively investigated to evaluate the fish manufacturing potentialities of a water body and to formulate fishery control guidelines. The zooplankton (microscopic drifting or wandering animals) occupies a essential position inside the trophic structure of an aquatic atmosphere and plays a key function in the energy transfer. Unlike algae or Zooplankton, zooplankton are microscopic animals that do not produce their personal meals. Freshwater zooplankton plays an essential position in ponds, lakes and reservoirs environment and food chain. They are responsible for ingesting tens of millions of little algae that can otherwise grow to an out-of-manipulate state (7). However, no longer all algae are suitable for eating and of ten instances it's the blue green algae that we would like to look disappear that cannot be eaten. In fact, as often filter out feeders, a community of zooplankton can clear out thru the quantity of an entire lake in a matter of days. The zooplankton network consists of each primary purchasers (which consume Zooplankton) and secondary purchasers (which feed on the other zooplankton). The aquatic ecosystems are tormented by several health stressors that notably burn up biodiversity. Zooplankton species have exclusive types of lifestyles histories prompted through seasonal variations of biotic elements, feeding ecology and predation strain (eight). In the destiny, a loss of biodiversity and its effects are anticipated to be greater for aquatic ecosystems than for terrestrial ecosystems. The zooplankton is likewise a precious meals source for planktivorous fish and different organisms. The presence or absence of healthy zooplankton populations can decide some industrial fisheries success in both clean and saltwater our bodies (6-9).

Materials & methods:

The present study was carried out during 9 Feb. 2024 to 27April 2024 with a view to investigate the zooplankton diversity of Lake Lokpal Sagar. For this purpose, laboratory studies were conducted in the College of Fisheries, Panna while field studies were conducted at lake Lokpal Sagar.

Study area:

The Lokpal Sagar lake, under investigation is situated 5 km away from panna (Madhya Pradesh) The Catchment Area of Lake Lokpal Sagar is Semi-Hilly Androcky. Lokpal Sagar is situated nearby to the locality narangibag, as well as near the village janakpur..The maximum depth being 15 meters.the lake situated as Latitude. 24.72252° or 24° 43′ 21″ north ; and Longitude. 80.21465° or 80° 12′ 53″ east ; Elevation. 396 metres (1,299 feet).

Figure No.1: Satellite image of lokpal sagar lake (Google map).

Sample collection:

During the take a look at length, water samples from all the 3 selected sampling stations were gathered the use of a plastic bucket. The water samples were saved in one liter plastic bottles with air tight cap for evaluation of sure parameters in the laboratory.

Water Quality Analysis: Water excellent parameters consisting of temperature, colour (visual), depth of visibility, pH, total alkalinity (carbonates and bicarbonates), DO, CO2, EC/TDS have been determined in the area itself, while for the evaluation of nitrate-nitrogen and rthophosphate the samples had been added to the laboratory in plastic bottles of one liter ability and analyzed as soon as possible the usage of widespread strategies of Trivedy et al.(1987) and APHA(2005). For qualitative and quantitative analyses of zooplankton, strategies defined by Needham and Needham (1962) and Adoni (1985) have been observed.

Air and water temperature: A centigrade thermometer of 0 to 50°C range and graduatedto 0.1°C became used to measure air and water temperature. Air temperature across the sampling station became measured in colour. The water temperature became discovered through immersing the thermometer in water samples at once after series.

Depth of visibility: The transparency of water was determined using a trendy Secchi disc of 20 cm diameter. Two readings, one for disappearance and other for reappearance were recorded and then the depth of visibility was calculated as beneath formula.

Electrical conductivity (EC): Electrical conductivity turned into measured with the help of a pen kind electronic conductivity meter and effects had been expressed as mscm-^{1}.

Total dissolved solids (TDS): For the estimation of overall dissolvedsolids in every pattern, a element fee of 640 became increased with the respective price of EC.

Dissolved oxygen: The awareness of dissolved oxygen in water changed into predicted following the modified Winkler's approach (Ellis et al., 1949). In this technique, oxygen combines with manganous hydroxide to shape higher hydroxides which on acidification liberate iodine equal to that of oxygen fixed.This iodine is titrated with wellknown sodium thiosulphate answer the usage of starch as an indicator.

