SUMMARY

Water is one of the prime necessities of life and it is an essential and most abundant substances available to mankind. Protoplasm in most living cells contains about 80% of water. It might be said that all life is aquatic, means water is the principal external as well as internal medium.

Limnology concerns mainly large and varied physical, chemical and biological characteristics of water and its relationship with aquatic animals and environment. The different parameters in one or the other way have significant influence on the aquatic life. Thus, it can be said that all the aspects of water ecology and its dynamics are considered in limnology.

According to Tyagi et.al. (1989) every five litre of water has only one teaspoonful of sweet water. Since man is not careful in using the water, he inadvertently pollutes it. Deterioration of the aquatic environment due to wide spread application and abuse of chemicals have been widely recognized with the intensification of agriculture with other farming practices. Various inputs such as fertilizers, pesticides and industrial effluents find their way in to the aquatic environment and thus affect the biotic life, their habitat, basic behavioral patterns and reproduction. Fresh and clean drinking water is essential requirement for healthy life. In the deteriorating condition people get affected with water borne diseases and other problems due to polluted water. Any change in the physicochemical properties of water as well as combination of any foreign substance that lead to health hazards can be termed as water pollution. This change is mainly due to human activities.
such as rapid urbanization and industrialization coupled with injudicious exploration of natural resources.

Limnology as a branch of biological science took its beginning as early as Leeawenhock (1674). Study of lakes as a science started in 1887 when Forbs described the lake as a microcosm, a little world within itself. Forel (1901) for the first time designated these studies as limnology and wrote an inspiring book. “The Science of Lakes” which provided an impetus for investigation of freshwater and many workers entered in to this new field. Since 1918 with the progress in this field various scientists in many countries have looked at it with slightly different views.

The phytoplankton and zooplankton play an important role as the supplier of organic matter which directly or indirectly serve as food to all living organisms. Various scientists engaged in this study find this relationship far more complicated than what it was presumed to be by earlier workers as the plankton form not only the main food of the aquatic fauna but also from the bottom deposits after dying.

The Angoori reservoir is an irregularly shaped manmade reservoir. Its construction started in the year 1992-93 on Angoori nalaa, tributary of Pahuj river. This reservoir has been constructed with the help of J.B.I.C. It was completed in the year 2004. This reservoir is situated in district Datia (M.P.) at longitude 78.28° and latitude 25.38° on NH no.75, 9 km. from Datia head quarter. Delhi-Mumbai train way and NH 75 are on the North side, village Gandhari, Pisnari, Lamaych are on the South-West side of the reservoir and West side is covered with the rock. Derra and Chirulla villages are situated on the Eastern side of the reservoir.

Catchment area of this reservoir is 162sq. km. it has the capacity of 2.55 million cubic meters while live capacity is 2.05 million cubic
meters. Maximum water level is 235.60 sq. km, while river bed level is 230.5 million cubic meters. The reservoir has submerged area of 197 hectares. The gross command area is 57683 hectares. The reservoir is an important source for irrigation in district Datia. About 246 villages are benefitted from this reservoir.

A systematic limnological study has been made to understand the physical and chemical characteristics of water and biotic components of the Angoori reservoir with special reference to fish diversity. Monthly observations were made for two years from January 2009 to December 2010. Four sampling stations were set up in varied ecological zones of Angoori reservoir. Station ‘A’ was near of village Gandhari, Pisnari, Lamaycha on the South-West, Station ‘B’ was on the West side of the reservoir covered with rock and unused land, Station ‘C’ was on the North side of Delhi – Bombay train route and NH 75 and the station ‘D’ was on East side of reservoir near the Derra and Chirulla village.

The present research work has been carried out to investigate the limnology of Angoori reservoir, to have firsthand knowledge and get base line data of the water quality and productivity as well as fish and planktonic diversity and physico-chemical characteristics of water. The present study will be beneficial not only academically but will also help in water quality improvement of the water body. The present study has been undertaken keeping in view the following objectives.

