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Comparative Diversity of Some Common Selective Planktons Occupy in Sapna and Kosmi Dams of Betul District

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Abstract: Planktons are normal living organisms sustaining in water and maintain water quality for other living organisms. Man-made resources of water are stored on Earth for many purposes including irrigation and fish forming. In which included a wide variety of organisms with phytoplankton and zooplankton. This research focused on some types of common planktons available between the Sapna and Kosmi dams in Betul district. The various methods are used for analysis of common phytoplankton of three groups namely Bacilliriohyceae, Chlorophyceae and Cyanophyceae and also common zooplankton of four groups known as Cladocera, Copepods, Protozoa and Rotifers etc. available in both the dams.

INTRODUCTION

Generally, feeding on some important plankton such as phytoplankton and zooplankton for high production of fish is ubiquitous in the ecosystem of the water body. Plankton found in freshwater reservoirs, including ponds, dams, lakes and oceans, are good indicators of a healthy environment. Many types of plankton are usually seen microscopically; some are larger and can be seen directly with the naked eye [1-4]. At present only half of the potential of aquatic resources is being tapped for the fisheries sector, which can be increased from a scientific point of view, especially through management of catchment area activities and application of new technologies.

Plankton is well documented for the ecological status of water resources as it is an essential part of the food chain of aquatic systems. They play an important role in the cycling of dissolved organic matter in aquatic ecosystems [5]. Aquatic life in which resources such as fish are food producers through communities of plankton have many economies value [6].

Plankton is an important food source for fish and other aquatic organisms that persist in water bodies [7]. In which the zooplankton form a central place in the food cycle as an eco-friendly behavior with other species after the phytoplankton of the aquatic ecosystem. It is an integral part of the lentic community, contributing significantly to the biological productivity of freshwater ecosystems [8]. Plankton is an important protagonist in the structure of an aquatic ecosystem and plays an important role in energy transfer [9]. The planktons are small living organisms that make their own food like water-soluble nutrients. Some organisms that rely on small phytoplankton use freshwater resources of ecosystems as primary consumers to play a ceremonial role beyond that in stabilizing the food chain. Planktonic autotrophs and heterotrophs of fish and planktonic fish produce a specific association in energy transfer in the aquatic food web [10]. Aquatic ecosystems are affected by many health stresses, which greatly reduce biodiversity [11].

The diversity of different types of plankton helps the learner to study and understand the actual condition of the freshwater reservoir, the aquatic ecosystem known to sustain the efforts of different organisms [12, 13]. These planktons are free-floating forms under the microscopic observation of animals found in aquatic ecosystems. It is very important and useful to create general awareness among people to prevent water pollution and improve other uses of such valuable water sources in near future [14]. In Sapna and Kosmi Dam plankton diversity was conducted to examine the status of seasonal variations in the density and diversity of phytoplankton and zooplankton in the freshwater frames of the dams. Plankton acts as a pollutant in water bodies, so to determine the presence of different groups; Plankton diversity provides a standard parameter for determining the presence of water bodies in polluted and non-polluted habitats [15-17].

The life history of plankton species is influenced by seasonal changes in biological factors that increase ecological and predictive pressures [18, 19]. In the future, biodiversity loss and its impacts are projected to be greater for aquatic ecosystems than for terrestrial ecosystems [20]. The biodiversity of phytoplankton and zooplankton is also rich in nature [21]. In India, freshwater ecosystems are most threatened by man-made reservoir deforestation, seasonal flooding, polluted wetlands and loss of forests from surrounding waters [22]. A special action is needed to protect the water-valued animal plankton through extensive scientific studies. The heterotrophic activity of zooplankton plays an important role in the cycling of organic matter in aquatic ecosystems and is used as a bio indicator of a healthy biological quality in the aquatic environment [23].