Nitrate-nitrogen: This became analysed using phenol disulphonic acid (PDA) technique of APHA (1989). For this motive, 50 ml of filtered sample changed into taken in a conical flask. To cast off the interferences of chlorides, 5mlsilversulphatesolution was added. This turned into heatedslightly andthe precipitate received was removed by using filteration. The filterate become evaporated in aporcelain disc to finish dryness. The residue become cooled and dissolved in 2ml phenol disulphonic acid. The content material become diluted to 50 ml with double distilled water. Using standard nitrate answer, a trendy curve became plotted to estimate the amount of nitrate within the pattern which changed into expressed as NO3-N in mg l^{-1}.

Primary Productivity: Primary productiveness was measured at all of the 3 stations following light and darkish bottles approach. For this purpose, glass stoppered black and white BOD bottles of 250 ml had been used. The bottles had been suspended approximately 15 cm underneath the water line. The incubation period became saved three hours. Oxygen (O2) estimation in the BOD bottles become made following regular Winkler's method. The calculation was executed as underneath:

(i) Gross Oxygen Production (GOP) mgl-1=LB-DB
(ii) Net Oxygen Production (NOP) mg l-1=LB-IB
(iii) Community Respiration (CR)mgl-1=IB-DB

Plankton analysis: The zooplankton samples were accrued along with the sampling of water. For the pattern collection, the ideal amount of water pattern (i.E. 50 liters)changed into filtered thru bolting silk No. 15 and plankton as a result received were preserved in four% neutralized for malin for further quantitative and qualitative evaluation. For quantitative analysis of zooplankton, 1ml subsample turned into taken inSedgwick Rafter plankton counting cell with the assist of plankton pipette and counted under C.Z. Inverted microscope. The general quantity of plankton

counted in each pattern became increased with dilution thing and consequences have been expressed as No. Ml-1 for zooplankton (APHA, 1989).

Statistical evaluation: The statistics accrued at some point of the prevailing research were processed for statistical analyses. The analysis become achieved for correlation coefficient and general deviation for drawing unique conclusions.

Results:

Physico-Chemical Parameters: The weekly fluctuations in selected water quality parameters of Lokpal Sagar lake for the three months period (February to April) have been shown station wise.

Air and water temperature: From the Tables 4.1 to 4.3 it is evident that the highest air temperature 37.0°C was noted on XII Week while the lowest (21.10°C) was on I Week. The average temperature of 29.0°C, 29.2°C and 28.92°C was observed at stations A, B and C, respectively. The surface water temperature fluctuated between 18.5°C to 29.5°C with average water temperature of 25.25°C, 24.20°C and 24.06°C at stations A, B and C, respectively.

Hydrogen ion concentration (pH): In general, the water of Lokpal Sagar remained alkaline throughout the study period (February to April). The pH values oscillated from 8.0 to 8.8, 8.0 to 8.7 and 7.9 to 9.0 at the three stations *viz.* A, B and C. Further, the respective average pH values at stations A, B and C were 8.30, 8.35 and 8.33. (Tables 4.1 to 4.3). The highest value of 8.8 and 9.0 were at station A and C and lowest value of 7.9 and 8.0 were at station A and C.

Depth of visibility: The values of depth of visibility also referred to as transparency at stations A, B and C of Lokpal Sagar fluctuated between 45 to 52, 10 to 45 and 40 to 65, respectively. Amongst the three sampling stations, the average value of depth of visibility was highest (54.75) at station C and lowest (29.33) at station A.

Dissolved oxygen (DO): During the study period (February to April) the concentration of dissolved oxygen in subsurface water of Lokpal Sagar ranged from 7.6 to 8.8, 7.2 to 8.8 and 7.2 to 8.8 mg l-1 at stations A, B and C respectively. The average values of dissolved oxygen were 8.1, 8.10 and 8.17 at three stations serially. Station C had the highest dissolved oxygen (8.17 mg l-1) while station A showed the lowest dissolved oxygen (8.1 mg l-1) contents.

Free carbon dioxide (Free CO2): Over the study period, the free CO2 was conspicuous by its absence on all the three sampling stations.

Carbonate alkalinity: In Lokpal Sagar, the carbonate alkalinity ranged between 54 to 70, 54 to 72 and 44 to 65 mg l-1 at stations A, B and C, respectively. Its average values however, were 61.33, 60.33 and 53.58 at stations A, B and C, respectively .