1. A general survey of the reservoir with reference to its history, geographical situation, geological and climatic condition.
2. To test and find out the physico-chemical properties of reservoir water.
3. The qualitative analysis and correlation of water samples to evaluate the physico-chemical parameters.
4. Biological study of plankton and fish diversity.
The physico-chemical characteristics of water of Angoori reservoir including the water colour, odor, temperature, transparency, electrical conductivity, total dissolved solids, pH, dissolved oxygen, biological oxygen demand, chemical oxygen demand, free carbon dioxide, total alkalinity, calcium hardness, magnesium hardness, total hardness, chlorides, sulphates, sodium, potassium, and nitrates were analyzed on monthly basis at selected stations in the reservoir. The analyses of samples was based on standard methodology outlined by APHA (1985), Trivedy and Goel (1986), and Adoni (1985).

In biological assessment, planktonic fauna, fish and fisheries were studied. The identification of the aquatic biota were made as per the books of Fresh water microscopy (Garnat 1965), freshwater biology (Ward and Whipple 1959), Algae and water pollution (Palmer and Mervin 1980), fundamentals of limnology (Ruttner 1953), Text book of limnology (Welch 1935), Work book on limnology (Adoni 1985).

The result thus achieved after thorough investigations have been recorded properly and data is diagrammatically presented for ready reference. Plate 1 for phytoplankton, Plate 2 for zooplankton and Plate 3 for fishes and bar diagrams and tables depict the physico-chemical and biological parameters. The month wise and station wise minimum and maximum values are also given in different tables.

The findings of the current investigation are summarized as under:

The value of transparency of Angoori reservoir water ranged from 97.53 cms (station ‘D’ in September 2009 and station ‘A’ in October 2010) to 295.1 cms (station ‘B’ in February 2009). In the year 2009 the transparency ranged from 97.53 cms (station ‘D’ in September) to 295.1 cms (station ‘B’ in February), while in the year 2010 the transparency of Angoori reservoir water ranged between 97.53 cms (station ‘A’ in
October) to 231.6 cms (station ‘C’ in March). Seasonally the transparency in winter was maximum and minimum in rainy season. The maximum secchi transparency during winter season may be ascribed to the sedimentation of the silt and other suspended particles brought in during rainy season at low temperature.

The temperature of water in the present study was recorded at four sampling stations, at the time of sample collection. The temperature of the Angoori reservoir water varied from 17.10°C (station ‘A’ in January 2010) to 31.60°C (station ‘D’ in June 2010). In the year 2009 the temperature varied from 17.50°C (station ‘C’ in December) to 29.80°C (station ‘C’ in May) while in the year 2010 the temperature of Angoori Reservoir water was recorded from 17.10°C (station ‘A’ in January) to 31.60°C (station ‘D’ in June). The minimum water temperature during winter season could be due to low intensity of solar radiation and the maximum in summer season may be due to intense solar radiations. The high temperature in summer months can also be attributed to high rate of evaporation and back radiation.

The values of electrical conductivity ranged from 197.2 µmhos/l (station ‘C’ in July 2009) to 397.2 µmhos/cm (station ‘D’ in June 2010) during investigation. In the year 2009 the range of electrical conductivity was from 197.2 µmhos/cm (station ‘C’ in July) to 296.2 µmhos/cm (station ‘A’ in April) while In the year 2010 the values of electrical conductivity ranged from 227.4 µmhos/cm (station ‘A’ in August) to 397.2 µmhos/cm (station ‘D’ in June). The minimum value of electrical conductivity was recorded in winter season and maximum in summer season in the year 2009 while in the year 2010 the minimum value of electrical conductivity was in winter season and maximum in summer season. The minimum conductivity in winter season may be due to minimum dissociation of ions. In rainy season dilution effect of rains and
sedimentation of dissolved solids may be responsible for low electrical conductivity.

The total dissolved solids were observed from 123.3 mg/l at station B in January to 175.3 mg/l at station B in June in the year 2009 while in the year 2010 it was 120.5 mg/l at station D in December to 173.8 mg/l at station B in June and the average values in year 2009 were 130.0 mg/l in July to 172.4 mg/l in June and in the year 2010 they were 128.2 mg/l in August to 166.6 mg/l in June. The total dissolved solids were higher in summer season in both the years and minimum in winter season 2009 and rainy season of 2010. The total dissolved solids show more or less positive correlated with pH, biological oxygen demand, chemical oxygen demand, free carbon dioxide, total alkalinity, chloride, sulphate, sodium potassium, and nitrate during the study period 2009, 2010.