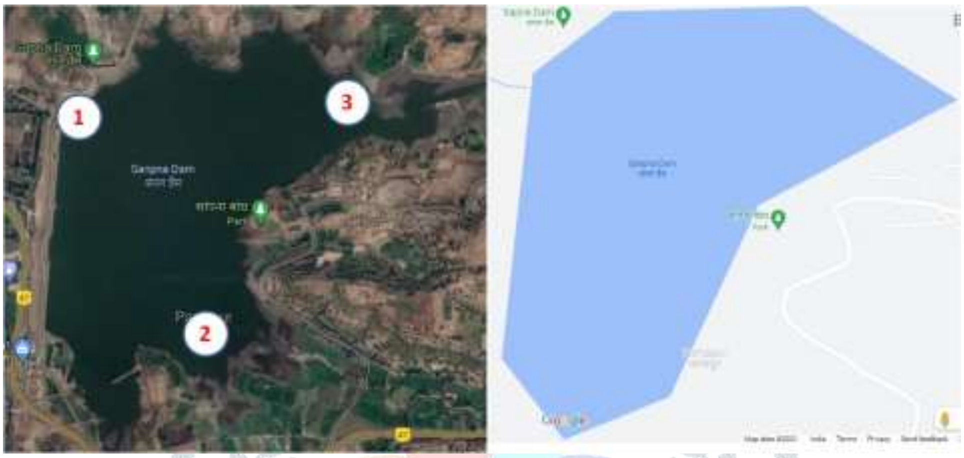

Figure 1: Satellite image of Sapna Dam and study sites

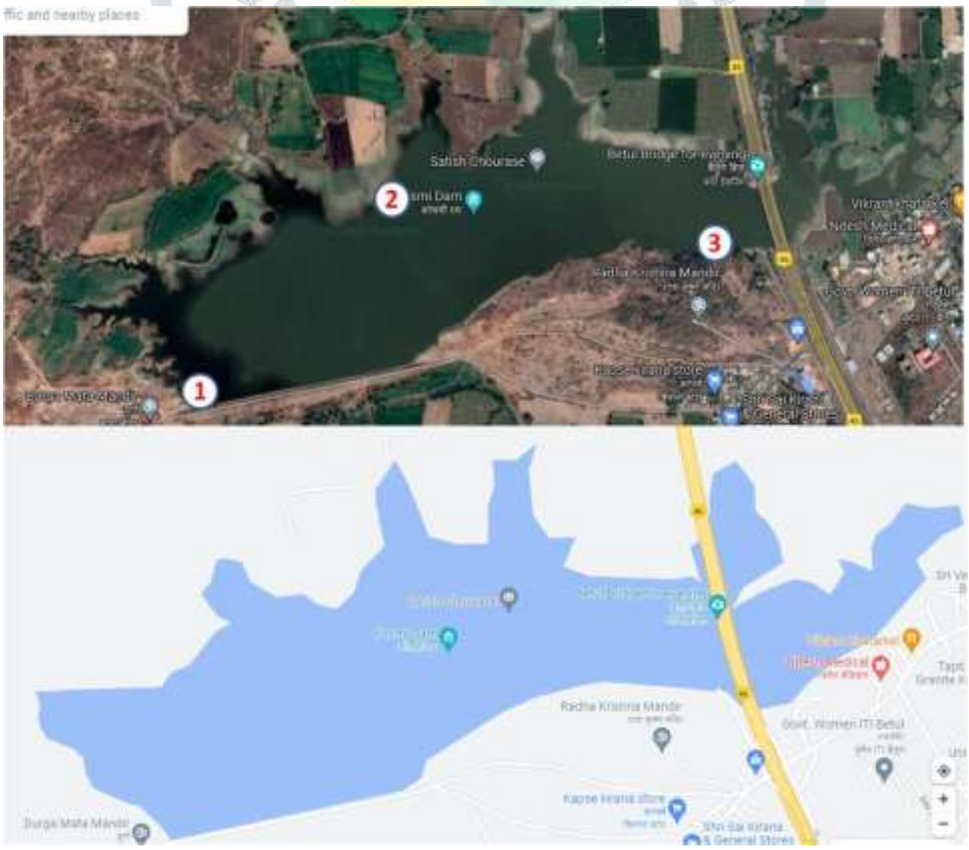

Figure 2: Satellite image of Kosmi Dam and study sites

Three study sites were selected from both the Sapna and Kosmi dams at standard length intervals from outside of city. The Sapna Dam was a very old dam located on the Betul to Multai main road surround by three sites with mountain, the details of which are shown in Figure 1. The geological structure of the Sapna dam like as snake head, and Kosmi Dam was located on Bhopal to Nagpur highway near of Sonaghati village and local industrial areas of city and map appears as a lion when viewed from a satellite, the details are shown in the Figure 2.

The total plankton abundance observed in a year was divided into three seasons, namely summer, monsoon and winter; in which fine one season is equal to four months. The overall density of phytoplankton and zooplankton diversity ranged from high to low according to seasonal variation. Based on samples collected from the Sapna and Kosmi dams, which have different patterns of abundance, abundance and species diversity, monthly diversity has been observed, with some limited effects on phytoplankton and zooplankton richness and freshwater fish production. Individual abiotic parameters are influenced to promote.

The nutritional level parameters of water bodies play an important role in controlling the production of plankton which is the natural food of many species of fish. Phytoplankton or zooplankton in particular provide an important food source for many omnivorous and carnivorous fish, and the protein also supports essential amounts of other nutrients for the rapid growth of larval carp. The biological characteristics of water at different locations are measured with the help of limnological measuring instruments to improve the water quality [25].

MATERIALS AND METHODS

Sample site

Three stations selected from both the dams, namely S1, S2 and S3 of the Sapna and Kosmi dams, at an average distance from one to the other sites, were selected for the collection of samples with live organisms. These are located in three directions of the Sapna and Kosmi dams where easy samples stored for further analysis of the following properties. One year study data from March 2019 to February 2020 was collected the cluster of four months and divided in three seasons and measured seasonal parameters correlate changes, such as summer (March, April, May and June), monsoon (July, August, Sept, and October), and winter (November, December, January and February) [26-28].

Collection of samples

The study area was visited at monthly intervals during the period of one year. Water samples containing living organisms were collected from study sites in time from 8:00 am to 10:00 am, samples of which were mainly used for analysis were collected from fine mesh [29, 30]. Successful collection of samples was basically dependent on the selection of suitable time period of collection various water depth.

This method was mainly used to collect various sized phytoplankton and zooplankton. In which were completely sterilized form with used 70% ethanol. The collections of samples were obtained from the water surface level to the desired depth of the laminic zone and maintained plankton concentrations of various sizes [31].

The obtained samples from filtered water for specific phytoplankton and zooplankton were available along with valuable amounts of plankton qualitative. Although the collection of plankton was applied to a mesh net made of silk and nylon was used to collect a variety of plankton and a variety of trap sizes from 65µm to 2 mm. The net size of the trap material was designed to influence the type of plankton collected by the trap, which was best suited to the size of the pore used to collect a variety of phytoplankton and plankton for related studies [32].

Plankton analysis

Most of them have microscopic, unicellular and multicellular forms, ranging in size from a few microns to millimetres. In addition to size differences, there is also variation in morphological structures positions. Evaluation of phytoplankton and zooplankton was specific areas primarily depend on the specific plankton samples [33-35].

Fixation

The fixation of plankton was emphasized before the determination of phytoplankton and zooplankton, used distilled water for 1-2 min to remove sludge and germs. The specimen was fixed within 5 min used fixing reagents such as formaldehyde: water in a ratio (1:9) and fixed formalin at a pH 7.5 and used 2% propylene glycerol in a fixative for resistance to infection by microorganisms [35].

Preservation

After fixation, the planktons were transferred in 70% ethanol to dry and maintain specimens to preserve, with glycerine was added as per needed at 25 °C [36].

Identification

This involved various steps such as sample cleaning, staining, dissection and slide preparation. Plankton species were identified as a set of distribution patterns of phytoplankton and zooplankton, and community structure under the microscope observation.

The correlation between the different parameters was calculated for phytoplankton and zooplankton. The number of species present in an area's richness was positively correlated with some measure of ecological diversity [37]. The three major groups of phytoplankton studied were the Bacillariophyceae, the Chlorophyceae, and the Cyanophyceae. The four major groups in the study of zooplankton are Rotifera, Cladocera, Copepoda, and Protozoa.

RESULTS AND DISCUSSION

Plankton analysis

Most of them contain microscopic observations of plankton in unicellular and multicellular forms, ranging in size from a few (phytoplankton and zooplankton) microns to cm. In addition to size differences, there is also variation in morphological structures and taxonomic conditions. Plankton play an important role in studying the diversity of ecosystems. Phytoplankton and zooplankton occurrence and distribution impact on fish potential.

Phytoplankton analysis

The diversity of phytoplankton groups from three sites of both Sapna and Kosmi dams was analyzed for a total of twelve months from March-2019 to February-2020. In which three groups Bacillariophyceae, Chlorophyceae and Cyanophyceae were obtained.