Bicarbonate alkalinity: The values of bicarbonate alkalinity ranged from 190 to 238, 190 to 286 and 190 to 260 mg l-1 at stations A, B and C, respectively. Its average values however, were 218.83, 227.7 and 238.66 at stations A, B and C, respectively.

Total alkalinity: In general, the total alkalinity in the present study varied between 248 to 308, 248 to 358 and 240 to 320 mg l-1 at stations A, B and C**,** respectively. Its average values however, were 280.16, 287.33 and 283.91 at stations A, B and C, respectively.

Electrical conductivity (EC): The values of electrical conductivity fluctuated from 0.20 to 0.35, 0.19 to 0.32 d 0.22 to 0.34 m S cm-1 at stations A, B and C, respectively. Its average values however, were 0.26, 0.24, 0.26 m S cm-1 at stations A, B and C, respectively.

Total dissolved solids (TDS): Values of TDS fluctuated from 128 to 224, 121 to 204.8 and 140.8 to 217.6 mgl-1 in surface waters at all the three stations in respective order. Its average values however, were 168.00, 159.36, 170.13 mg l -1 at stations A, B andC, respectively.

Nitrate-nitrogen (NO3-N): The nitrate-nitrogen in Lokpal Sagar during the study period ranged from 0.15 to 0.36, 0.16 to 0.34 and 0.12 to 0.20 mg l-1 at stations A, B and C, respectively. The average nitrate-nitrogen values were 0.23, 0.21 and 0.17.

Orthophosphates (HPO4-P):

The orthophosphates in the Lokpal Sagar during the study period ranged from 0.29 to 0.79, 0.60 to 0.71 and 0.40 to 0.69 mg l-1 at stations A, B and C, respectively. The average values were 0.63, 0.65 and 0.59 at stations A, B and C, respectively. Statistically, the levels of orthophosphates in surface water had a positive correlation with bicarbonates, total alkalinity, electrical conductivity, TDS and nitratenitrogen. Whereas, a negative relationship with air and water temperature, pH, depth of visibility, dissolved oxygen, carbonates, GPP, NPP, CR and total zooplankton.

Primary productivity: The results pertaining to gross and net primary productivities of Lokpal Sagar during the study period (February to April) are presented in Tables 4.1 to 4.3. In general, the GPP ranged between 0.35 to 0.65, 0.35 to 0.60 and 0.35 to 0.65 g C m-3 h1 at stations A, B and C, respectively. The average values of GPP were 0.52, 0.47 and 0.50.

Zooplankton Abundance:

Among the zooplankton, total 36 genera belonging to four major groups i.e. rotifer, cladocera, copepod and protozoa, were recorded during the study period of Lokpal Sagar Lake. These genera are enumerated in the Table 4.8. Out of these 36 enera, 18 were from rotifer, 7 from cladocera, 7 from copepoda and 4 belonged to protozoa group. The zooplanktonic population was dominated by rotifers, cladocerans and copepoda.