The pH value of the Angoori Reservoir water varied from 7.1 to 7.9 from January 2009 to December 2010. In the year 2009 the pH value of Angoori Reservoir water varied from 7.1 (station ‘D’ in May) to 7.8 (station ‘D’ in November) while in the year 2010 the pH value of water varied from 7.2 (stations ‘A’ and ‘D’ in May) to 7.9 (station ‘D’ in November). Maximum seasonal value was recorded in summer season in both the years and minimum seasonal value was observed in rainy season in the year 2009 while in the year 2010 it was recorded in winter season. pH also showed significant positive correlation with temperature, transparency, electrical conductivity, total dissolved solids, chemical oxygen demand, free carbon dioxide, total alkalinity, and chloride during investigation at Angoori reservoir.

In the present investigation the range of dissolved oxygen varied from 2.800 mg/l in August at station ‘D’ to 8.900 mg/l in February at station ‘B’ in year 2009 while in the year 2010 it ranged from 3.600 mg/l
at station ‘A’ in May and at station ‘D’ in September to 8.800 mg/l at station ‘A’ in January and the monthly average value of dissolved oxygen in the year 2009 was 4.100 mg/l in August to 8.300 mg/l in February while in the year 2010 it was 4.400 mg/l in April and September to 8.200 mg/l in December. The maximum seasonal value was found to be during winter seasons in both the years and minimum in rainy season in year 2009 while in the year 2010 it was in summer season. Comparatively higher temperature in rainy season might have reduced the solubility of oxygen inducing low population of phytoplankton, putrification of organic matter and presence of more free carbon dioxide in the same season. Dissolved oxygen showed positive correlation with transparency, calcium hardness, magnesium hardness, and total hardness during study period.

The values of biological oxygen demand varied from 0.400 mg/l (station ‘A’ in September and October 2009) to 5.600 mg/l (station ‘A’ in April 2009) during the study period at Angoori reservoir. In the year 2009 the biological oxygen demand ranged from 0.400 mg/l (station ‘A’ in September and October) to 5.600 mg/l (station ‘A’ in April). In the year 2010 the biological oxygen demand ranged from 1.000 mg/l (station ‘B’ ‘D’ in September) to 4.400 mg/l (station ‘B’ in June). The average values of Biological oxygen demand in year 2009 were 1.350 mg/l in August to 4.800 mg/l in May 2009 while in the year 2010 they were 1.150 mg/l in September to 4.050 mg/l in June. The seasonal value of BOD in Angoori reservoir was maximum in summer season and minimum in rainy season during investigation period showing conformity with the observations of Chatterjee (1992) in river Nuri. The correlation coefficient of biological oxygen demand was positive with electrical conductivity, total dissolved solids, chemical oxygen demand,
free carbon dioxide, total alkalinity, chlorides, sulphates, sodium potassium, and nitrates during January 2009 to December 2010.

The values of Chemical oxygen demand in Angoori reservoir water ranged between 10.50 mg/l (station 'D' in October 2010) to 38.80 mg/l (station 'B' in June 2010) during the investigation. In the year 2009 the chemical oxygen demand ranged between 10.60 mg/l (station ‘A’ in February) to 35.20 mg/l (station ‘B’ in June). In the year 2010 the chemical oxygen demand ranged between 10.80 mg/l (station ‘A’ in January) to 38.80 mg/l (station ‘B’ in June). The average values of chemical oxygen demand in year 2009 were 11.95 mg/l in September to 34.70 mg/l in June and in the year 2010 they were 10.88 mg/l in October to 34.80 mg/l in June. The seasonal average value was maximum in summer season and minimum in winter season. Chemical oxygen demand showed positive correlation with temperature, electrical conductivity, total dissolved solids, pH, biological oxygen demand, free carbon dioxide, total alkalinity, chlorides, sodium potassium, and nitrates during the study period.