Phytoplanktons found in the different organisms belonging to the three groups were derived from the water of both Sapna and Kosmi dams. The dams were divided into three investigation sites S1, S2, and S3 respectively observation was found 14 organisms belonging from three groups kwon as group Bacillariophyceae (Cymbella, Diatoms, Fragilaria, Melosira, and Synedra), group Chlorophyceae (Chlorella, Cladophora, Microspora, Oedgonium, Spirogyra, and Volvox), and group Cyanophyceae (Anabaena, Nostoc, and Spirulina) shown monthly frequency of phytoplankton were obtained from twelve months.

The phytoplankton diversity was described group wise monthly frequencies of organisms from site S1 of Sapna dams show as Bacillariophyceae (Diatoms > Synedra > Fragilaria Cymbella, Melosira), Chlorophyceae (Oedgonium, Spirogyra, Volvox > Chlorella > Cladophora > Microspora), and Cyanophyceae (Nostoc > Spirulina > Anabaena). The details are shown in Figure 3. The phytoplankton diversity was described group wise monthly frequencies of organisms from site S2 of Sapna dams show as Bacillariophyceae (Diatoms > Cymbella > Synedra > Fragilaria > Melosira), Chlorophyceae (Oedgonium > Volvox > Spirogyra, > Microspora Chlorella, Cladophora), and Cyanophyceae (Nostoc > Anabaena > Spirulina). The details are shown in Figure 4. The phytoplankton diversity was described group wise monthly frequencies of organisms from site S3 of Sapna dams show as Bacillariophyceae (Diatoms, Melosira > Synedra > Fragilaria, Cymbella), Chlorophyceae (Volvox > Oedgonium > Spirogyra > Chlorella, Microspora > Cladophora), and Cyanophyceae (Nostoc > Spirulina > Anabaena). The details are shown in Figure 5.

The phytoplankton diversity was described group wise monthly frequencies of organisms from site S1 of Kosmi dam show as Bacillariophyceae (Diatoms > Synedra > Melosira > Cymbella > Fragilaria), Chlorophyceae (Oedgonium, Spirogyra, Volvox > Chlorella, Microspora > Cladophora), and Cyanophyceae (Nostoc > Spirulina > Anabaena). The details are shown in Figure 6. The phytoplankton diversity was described group wise monthly frequencies of organisms from site S2 of Kosmi dam show as Bacillariophyceae (Diatoms, Synedra > Fragilaria, Melosira > Cymbella), Chlorophyceae (Chlorella, Oedgonium > Spirogyra > Volvox > Cladophora > Microspora), and Cyanophyceae (Nostoc > Spirulina > Anabaena). The details are shown in Figure 7. The phytoplankton diversity was described group wise monthly frequencies of organisms from site S3 of Kosmi dam show as Bacillariophyceae (Diatoms > Melosira > Synedra > Cymbella, Fragilaria), Chlorophyceae (Oedgonium > Spirogyra > Chlorella, Microspora, Volvox > Cladophora), and Cyanophyceae (Nostoc > Anabaena > Spirulina). The details are shown in Figure 8.

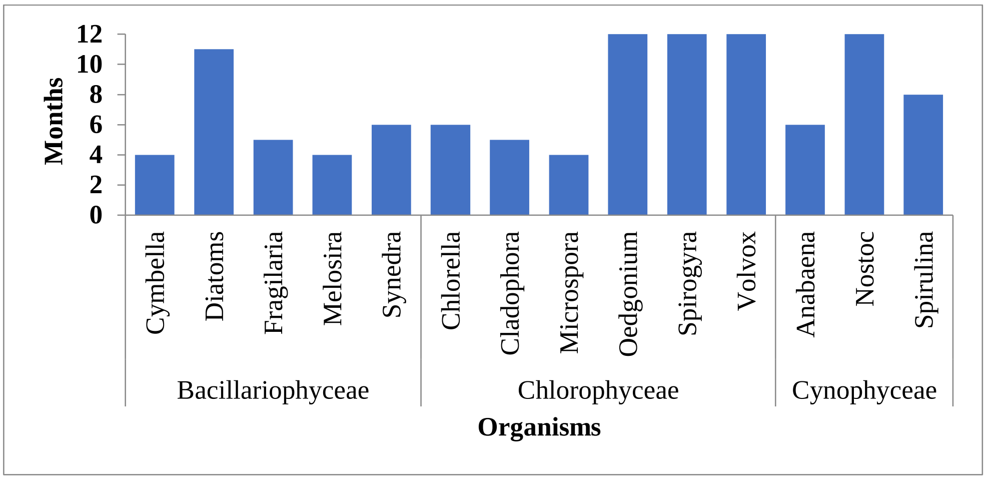

Figure 3: Phytoplankton from site S1 of Sapna dam.

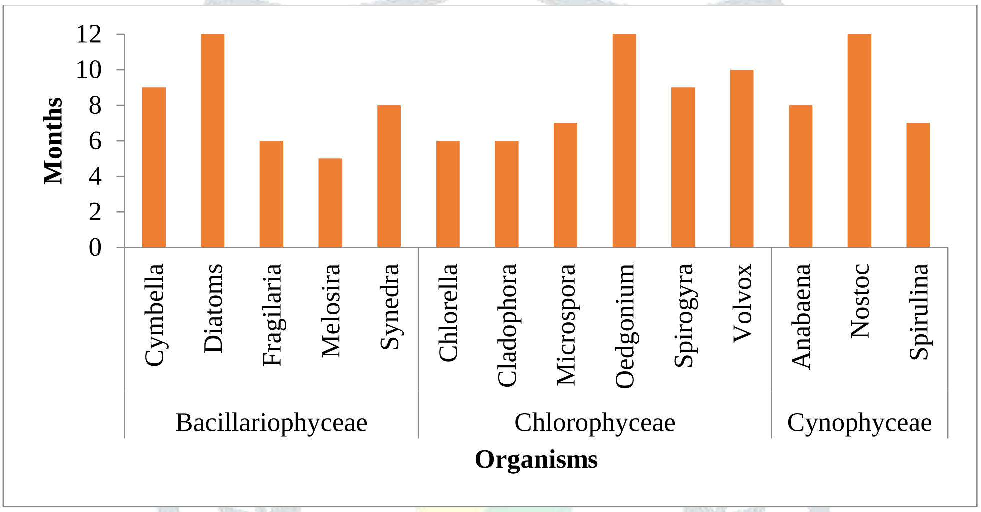

Figure 4: Phytoplankton from site S2 of Sapna dam.