S. No.	Parameters	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Avg.	S.D	Min.	Max.	C.V. (%)
1	Air temperature (^{0}C)	21.5	23.5	24.5	25.5	27.0	29.0	30.5	30.5	32.0	33.5	34.5	36.0	**29.0**	**4.63**	**21.5**	**36.0**	**15.96**
2	Water temperature ($^{\circ}$C)	18.5	19.0	21.0	23.0	25.0	24.5	28.0	27.5	29.5	28.5	29.5	29.0	**25.25**	**4.06**	**18.5**	**29.5**	**16.07**
3	pH	8.2	8.2	8.0	8.2	8.0	8.4	8.3	8.5	8.8	8.0	8.6	8.5	**8.30**	**0.25**	**8.0**	**8.8**	**3.01**
4	Depth of visibility (Cm)	45	47	45	48	50	47	49	46	45	48	50	52	**47.66**	**2.26**	**45**	**52**	**4.74**
5	Dissolved oxygen (mgl^{-1})	7.8	7.6	8.0	8.2	8.4	8.8	8.0	8.0	8.0	8.4	8.4	7.6	**8.1**	**0.35**	**7.6**	**8.8**	**4.32**
6	Free carbon dioxide (mgl^{-1})	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	Carbonate alkalinity(mgl^{-1})	56	60	64	62	58	54	58	64	70	64	64	62	**61.33**	**4.37**	**54**	**70**	**7.12**
8	Bicarbonate alkalinity(mgl^{-1})	226	232	234	218	200	234	190	190	238	222	210	232	**218.83**	**17.40**	**190**	**238**	**7.95**
9	Total alkalinity(mgl^{-1})	282	292	298	280	258	288	248	254	308	286	274	294	**280.16**	**18.51**	**248**	**308**	**6.60**
10	Electric conductivity(mScm^{-1})	0.35	0.32	0.30	0.26	0.22	0.33	0.24	0.20	0.22	0.27	0.20	0.24	**0.26**	**0.05**	**0.20**	**0.35**	**19.23**
11	Total dissolved solids(mgl^{-1})	224	204.8	192	166.4	140.8	211.2	153.6	128	140.8	172.8	128	153.6	**168**	**33.10**	**128**	**224**	**19.70**
12	Nitrate-nitrogen(mgl^{-1})	0.31	0.36	0.30	0.26	0.18	0.19	0.20	0.19	0.15	0.18	0.27	0.17	**0.23**	**0.06**	**0.15**	**0.36**	**26.08**
13	Orthophosphate(mgl^{-1})	0.79	0.68	0.78	0.69	0.68	0.65	0.68	0.38	0.29	0.63	0.69	0.68	**0.63**	**0.14**	**0.29**	**0.79**	**22.22**
14	Primary productivity (gCm^{-3}h^{-1})																	

(i)	Gross primary productivity	0.60	0.50	0.35	0.60	0.60	0.65	0.60	0.45	0.55	0.40	0.65	0.40	**0.52**	**0.10**	**0.35**	**0.65**	**19.23**
(ii)	Net primary productivity	0.45	0.35	0.15	0.45	0.40	0.50	0.40	0.35	0.45	0.25	0.50	0.25	**0.37**	**0.10**	**0.15**	**0.50**	**27.02**
(iii)	Community respiration	0.15	0.15	0.20	0.15	0.20	0.15	0.20	0.10	0.10	0.15	0.15	0.15	**0.15**	**0.03**	**0.10**	**0.20**	**20.0**

Table No. 1:

Weekly observations of Physico-chemical and biological characteristics of water of Lake Lokpal Sagar,

Table No. 2:

Correlation matrix of different water quality parameters of Lake Lokpal Sagar, Lokpalpur

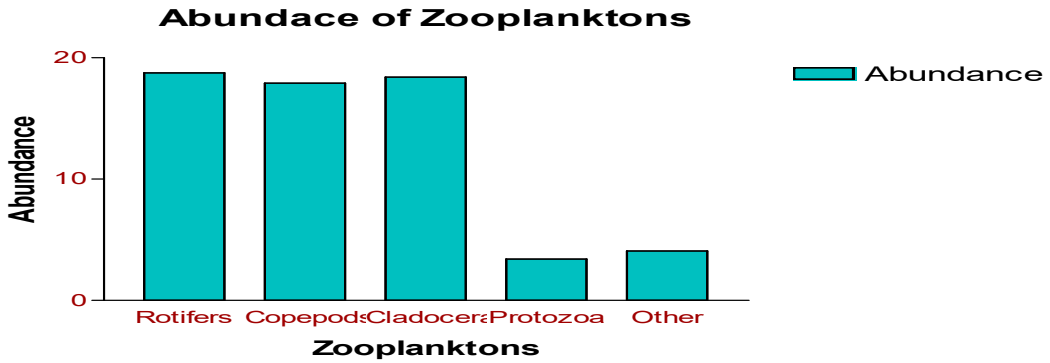
Para-meters	**Air temp.**	**Water temp.**	**pH**	**Depth of vis.**	**DO_2**	**Free CO_2**	**CO_3**	**HCO_3**	**Total Alk.**	**EC**	**TDS**	**NO_3-N**	**HPO_4**	**GPP**	**NPP**	**CR**	**TZP**
Air temp.	1					-											
Water temp.	0.9666**	1				-											
pH	0.4624	0.5358	1			-											
Depth of vis.	0.9388**	0.9272**	0.4790	1		-											
Dissolved O_2	-0.1347	-0.0012	0.4150	0.04245	1	_											
Free CO_2	_	_	_	_	_	_											
CO_3	0.1631	0.17225	-0.0728	-0.0098	0.0946	-	1										
HCO_3	-0.5263	-0.5896*	0.0355	-0.5675*	0.162	-	-0.107	1									