During the study the free carbon dioxide value was recorded from 17.04 mg/l (station ‘A’ in December 2009) to 66.60 mg/l (station ‘D’ in May 2010). In the year 2009 the values of free carbon dioxide varied from 17.04 mg/l (stations ‘A’ December 2009) to 61.6 mg/l (stations ‘A’ and ‘D’ in June). In the year 2010 the free carbon dioxide values varied from 17.60 mg/l (station ‘A’ in January) to 66.60 mg/l (station ‘D’ in May). The average value of the year 2009 was 19.56 mg/l in December to 55.00 mg/l in June and the year 2010 it was 23.05 mg/l in January to 60.45 mg/l in May. The highest free CO₂ level during summer season may be due to the increase in population density of aquatic fauna which produce carbon dioxide by respiration. The minimum concentration of free CO₂ during winter season might be due to the decaying of organic
matter carried into the water body during the rainy season and its utilization in photosynthesis.

The total alkalinity of Angoori reservoir water varied from 96.60 mg/l (stations ‘B’ in January 2010) to 180.0 mg/l (station ‘A’ in June 2009) during investigation. The values of total alkalinity in the year 2009 varied from 100.0 mg/l (stations ‘C’ and ‘D’ in January) to 180.0 at station ‘A’ in June while, in the year 2010 the values of total alkalinity varied from 96.60 mg/l station ‘B’ in January) to 176.0 mg/l (station ‘A’ in June). The monthly average value of total alkalinity was 112.0 mg/l in December to 170.0 mg/l in June in the year 2009 while in the year 2010 it was 97.67 mg/l in January to 167.0 mg/l in June. The lowest seasonal average value was recorded in winter season and highest was in summer season in both the years. Total alkalinity showed positive relationship with temperature, electrical conductivity, chlorides and nitrates during the investigation.

The values of calcium hardness of Angoori reservoir water varied from 11.20 mg/l (station ‘D’ in March 2009) to 56.10 mg/l (station ‘C’ in January 2009) during the study period. In the year 2009 the values of calcium hardness varied from 11.20 mg/l (station ‘D’ in March) to 56.10 mg/l (station ‘C’ in January) in the year 2010 the values of calcium hardness were recorded from 14.42 mg/l (station ‘A’ in October) to 33.66 mg/l (station ‘B’ in September). The average range of calcium hardness were 15.95 mg/l in June to 52.48 mg/l in January 2009 and in the year 2010 they were 16.83 mg/l in May to 45.85 mg/l in January.

The values of magnesium hardness of Angoori reservoir water were recorded from 34.40 mg/l (station ‘A’ in June 2009) to 148.80 mg/l (station ‘C’ in November 2010) during investigation period. In the year 2009 the values of magnesium hardness varied from 35.80 mg/l (station ‘D’ in June) to 148.80 mg/l (station ‘C’ in November) In the year 2010
the values varied from 34.40 mg/l (station ‘A’ in June) to 125.2 mg/l (station ‘C’ in November), while average range varied from 42.80 mg/l in June to 128.0 mg/l in November 2009 and in the year 2010 they were 40.73 mg/l in June to 126.6 mg/l in January.

The values of total hardness varied from 52.0 mg/l (station ‘A’ in June 2009) to 170.0 mg/l (station ‘C’ in December 2009) during the study period. In the year 2009 the total hardness varied from 52.0 mg/l (station ‘A’ in June) to 170.0 mg/l (station ‘C’ in December). In the year 2010 the values varied from 54.0 mg/l (Station ‘A’ in June) to 164.0 mg/l (station ‘A’ in January). The monthly average of total hardness from 58.8 mg/l in June to 155.0 mg/l in December 2009, while in the year 2010 they were 57.30 mg/l in June to 153.0 mg/l in January.