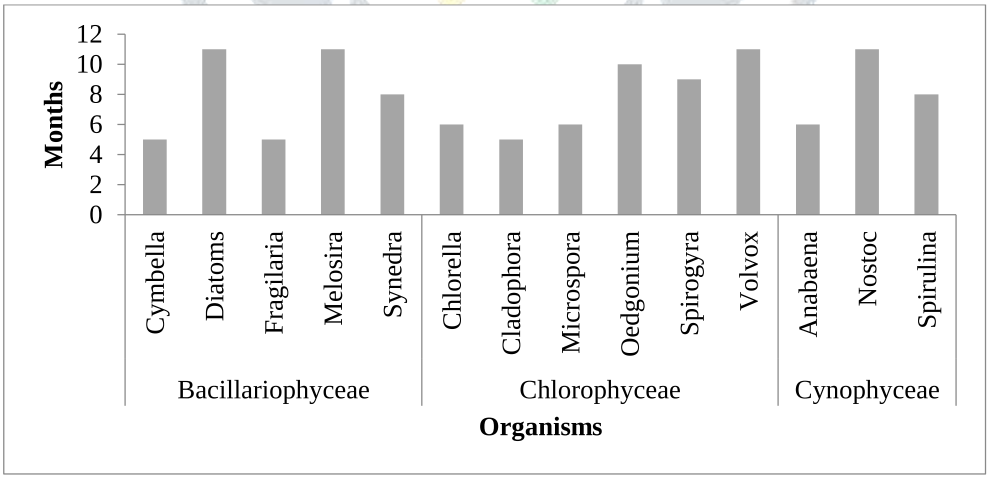

Figure 5: Phytoplankton from site S3 of Sapna dam.

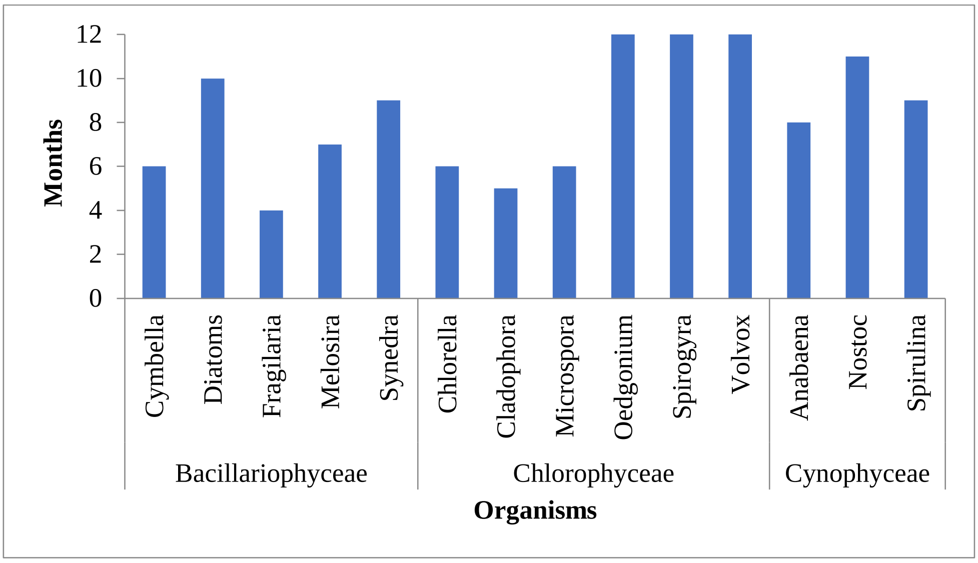

Figure 6: Phytoplankton from site S1 of Kosmi dam.

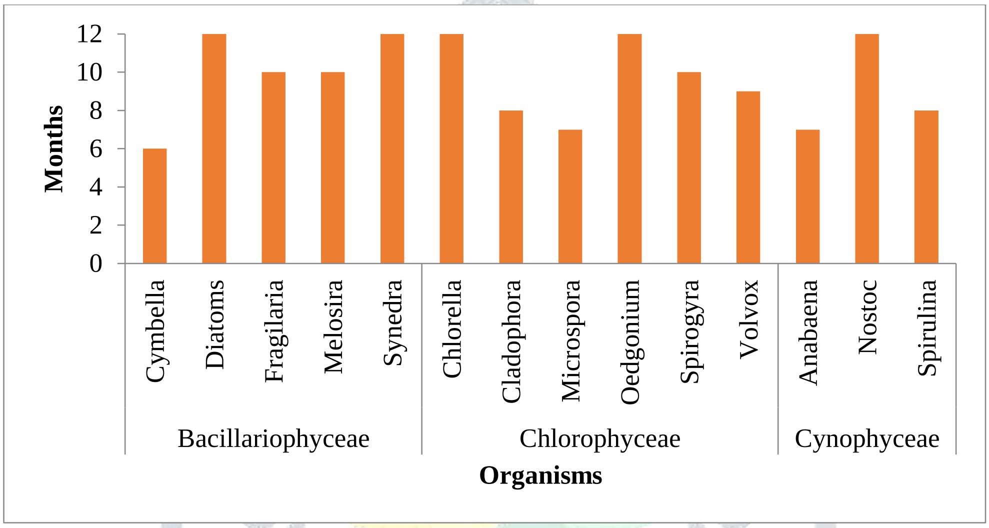

Figure 7: Phytoplankton from site S2 of Kosmi dam.

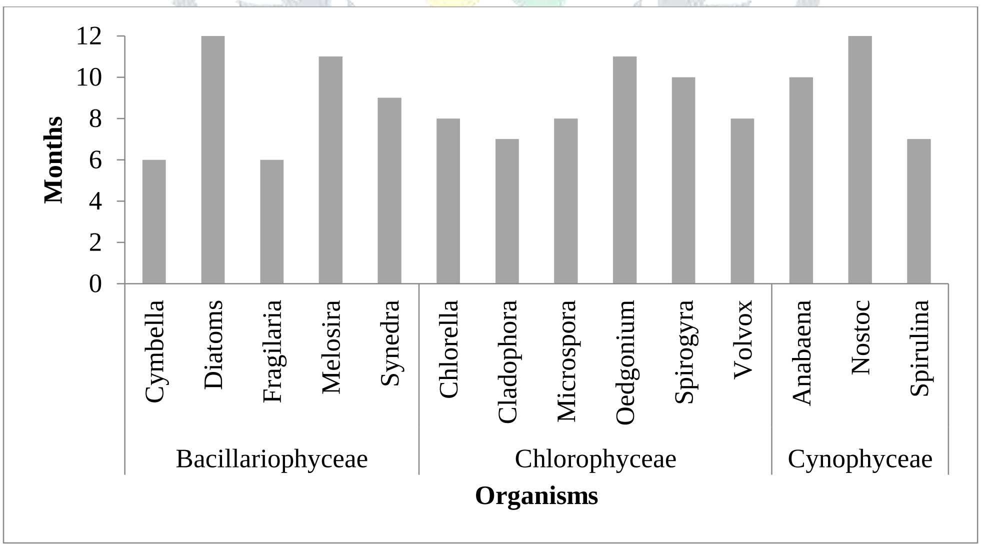

Figure 8: Phytoplankton from site S3 of Kosmi dam.