					9												
Total Alkalinity	-0.4134	-0.5111	0.0730	-0.5923*	-0.2075	-	0.0624	0.7759**	1								
EC	-0.8052**	-0.8602**	-0.2926	-0.7345**	0.0128	-	-0.3613	0.5325	0.5303	1							
TDS	-0.8571**	-0.9073**	-0.4204	-0.7761**	-0.0761	-	-0.27	0.4740	0.4801	0.9589**	1						
NO_3-N	-0.7331**	-0.7927**	-0.5554*	-0.8378**	-0.3117	-	0.2451	0.4277	0.5989*	0.6009*	0.7225**	1					
HPO_4	-0.3142	-0.5004	-0.5967*	-0.3627	-0.4952	-	-0.0885	0.2903	0.31641	0.2803	0.3696	0.5707*	1				
GPP	0.2403	0.3355	0.4112	0.4814	0.4039	-	-0.2727	-0.4441	-0.6147*	-0.0435	-0.0668	-0.5245	-0.5467	1			
NPP	0.2351	0.3101	0.6017*	0.4487	0.3960	-	-0.2928	-0.3131	-0.3834	0.0274	-0.0179	-0.4552	-0.5287	0.9360**	1		
CR	0.0413	0.1068	-0.4718	0.1433	0.0670	-	0.0239	-0.4066	-0.6986*	-0.1981	-0.1406	-0.2478	-0.1107	0.2870	-0.0685	1	
TZP	0.0124	-0.0559	0.1864	0.0409	0.0141	-	0.0631	0.2358	0.3428	0.2637	0.26089	-0.0651	-0.1748	0.0701	0.14772	-0.2031	1

Table No. 3:

Weekly Variations in zooplankton (No. l-1) at Lake Lokpal Sagar, Lokpalpur

S.No.	Group of zooplankton	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Avg.	S.D	Min.	Max.	C.V (%)	
1.	Rotifers	22	20	19	22	19	18	10	20	13	21	23	18	**18.75**	**3.79**	**10**	**23**	**20.21**	
2.	Copepods	15	15	12	18	15	21	22	20	19	22	16	20	**17.91**	**3.26**	**12**	**22**	**18.20**	
3	Cladocerans	15	19	20	18	21	18	22	18	25	19	10	16	**18.41**	**3.75**	**10**	**25**	**20.36**	**P<0.0001***
4.	Protozoa	4	6	4	3	2	1	3	5	2	2	1	8	**3.41**	**2.10**	**1**	**8**	**61.58**	
5.	Other	7	6	2	7	4	2	3	2	4	3	5	4	**4.08**	**1.83**	**2**	**7**	**44.85**	
	Total	**63**	**66**	**57**	**68**	**61**	**60**	**60**	**65**	**63**	**67**	**55**	**66**	**62.58**	**4.07**	**55**	**68**	**6.50**	



Graph No. 1; Abundance of Zooplanktons in Lokpal sagar lake.

Discussion:

The statistical correlation of both the air and water temperature with different water best parameters is supplied wherein indicated that during the have a look at duration, air temperature had positive dating with water temperature, pH, intensity of visibility, carbonates alkalinity, GPP, NPP, network respiration (CR), overall zooplankton and negative dating with, dissolved oxygen, bicarbonates alkalinity, general alkalinity, EC, TDS, NO3-N and orthophosphate. Water temperature had high quality relationship with air temperature, pH, intensity of visibility, carbonates, GPP, NPP and CR (14, 10). However, bad relationship with dissolved oxygen, bicarbonate alkalinity, total alkalinity, EC, TDS, NO3-N, orthophosphates and overall zooplankton (eleven). The statistical results shows that pH had tremendous widespread relationship with air and water temperatures, intensity of visibility, dissolved oxygen, bicarbonates alkalinity, total alkalinity, GPP, NPP and overall zooplankton however had bad considerable relationship with carbonate alkalinity, electrical conductivity, TDS, NO3- N, orthophosphates and CR content material. Statistically, the intensity of visibility had a positive substantial dating with air and water temperatures, pH, dissolved oxygen, GPP, NPP, CR and total zooplankton and a terrible substantial dating with carbonate, bicarbonate, overall alkalinity, EC, TDS, NO3-N and orthophosphates (13,12). The dissolved oxygen had high quality correlation with, pH, depth of visibility, CO3, bicarbonates, electrical conductivity, GPP, NPP, CR and total zooplankton. Whereas, a terrible correlation was obtrusive with air and water temperature, total alkalinity, TDS, nitrate-nitrogen and orthophosphates (10-15).