In case of seasonal fluctuation during present study the calcium, magnesium and total hardness showed maximum average value in winter season. It might be due to less phytoplankton population and consequently fall in the utilization of magnesium content. The high level of hardness might be due to use of detergents and soaps in washing of clothes and bathing. The minimum average value of calcium, magnesium and total hardness was recorded in summer season. Calcium, Magnesium and total hardness correlated in the present investigation with each other and also with other physic - chemical parameter. Calcium showed positive correlation with transparency, total hardness, dissolved oxygen, and magnesium hardness, whereas magnesium hardness was positively correlated with total hardness, dissolved oxygen and calcium hardness and the total hardness showed positive correlation with dissolved oxygen, calcium hardness and magnesium hardness.

The values of chlorides varied from 14.01 mg/l (station ‘B’ in August 2010) to 60.06 mg/l (station ‘C’ in June 2009) during the study
period of Angoori reservoir. In the year 2009 the values of chloride ranged between 18.0 1mg/l (station ‘A’ in August and station B in July) to 60.06 mg/l (station ‘C’ in June). In the year 2010 the values of chlorides were between 14.01 mg/l (station ‘B’ in August) to 40.04 mg/l (station ‘B’ in May). The monthly average values of chlorides in the year 2009 were 19.56 mg/l in Jul. to 50.55 mg/l in Jun while in the year 2010 they were 18.2mg/l in the month of August and maximum 35.53mg/l in the month of May. The higher concentration of chlorides was during summer season while lower concentration was recorded during rainy season. Chlorides content of the reservoir water showed a positive correlation with electrical conductivity, total dissolved solids, pH, biological oxygen demand, chemical oxygen demand, free carbon dioxide, total alkalinity, sulphates, sodium, potassium, and nitrates during January 2009 to December 2010.

The values of sulphates of Angoori reservoir water ranged between 5.20 mg/l (station ‘C’ October 2009 and ‘A’ in October 2010) to 14.90 mg/l (station ‘C’ in March 2009) during the investigation period. In the year 2009 the values of sulphates were recorded from 5.2 mg/l (station ‘C’ in October) to 14.9 mg/l (station ‘C’ in March). In the year 2010 the values varied from 5.20 mg/l (station ‘A’ in October) to 13.50 mg/l (station ‘C’ and ‘D’ in June). The monthly average value of sulphate was 5.80 mg/l in October to 14.53 mg/l in March in year 2009 while in the year 2010 it was 5.98 mg/l in October to 12.98 mg/l in June. The seasonal variation in sulphate content recorded in Angoori reservoir was maximum in summer season and minimum in rainy season in the both the years. Sulphates content of the reservoir water showed a positive correlation with electrical conductivity, total dissolved solids, biological oxygen demand, chlorides, sodium and potassium during the study period.
The values of sodium in Angoori reservoir water ranged between 8.20 mg/l (station ‘C’ in August 2010) to 18.80 mg/l (station ‘A’ in June 2010) during the study period. In the year 2009 the range of sodium was between 9.60 mg/l (station ‘C’ in August) to 16.70 mg/l (station ‘B’ in June), In the year 2010 the range of sodium was between 8.20 mg/l (station ‘C’ in August) to 18.80 mg/l (station ‘A’ in June), the monthly average value of sodium was 9.85 mg/l in August to 15.35 mg/l in June in 2009 and in the year 2010 it was 8.48 mg/l in August to 18.55 mg/l in June.

The values of potassium varied from 16.50 mg/l (station ‘C’ in August 2009 and station ‘A’ and ‘C’ in July 2010) to 31.90 mg/l (station ‘B’ in June 2010) during the study. In the year 2009 the values of potassium ranged from 16.50 mg/l (station ‘C’ in August) to 31.80 mg/l (station ‘B’ in May), In the year 2010 the values of potassium ranged from 16.30 mg/l (station ‘B’ in July) to 31.90 mg/l (station ‘B’ in June), the monthly average value of potassium was 16.95 mg/l in August to 30.90 mg/l in April in year 2009 and in the year 2010 it was 16.48 mg/l in July to 31.13 mg/l in May. The maximum seasonal average of sodium and potassium were recorded in summer season in both the years. Evaporation of water is a significant factor in increasing sodium and potassium level during summer season. Their minimum value was recorded in rainy season in both the years.