Zooplankton analysis

The zooplankton obtained from the water body of both the Sapna and Kosmi dams were found to be different organisms belonging to four groups. The dams were divided into three investigation sites S1, S2, and S3, respectively, belonging to four groups in observation as 16 organisms were found such as the group Cladocera (Bosmina, Chydorus and Moina), the group Copepoda (Cyclops and Dioptomus), the group Protozoa (Amoeba, Euglena, and Paramecium), and the group Rotifers (Ascomorpha, Brachionus, Colurella, Epiphanees, Keratella, Notholca, Rotatoria and Trichocera) showed that the monthly frequency of zooplankton was obtained from twelve months.

The zooplankton diversity was characterized by group-wise monthly frequencies of organisms from site S1 of the Sapna Dam, such as the group Cladocera (Chydorus, Moina > Bosmina), the group Copepoda (Cyclops > Dioptomus), the group Protozoa (Paramecium > Euglena > Amoeba), Group rotifers (Brachionus, Keratella > Ascomorpha, Rotatoria > Coleurella, Epiphanees, Notholka > Trichocera). The details are shown in Figure 9.The zooplankton diversity was characterized by group-wise monthly frequencies of organisms from site S2 of the Sapna dam, such as group Cladocera (Bosmina, Chydorus, Moina), group Copepoda (Diaptomus > Cyclops), group Protozoa (Paramecium > Amoeba, Euglena), group Rotifers (Brachionus, Keratella > Ascomorpha > Coleurella, Notholca, Rotatoria, Trichosera > Epiphanees). The details are shown in Figure 10. The Zooplankton diversity was described from Site S3 of the Sapna Dam show group wise monthly frequencies of organisms such as Cladocera (Bosmina > Moina > Chidorus), Group Copepoda (Cyclops > Diaptomus), Group Protozoa (Paramecium, Euglena > Amoeba) and Group Rotifers (Keratella > Brachionus, > Ascomorpha > Coleurella, Rotatoria > Notholca > Epiphanees, Trichosera). The details are shown in Figure 11.

This was done to determine the group-wise monthly frequencies of zooplankton diversity from site S1 of the Kosmi Dam to organisms such as group Cladocera (Bosmina > Chidorus, Moina), group Copepoda (Cyclops > Dioptomus), group Protozoa (Paramecium > Euglena > Amoeba), and group Rotifers (Caratella > Brachionus, > Ascomorpha, Coleurella > Epiphanees, Notholca, Rotatoria > Trichocera).The details are shown in Figure 12. Zooplankton diversity from site S2 at Kosmi Dam was shows their monthly frequencies of group-wise organisms such as group Cladocera (Chydorus > Bosmina, Moina), group Copepoda (Cyclops > Diaptomus), group Protozoa (Euglena, Paramecium > Amoeba), and group Rotifers (Brachionus > Keratella > Ascomorpha, Notholca, Rotatoria > Colurella > Trichocera > Epiphanees). The details are shown in Figure 13. The group-wise monthly frequencies of organisms for the diversity of zooplankton from the site S3 of the Kosmi Dam were shown such as group Cladocera (Chydorus > Bosmina > Moina), group Copepoda (Cyclops, Diaptomus), group Protozoa (Paramecium > Euglena > Amoeba), and group Rotifer (Brachionus, Keratella > Ascomorpha > Colurella, Rotatoria > Epiphanees, Notholca, Trichocera). The details are shown in Figure 14.

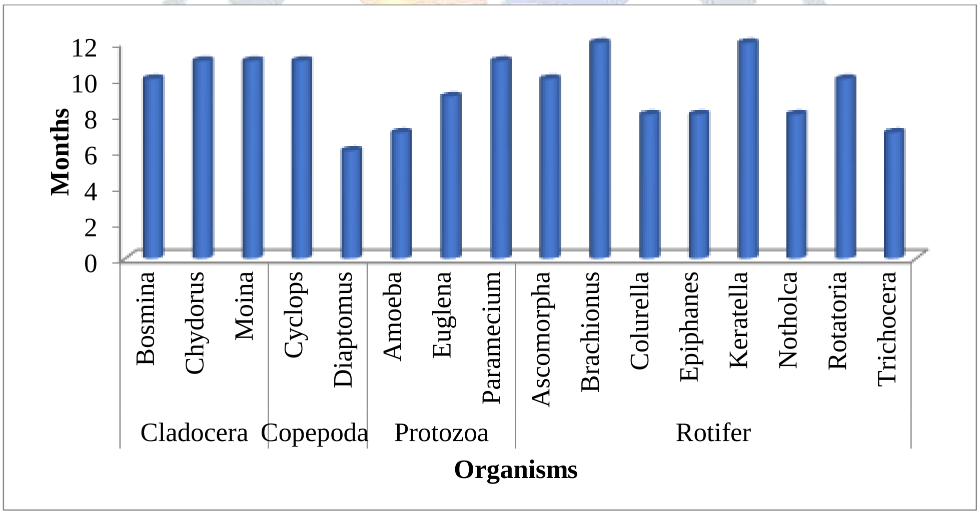

Figure 9: Zooplankton from site S1 of Sapna dam.