The carbonate alkalinity had a fantastic correlation with air and water temperature, dissolved oxygen, total alkalinity, nitrate-nitrogen, network breathing (CR) and total zooplankton. However, a negative dating was determined with pH, depth of visibility, bicarbonates alkalinity, electric conductivity, TDS, orthophosphates, GPP and NPP (17). The bicarbonate alkalinity had a positive correlation with pH, dissolved oxygen, general alkalinity, electric conductivity, TDS, nitrate-nitrogen, orthophosphates and total zooplankton. However, terrible courting with air and water temperature, intensity of visibility, carbonates, GPP, NPP and CR. The minimal cost (240 mg l-1) changed into observed in IX Week at station C, at the same time as the most (358 mg l-1) was recorded at station B on II Week (19). Positive correlation of general alkalinity become discovered with pH, carbonates, bicarbonates, electrical conductivity, TDS, nitrate-nitrogen, orthophosphates and total zooplankton and terrible dating with air and water temperature, depth of visibility, dissolved oxygen, GPP, NPP and CR. It shows a superb correlation with dissolved oxygen, bicarbonates, general alkalinity, TDS, nitrate-nitrogen, orthophosphates, NPP and total zooplankton (16-20).

The statistical courting of overall dissolved solids with decided on water exceptional parameters. The TDS exhibited a superb sizeable, dating with bicarbonates, general alkalinity, electric conductivity, nitratenitrogen, orthophosphates and overall zooplankton and bad widespread, relationship with air and water temperature, pH, depth of visibility, dissolved oxygen, carbonates, GPP, NPP and CR. The nitrate-nitrogen had a effective relationship with carbonates, bicarbonates, total alkalinity, electric conductivity, TDS and orthophosphates (21). Whereas, terrible relationship became located with air and water temperature, depth of visibility, dissolved oxygen, pH, GPP, NPP, CR and total zooplankton. The statistical dating of GPP was discovered tremendous with air and water temperature, pH, intensity of visibility, dissolved oxygen, NPP, community respiratory (CR) and total zooplankton and terrible dating with carbonates, bicarbonates, overall alkalinity, electrical conductivity, TDS, nitrate-nitrogen and orthophosphates (22,26). The respective values of internet number one productiveness (NPP) at stations A, B and C ranged from 0.15-0.50, 0.25-0. 45 and 0.25-zero.45 g C m-three h-1.The common values of NPP had been zero.37, zero.36 and 0.37. The statistical courting of NPP was discovered advantageous with air and water temperature, pH, depth of visibility, dissolved oxygen, electrical conductivity, GPP and general zooplankton and bad dating with carbonates, bicarbonates, overall alkalinity, TDS, nitrate-nitrogen, orthophosphates and CR (23,24). The respective values of network respiration (CR) at stations A, B and C ranged from zero.10 to zero.20, 0.05 to 0.20 and zero.05 to 0.20 g C m-three h-1. The corresponding common values of CR were 0.15, 0.10 and zero.12. The statistical correlation of CR turned into located fine with air and water temperature, depth of visibility, dissolved oxygen, carbonates and GPP. However, there was a bad courting with, pH, bicarbonates, general alkalinity, electric conductivity, TDS, nitrate-nitrogen, orthophosphates, NPP and general zooplankton. The maximum zooplankton density (68 No.L-1) turned into located on IV Week at station A (24,26). The populace of zooplankton at stations A, B and C ranged from 55 to 68, 23 to 36, and forty six to sixty one in subsurface water. The statistical correlation of zooplankton become determined high quality with air temperature, pH and intensity of visibility, dissolved oxygen, carbonates, bicarbonates, overall alkalinity and electric conductivity, TDS, GPP and NPP. However, there has been a bad courting with, water temperature, nitrate-nitrogen, orthophosphates and network respiration (14,25). Zooplanktons are the producers of aquatic ecosystems as they shop sun strength and deliver the power to higher trophic stages (21-26).