Nitrates ranged from 0.380 mg/l (station ‘B’ in January 2009) to 1.680 mg/l (station ‘D’ in May 2009) during the present investigation. In the year 2009 the values of nitrates range between 0.380 mg/l (station ‘B’ in January) to 1.680 mg/l (station ‘D’ in May), in the year 2010 the values were between 0.390 mg/l (station ‘C’ in December) to 1.540 mg/l (station ‘A’ in May). The monthly average value of nitrate was 0.410 mg/l in January to 1.448 mg/l in May in year 2009 and in the year 2010.
it was 0.425 mg/l in December to 1.503 mg/l in June. The nitrate content of the reservoir water showed a positive correlation with temperature, electrical conductivity, total dissolved solids, pH, biological oxygen demand, chemical oxygen demand, free carbon dioxide, total alkalinity and chlorides during the study period.

The plankton populations growing in fresh water systems have been realized to have their indispensable participation in energy flow system. The planktonic communities usually represent the functioning of primary producers and consumers. The qualitative and quantitative change in plankton is usually affected by a number of physicochemical and biotic factors. The changes in ecological conditions and the change in planktonic composition and abundance is not only interrelated but also depend, partially or totally on each other. “Plankton population on which the whole aquatic life depends directly or indirectly is governed by the interaction of a number of physical, chemical and biological conditions of the water body and the tolerance to one or more of the conditions” (Reid and Wood 1976)

Phytoplanktons are the planktons which are able to manufacture their food by photosynthesis. They are the main biotic component of an aquatic ecosystem which not only participate in energy flow but also provide the basic food for fishes and other aquatic organisms. During the study period (January 2009 to December 2010) in total five different groups of phytoplankton were recorded at different sampling stations A, B, C and D. They were Chlorophyta, Bacillariophyta, Cyanophyta, Pyrrophyta and Euglenophyta. The group Chlorophyta dominated over other groups of phytoplanktons. The following was the order of dominance of different groups at different stations during study period which appeared accropetally:
In year 2009:

Station A
Cladocera (588org/l) > Rotifera (224org/l) > Copepoda (199org/l)
Protozoa (144org/l) > Ostracoda (40org/l)

Station B
Cladocera (440org/l) > Rotifera (249org/l) > Copepoda (186org/l)
Protozoa (168org/l) > Ostracoda (35org/l)

Station C
Cladocera (433org/l) > Rotifera (274org/l) > Copepoda (205org/l)
Protozoa (192org/l) > Ostracoda (43org/l)

Station D
Cladocera (524org/l) > Rotifera (321org/l) > Copepoda (249org/l)
Protozoa (199org/l) > Ostracoda (41org/l).

In the year 2010

Station ‘A’:
Chlorophyta (2420 org/l) > Bacillariophyta (1368 org/l) > Cyanophyta (554 org/l) > Pyrrophyta (43 org/l) > Euglenophyta (35 org/l)

Station ‘B’:
Chlorophyta (2390 org/l) > Bacillariophyta (1390 org/l) > Cyanophyta (560 org/l) > Pyrrophyta (80 org/l) > Euglenophyta (52 org/l)

Station ‘C’:
Chlorophyta (2185 org/l) > Bacillariophyta (1188 org/l) > Cyanophyta (718 org/l) > Pyrrophyta (85 org/l) > Euglenophyta (46 org/l)

Station ‘D’:
Chlorophyta (2105 org/l) > Bacillariophyta (1066 org/l) > Cyanophyta (587 org/l) > Pyrrophyta (49 org/l) > Euglenophyta (60 org/l)
The group Chlorophyta was dominant over the other phytoplankton with 8 families and 18 genera. The percent of Chlorophyta was 59.81% in the year 2009 and in the year 2010 it was 53.51% followed by Bacillariophyta (27.26%) in year 2009 and 29.79% in the year 2010 with 6 families and 8 genera. Cyanophyta was 11.42% in year 2009 and 14.07% in the year 2010 with 3 families and 4 genera while Pyrrophyta was 0.78% in year 2009 and 1.49% in the year 2010 with 1 family and 1 genus and Euglenophyta was 0.70% in year 2009 and 1.12% in the year 2010 with 1 family and 1 genus. Total number of phytoplankton was 40268 during the study period, with 57.30% in the year 2009 and 42.69% in the year 2010. The seasonal abundance of total phytoplankton was lowest 1413 org/l at station ‘B’ in winter and the highest value was 2839 org/l at station ‘D’ in summer season in the year 2009 whereas in the year 2010 lowest value was 847 org/l at station ‘D’ in rainy season and highest was 1910 org/l at station ‘D’ in summer season. Temperature directly effects plankton population. During summer the temperature is high and the plankton population reached the maximum and when the temperature is low during winter the plankton population becomes low.