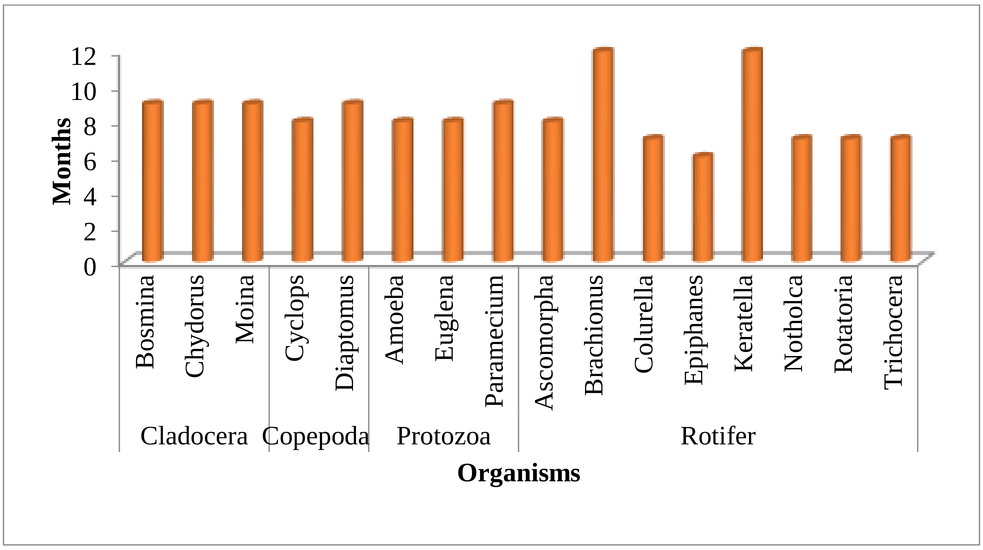

Figure 10: Zooplankton from site S2 of Sapna dam.

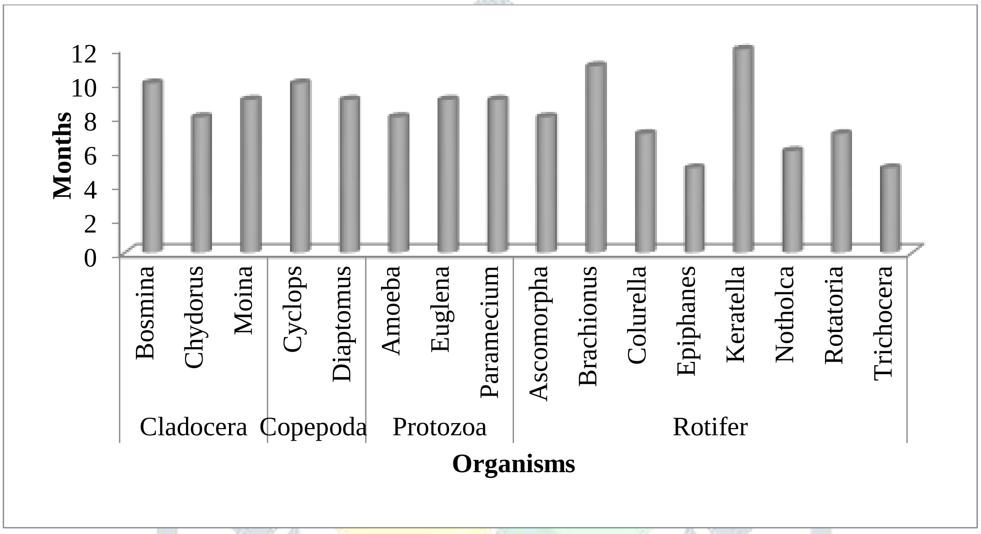

Figure 11: Zooplankton from site S3 of Sapna dam.

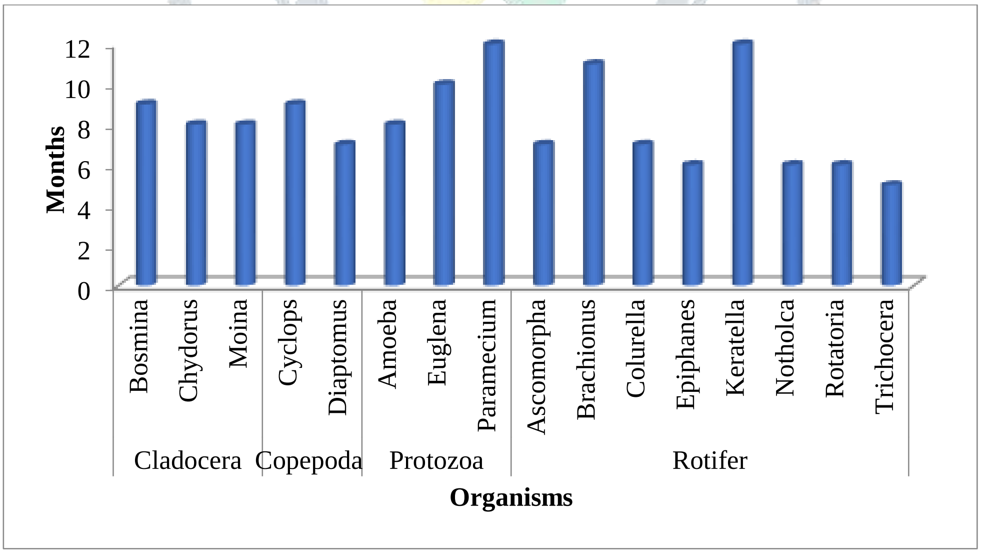

Figure 12: Zooplankton from site S1 of Kosmi dam.

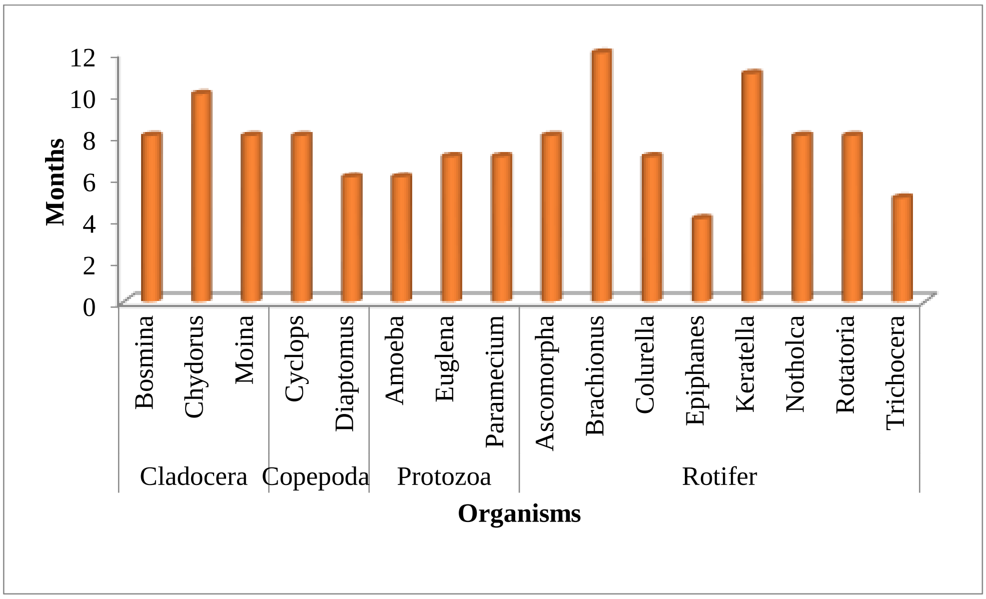

Figure 13: Zooplankton from site S2 of Kosmi dam.