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Conclusion:

Physico-chemical parameters of lake Lokpal Sagar were found to be congenial throughout the study period. The average water quality parameters of the

lake duringthe study period were: air temperature-29.04 °C; water temperature-24.51°C; Depth of visibility-43.92 cm; pH-8.33; EC-0.26 m S cm-1; dissolved oxygen-8.13 mg l-1; free CO_2-0.0mgl-1;carbonates-58.42mgl-1;bicarbonates-228.17mgl-1;totalalkalinity- 283.21 mg l-1 ; total dissolved solids-165.83 mg l-1; orthophosphates-0.63 mg l-1 ;nitrate-nitrogen-0.21 mg l-1; GPP-0.50 g C m3 h-1; NPP-0.27 g C m3 h-1; CR-0.13 g C m3h-1; Zooplankton and zooplankton constitute natural food for fish fry, fingerlings and adults and an adequate supply of these items are essential for the proper growth of fishes. Our current understanding of the seasonal and spatial variation of Zooplankton with environmental factors is insufficient in Lake Lokpal. Seasonal variations in Zooplankton are related to a variety of environmental factors in aquatic environments. Water temperature and transparency are among the most important physical factors affecting the distribution and seasonal variations of Zooplankton.

References:

1. Nirbhavane G. and Khobragade K. 2017. Study of water quality of sion lake, Mumbai, Maharashtra. Scholars Journal of Engineering and Technology, 5(8): pp. 413-415.
2. Borkar S. D. 2018. Effect of climate change on water quality of Khamb Talav, Bhandara district (Maharashtra) India. Journal Emerging Technologies and Innovative Research (JETIR), vol. 5(11): pp. 724-727.
3. Durge L. S., Dhamania A. A. and Chavhan R. N. 2018. Physico-chemical Characteristics of a fresh water pond of Ghugus, District Chandrapur, Maharashtra. International Journal of Scientific Research in Biological Sciences, vol. 5(3): pp. 59-64. Gadekar G. P. 2020. Diversity of Zooplankton of Pujaritola lake of Gondia District (M.S). International Journal of Research in Science and Technology, vol. 5(30): pp.1-3.
4. Goswami D. B. 2018. Diversity of zooplankton from Chankapur Dam, Kalwan, Nashik (M.S.). International Journal of Creative Research Thoughts, vol. 06(2), pp- 588-590.
5. Pimpalshende A. K. and Sitre S. R. 2018. Qualitative study of Zooplankton fauna of Satara Bhosale and Satara Tukum lakes of Pombhurna Tehsil in different seasons. International Conference on Frontiers in Life and Earth Science, vol. 5(1): pp. 08-15.
6. Amte G. K., Shinde P. P. and Ansari G. R. 2019. Assessment of water quality index of two fresh water bodies from Bhiwandi Tahsil, Dist. Thane, Maharashtra. International Journal of 9(3): pp. 53-59.