Zooplanktons are known as heterogeneous assemblage of minute and microscopic floating animals found in natural water. These organisms usually act as primary consumers and constitute an important link between primary producers and higher consumers in aquatic food chains. During the study period (January 2009 to December 2010) in total five different groups of zooplankton were recorded at different sampling stations. They were Protozoa, Rotifera, Cladocera, Copepoda and Ostracoda, out of which Cladocera and Rotifera were more in number in comparison to the other groups. The dominance of different groups is shown as under:
In year 2009:-

Station A

Cladocera (588org/l)>Rotifera (224org/l)>Copepoda (199org/l)
Protozoa (144org/l)> Ostracoda (40org/l)

Station B

Cladocera (440org/l)>Rotifera (249org/l)>Copepoda (186org/l)
Protozoa (168org/l)> Ostracoda (35org/l)

Station C

Cladocera (433org/l)>Rotifera (274org/l)>Copepoda (205org/l)
Protozoa (192org/l)> Ostracoda (43org/l)

Station D

Cladocera (524org/l)>Rotifera (321org/l)>Copepoda (249org/l)
Protozoa (199org/l)> Ostracoda (41org/l).

In year 2010:-

Station A

Cladocera (628org/l)>Rotifera (328org/l)>Copepoda (271org/l)
Protozoa (229org/l)> Ostracoda (57org/l)

Station B

Cladocera (514org/l)>Rotifera (325org/l)>Copepoda (239org/l)
Protozoa (177org/l)> Ostracoda (39org/l)

Station C

Cladocera (613org/l)>Rotifera (374org/l)>Protozoa (273org/l)>Copepoda(244org/l)> Ostracoda (52org/l)

Station D

Cladocera (602org/l)>Rotifera (398org/l)>Copepoda (305org/l)
Protozoa (249org/l)> Ostracoda (64org/l)

Group Cladocera was dominant over the other zooplanktons with 8 family and 11 genera. The percent of Cladocera was 41.74% in the year 2009, while in the year 2010 it was 39.36% followed by Rotifera
22.46% in the year 2009 and 23.84% in the year 2010 with 4 families and 6 genera. Copepoda was 17.64% in the year 2009 and 17.71% in the year 2010 with 4 families and 5 genera while Protozoa was 14.78% in the year 2009 and 15.52% in the year 2010 with 5 families and 5 genera and the Ostracoda was 3.34% in the year 2009 and 3.54% in the year 2010 with 1 family and 1 genus.

The seasonal abundance of zooplankton in the year 2009 was lowest (171 org/l) in winter season at station ‘B’ and the highest value (875 org/l) was in summer season at station ‘D’, while in the year 2010 lowest was (194 org/l) in rainy season at station ‘B’ and the highest value was (1037 org/l) in summer season at station ‘A’. The summer peak of zooplankton might be due to richness of some important nutrients in this season which may have favoured the reproductive growth of zooplankton directly or indirectly.