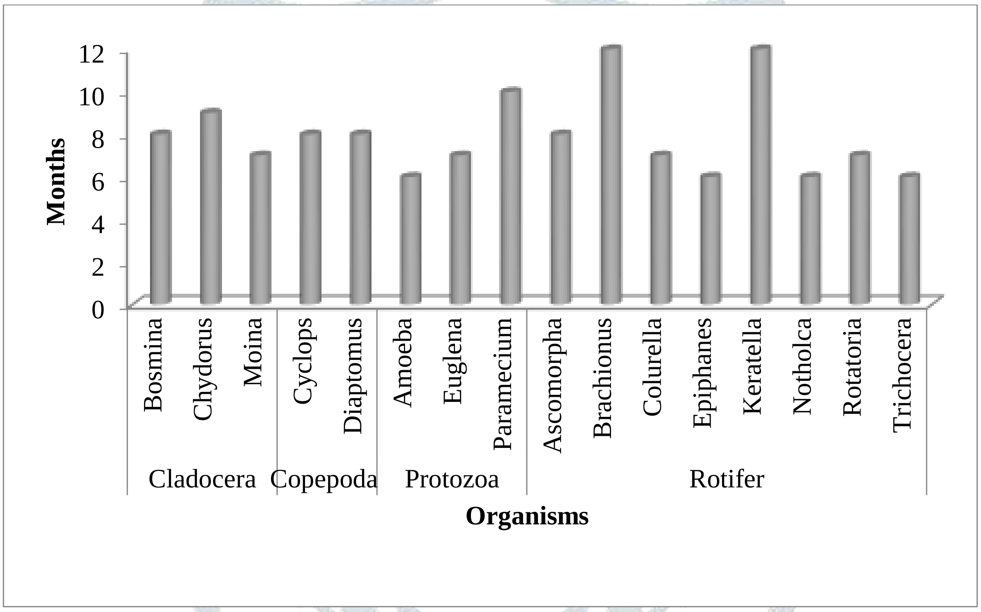

Figure 14: Zooplankton from site S3 of Kosmi dam.

Phytoplankton diversity from sites

Phytoplankton found in different organisms of three different groups were obtained from three selected sites of both Sapna and Kosmi dams.

Phytoplankton in Sapna and Kosmi dams

The Sapna Dam was divided into three test sites which are respectively S1, S2, and S3. The frequency of phytoplankton detected in the observational test results is given as a site-wise distribution with a maximum frequency at 35% of phytoplankton in site S2, and an average frequency at 33% of phytoplankton in site S3, and site S1 was found to have a minimum frequency at 32% of phytoplankton. The locations shown (S2>S3>S1) were the frequencies of phytoplankton obtained from one year. The details are shown in Figure 15.

The Kosmi Dam was divided into three investigation sites, known as S1, S2 and S3, respectively, the observation found the investigation results and the frequency of phytoplankton known as the site-wise distribution. Because site S2 has a maximum frequency at 36% of phytoplankton, site S3 has an average frequency at 33% of phytoplankton and also site S1 has a minimum frequency at 31% of phytoplankton. The locations shown (S2>S3>S1) were the frequencies of phytoplankton obtained from one year. The details are shown in Figure 16.

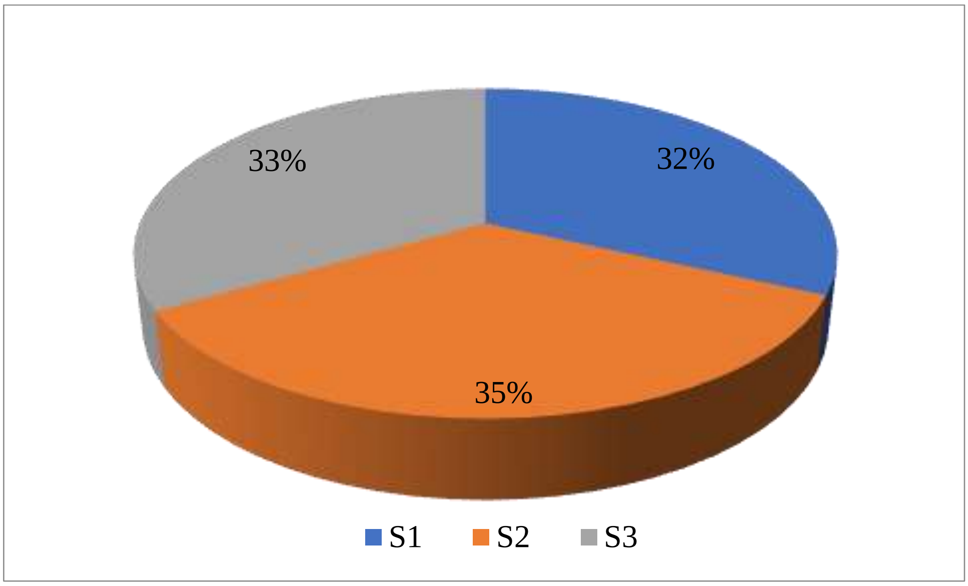

Figure 15: The sites frequency of phytoplankton in Sapna dam.