7. Babare A. D., Babare M.G. and Tal M. B. (2019). Study on diversity of zooplanktons from Kurnur dam in Akkalkot, Maharashtra. SSR Inst. Int. J. Life Sci., vol. 5(4): pp. 2235-2340.
8. Belkhode P. P. Sitre S. and Sattyanarayana (2015). Investigation of physico-chemical characteristics of ecologically fragile lake of Kuhi, Nagpur district, India. Indian Journal of Fundamental and Applied Life Sciences, vol. 5(4): pp. 136-140.
9. Jain, A., Singh B. N., Singh H. B. and Singh S. 2010. Exploring Biodiversity as bio-indicators for water pollution. National conference on biodiversity, development and poverty Alleviation 22th May 2010, pp- 50-56.
10. Pandhye S. M. and Victor R. 2015. Diversity and distribution of Cladocera (Crustacea: Branchiopda) in the rock pools of Western Ghat, Maharashtra, India. Ann. Limnol. – Int. j. Lim. 51: pp. 315-322.
11. Dorlikar A. V. 2016. Correlation study of zooplankton diversity, species richness and physicochemical parameters of Ghodazari lake (Maharashtra). International Journal of Researches in Bioscience, Agriculture and Technology, vol. 4(3): pp. 49-54.
12. Dube P. G., Shelar S. D., Mokashe S. and Shinde 2016. Diversity indices of fresh water Crustacian zooplankton. International Journal of Current Research and Academic Review, vol. 4(7): pp. 107-113.
13. Ingale D. 2016. Diversity and parameter of lentic ecosystem with reference to Eutrophication. International Journal of Innovative Research in Science, Engineering and Technology, vol. 5(1): pp. 1084-1092.
14. Padaya M. and Hambarde M. 2016. Effect of pollutant on Biochemical Profile and population dynamics of zooplankton. Universal Journal of Environmental Research and Technology, vol. 6(3): pp. 97-110.
15. Parmar T. K., Rawtani D. and Agrawal Y. K. 2016. Bioindicator: the natural indicator of environmental pollution. Frontiers in life Science, vol. 9(2): pp. 110-118. Patil Ravindra D. and Patil Rajendra D. 2019. Zooplankton diversity and their seasonal variation of Londhare dam Shahada Taluka District Nandurbar (M.S.) India, vol. 6(30): pp. 238-248.
16. Bakare R., Supekar S. and Nalawade S. 2017. Diversity of freshwater Protozoans from littoral zone of Venna lake in Mahabaleshwar. International Journal of Pharmaceutical, Chemical and Biological Sciences, 7(4): pp. 407-410.
17. Amte G. K. and Ayare T. S. 2020. Comparative account of planktonic diversity of Gauripada lake, Kalyan, Maharashtra, India. International Journal of Zoology and Applied Biosciences, vol. 5(3): pp. 163-169.

18. Bhute K. B. and Harney N. V. 2020. Diversity of Benthic Fauna of Nagrala lake, Bhadrawati, District Chandrapur(MS), India. Aayushi International Interdiscriplinary Research Journal, vol. 7(10): pp. 41- 43.
19. Gadekar G. P. 2020. Variation in zooplankton diversity of Kalisarar dam of Gondia District, Maharashtra. International Journal for Environmental Rehabilitation and Conservation, vol. XI (SP2): pp. 48-53.
20. Jadhav S., Borde S. Jadhav D. and Humbe A. 2012. Seasonal variations of zooplankton community in Sina Kolegoan Dam Osmanabad district, Maharashtra, India. Journal of Experimental Sciences, vol. 3(5): pp. 19-22.
21. Meshram M. P., Cherian K. J. and Bodkhe S. S. 2014. Studies on the Physico-chemical status of two water bodies at Nagpur city under Anthropogenic influences. International Journal of Reserches in Biosciences, Agriculture and Technology, Vol. I2(3): pp 130-144.
22. Bhandarkar S. V. 2015. Crustaceans in lentic ecosystem of Dhukeshwari temple pond Deori with reference to cultural Eutrophication. Review of research, vol. 5(1): pp.1-12.
23. Bhandarkar S. V. 2015. Species diversity of Rotifers in lentic ecosystem of Dhukeshwari temple pond Deori with reference to cultural eutrophication. Internatinal Journal of Current Microbiology and Applied Sciences, vol-04(9): pp- 736-743.
24. Khaire B. S. 2020. Correlations of Zooplankton population with some physico-chemical (India). International Journal of Innovative Science, Engineering & Technology, vol. 7(11): pp. 140-147. Lande, V. W. 2021. Biomonitoring of water environment in river, ponds and lakes. Journal of Global Bioscience, vol-10; pp- 8458- 8477.
25. Munde A. S. and More P. R. 2020. Diversity of zooplankton and seasonal variation of density in Sukhana Dam, Garkheda Dist Aurangabad (M.S.) India. International Journal of Advanced Research in Science, vol. 7(6): pp. 91-97.
26. Darvekar A. and Raut V. 2022. Studies on diversity, seasonal variation and zooplankton community of freshwater, Ramadeshwar lake (Hirwa Talav) of Tahsil–Ramtek, Dist – Nagpur, Maharashtra, India. World Journal of Pharmaceutical and Life Sciences, vol. 8(10): pp. 91-99.