Primary production is the most important biological phenomenon in nature on which the entire diverse array of life depends, either directly or indirectly. Rate of primary production by phytoplanktonic population can be measured by light and dark bottle technique. This method was first employed by Gaarder and Gram in 1927, wherein photosynthesis and respiration are measured in terms of oxygen production and oxygen consumption respectively by incubating the subsamples of phytoplanktonic population in light and dark bottles in natural conditions. Dissolved oxygen is estimated using Winkler’s method. In the present investigation primary productivity was studied every month in the years 2009 and 2010 by calculating GPP (Gross Primary Productivity), NPP (Net Primary Productivity), C.R. (Community Respiration) and NPE (Net Production Efficiency)

The maximum gross primary productivity value was 600 mgc/m$^{3}$/h$^{-4}$ at station ‘A’ in the month of June 2009 and in the year 2010 in the
month of April at station B. and at station D in June. Minimum gross primary productivity was 150 mgc/m$^3$/h$^4$ at Station ‘B’ in the month of August 2009, whereas in the year 2010 it was 187.5 mgc/m$^3$/h$^4$ at Station ‘A’ in the month of August.

The Net Primary Productivity was maximum 375.0 mgc/m$^3$/h$^4$ at station ‘A’ ‘B’ and ‘C’ in the months of June and April 2009, while in the year 2010 same value was recorded at all the sampling stations in the month of April, March and June. The minimum value of NPP was 75.0 mgc/m$^3$/h$^4$ at Station ‘B’ in the month of August 2009, whereas in the year 2010 the minimum NPP value was 112.5 mgc/m$^3$/h$^4$ at Station ‘A’ and ‘D’ in the month of August and September.

The maximum value of CR at Angoori reservoir was 262.5 mgc/m$^3$/h$^4$ at station ‘A’ in the month of March 2009, whereas minimum value, was 75.0 mgc/m$^3$/h$^4$ at all the sampling stations in the months of July, August, September, October and December 2009. In the year 2010 the maximum value of CR was 243.7 mgc/m$^3$/h$^4$ at station ‘A’ in the month of May and the minimum value 75.0 mgc/m$^3$/h$^4$ at station ‘A’, ‘B’ and ‘C’ in the months of July, August and October.

The maximum value of NPE of Angoori reservoir was 72.7% at station ‘C’ in the month of March 2009 and minimum value was 50.0% at stations ‘A’, ‘B’ and ‘C’ in November, August, July and December and station D showed NPP 66.6% in the month of September 2009, whereas in the year 2010 the maximum value of NPE was 77.0% at station ‘C’ in the month of March and minimum was 50.0% at station ‘B’ and ‘D’ in October, January and September.

The seasonal value of primary productivity was maximum in summer season and the minimum was in rainy season. This result is supported by the observations of Joshi and Singh (2004) who reported
minimum productivity in rainy season at Kotwal Reservoir, Morena, Madhya Pradesh,

The Indian fish fauna is divided into two classes viz Chondrichthyes (Cartilaginous fishes) and Osteichthyes (Bony fishes). The endemic fish families are 2.21 percent of the total bony fish families of the Indian region. The western ghat is the richest region in India with respect to endemic fresh water fishes. Northeastern India which has a very high diversity among fresh water fishes does not have many endemic species within India because of its jagged political boundary.

During the study period 27 species of fishes belonging to 7 orders and 11 families were identified. The dominating order was Cypriniformes (51.85%) with 14 species followed by Silluriformes and Ophiocephaliformes (14.81%) with 4 species and Osteoglossiformes (7.40%) with two species, while Beloniformes, Anguilliformes and Perciformes (3.70%) were represented by one species each.

The Angoori reservoir is used for composite fish culture since last four years by local fishermen. Of the 27 fish species identified 7 were culturable species namely: *Labeo rohita, Labeo calbasu, Catla-catla, Cirrhinus mrigala, Cyprinus carpio, Ctenopharyngodon idella, and Clarias batrachus*. Forteene fish species are weed fishes namely: *Puntius sarana, Puntius sophore, Mystus seenghala, Mystus aor, Mystus cavasis, Wallago attu, Ompok bimaculatis, Heteropeustes fossilis, Xenentodon cancila, Ophiocephalus marulius, Ophiocephalus striatus, Chanda nama, Notopterus notopterus, and Notopterus chitalla*. Other fishes are *Labio gonius, Cirrhinus reba, Rasbora daniconius Ophicephalus punctatus, Mastacembelus armatus and Anguilla bengalensis*. The specimens of fishes were identified by study of morphometric analysis and fin formula of each fish.