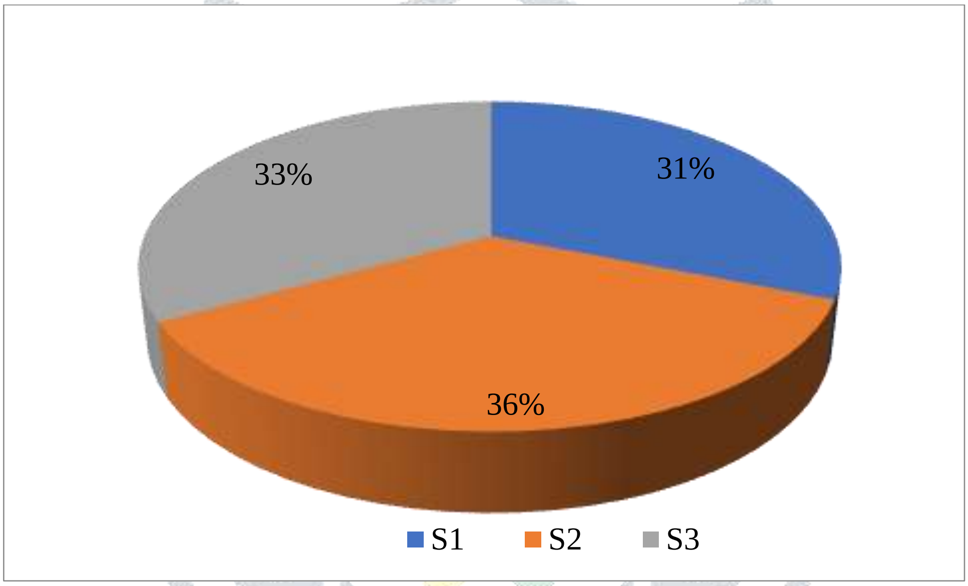

Figure 16: The sites frequency of phytoplankton in Kosmi dam.

Zooplankton diversity from sites

Zooplanktons found in different fauna from the four groups were obtained from the area of three selected water sites of both the Sapna and Kosmi dams.

Zooplankton in Sapna and Kosmi dams

The Sapna Dam was divided into three probe sites S1, S2, and S3 respectively. The results of the observation and determination of the frequency of zooplankton were determined, respectively, which is known as the site wise distribution because the zooplankton in sites S2 and S3 have the minimum equal frequency at 32% and the zooplankton in site S1 have the maximum frequency at 36%. The locations shown (S1 > S2 = S3) were the frequencies of zooplankton obtained from one year. The details are shown in Figure 17.

The Kosmi Dam was divided into three sites for investigation, S1, S2, and S3, respectively, the observation that the results of the investigation were found and the frequency of zooplankton determined, which is displayed as a site-wise distribution, as in site S1 the maximum frequency occurs at 35% of the total zooplankton, with site S3 having an average frequency. The minimum frequency is at 33% of the total zooplankton, and at 32% of the total zooplankton in Site S2. The locations shown (S1>S3>S2) were the frequencies of zooplankton obtained from one year. The details are shown in Figure 18.

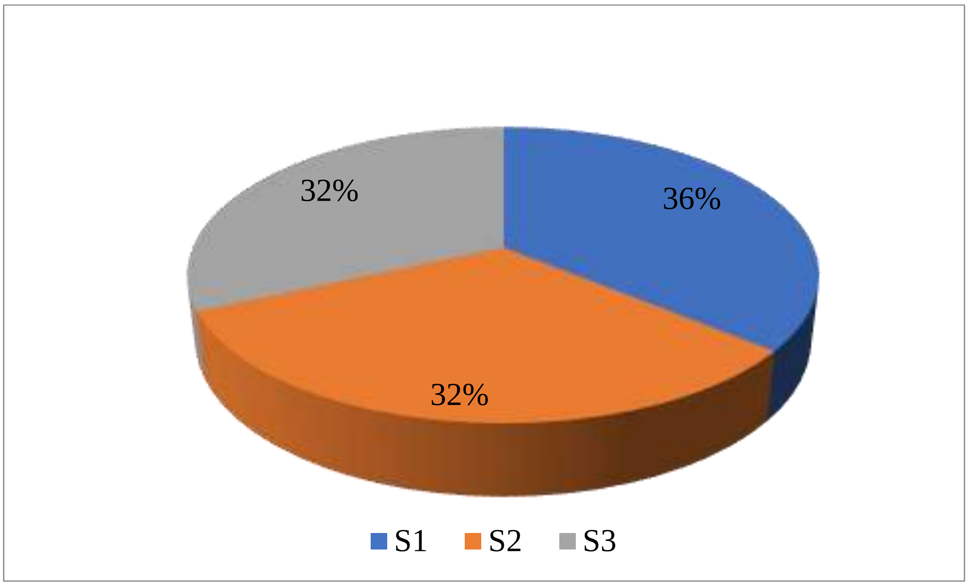

Figure 17: The sites frequency of zooplankton in Sapna dam.

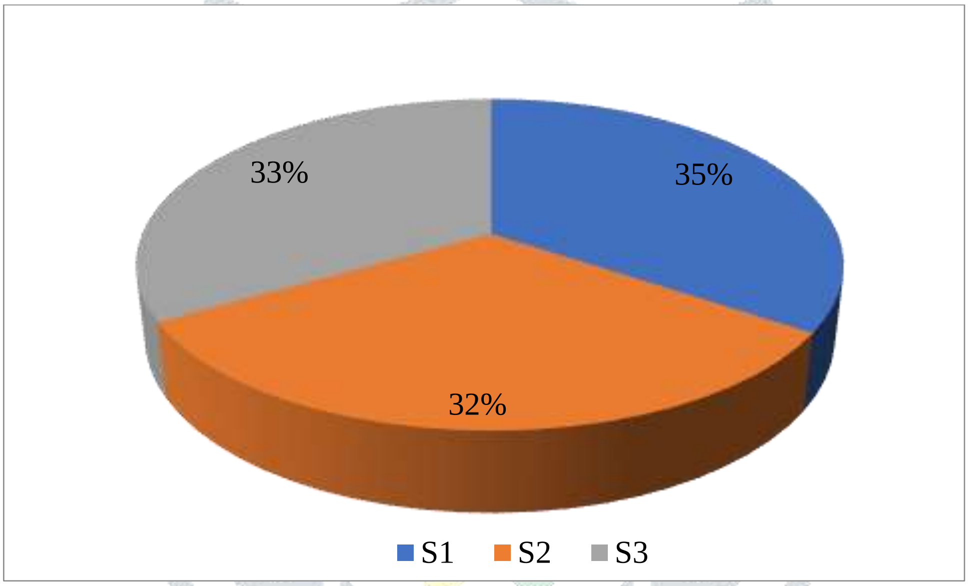

Figure 18: The sites frequency of zooplankton in Kosmi dam.

CONCLUSIONS

Plankton including phytoplankton and zooplankton obtained from both the dams have been studied month-wise. While one Sapna dam is located in the forest and hilly area and the other Kosmi dam is located in industrial where industrial raw fluid is discharged. Based on the results of phytoplankton and zooplankton quantity analyses, sufficient is available in Sapna Dam and moderately low in Kosmi Dam.

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