DISTRICT MORENA MP PAGARA DAM HYDROBIOLOGICAL RESEARCH

Dr. V. K. Tripathi,
Associate Professor, Deppt. of Zoology, T. D. College, Jaunpur- 2220022

Dr. Dev Brat Mishra
Deptt.of Zoology T. D. College Jaunpur
devbrat1003@gmail.com

ABSTRACT

Limnology is the field of research concerned with freshwater. Limnology is the study of inland aquatic ecosystems, such as lakes, reservoirs, ponds, rivers, springs, streams, wetlands, and groundwater, in terms of their biological, chemical, physical, and geological properties and functions (Wetzel, 2001). Limnology is a branch of hydrology that studies freshwater lakes and ponds, with an emphasis on hydrobiology in cooperation with other disciplines such as chemistry, physics, geology, and anthropology. Limnology, according to Golterman (1975), is "an interdisciplinary science, encompassing all the components of hydrobiology, hydrochemistry, hydrophysics, and geology. To put it another way, "limnology is the study of the interrelationships of inland water fauna as they are impacted by their dynamic physical and biotic surroundings," says Wetzel (2001).

INTRODUCTION

Water is essential for the survival of all forms of life on the planet, including microbes. Water is an essential component of life; it is what we are made of, and it is what we live, breathe, and consume. According to popular belief, water is "the source of all life." Natural resources such as water, which is used to create, feed, nourish, and rejuvenate all living things, are very precious. Water is a valuable resource offered by nature. We are unable to imagine any kind of life without water. Water and life are two sides of the same coin, and they are intertwined. In addition to being used for drinking, irrigation, fish culture, industrial purposes, power generation, transportation and recreational activities, water is also used for a wide variety of other purposes as well. Water is critical to the world economy in a variety of ways. It is estimated that agriculture uses around 70% of the freshwater that is used by humans. Among the most important natural resources on the earth, water is one of the most abundant. Water is essential not only for the survival of all living species, but also for the health of ecological systems and the development of the economy. As far back as recorded history can go, water has been considered a need for human survival on the planet. Our forefathers had realised the need of locating themselves near water sources thousands of years before us. They used water for a variety of purposes including cooking, cleaning, food production, and transportation.

Water is essential for human survival, and although we all recognise this, many civilizations have developed their own unique ways of depicting the importance of this resource. Water is used in religious rites and traditions all across the globe, and it has a significant role to play. Water is greatly regarded in Hinduism for its ability to cleanse and purify the environment. Rivers have played an essential part in Hinduism for a long time. According to Hindu belief, the Ganges River is the holiest of all of these rivers. In the minds of hundreds of millions of contemporary Indians, the river Ganga, which comes from Shiva's crown in the Himalayas and flows through northern India, is a goddess who should be worshipped and adored (Ganga). Water symbolises the non-manifested base from which all manifestations emanate and serves as a metaphor for the universe. According to Hindu tradition, holy water serves as a cleansing, a life-giver, and a deterrent to evil, among other functions. Water, which is referred to as "ap" in Sanskrit, is said to be as ancient as the cosmos itself, having been imprisoned in an egg from which all else sprang. Sacred water is regarded as such in the Vedas, and it is thought to provide joy, wealth, long life, and perfect health to those who drink it. It protects all life, whether they are living or dead, and it provides redemption to the whole world by its power.

According to legend, the gods are thought to reside in bodies of water. When it comes to our culture, water has always been seen as a purifying agent that eliminates impurities while also removing the defects of the human race. One of the most significant components in both Hinduism and Islam is water, which is recognised as one of the most vital elements. Even though all human beings are reliant on water, Muslims see water as the most important social good in the world, according to their religion. Water is essential for all life on Earth, and it is cherished as Allah's gift to mankind.

Purification of the body, mind, and spirit is a vital aspect of the Buddhist path to enlightenment; for Buddhists, water symbolises purity, clarity, and calm, and it is used to symbolise these qualities. It's for this reason that water has long been seen as "an extraordinary and pervasive element" that must be treated with respect in many religions and civilizations. Our ancient wisdoms teach us to take responsibility for this sacred treasure that binds all life on the planet. Despite the widespread love for water and the vital role it plays in cultural and religious beliefs, water is often taken for granted, polluted, spilled, and fought over in everyday life.

LITERATURE REVIEW

Pramanik, Arun Kumar & Majumdar (2020) The Tilaiya Dam reservoir in the Indian state of Jharkhand is one of the region's most important freshwater sources, and it is one of the largest in the world. The majority of the water stored in the reservoir is used for agricultural and domestic uses. Water quality monitoring was conducted at five locations throughout the 2017-2018 monsoon, monsoon, and post-monsoon seasons to better understand spatiotemporal variance and the suitability of water for present uses. Reservoir water was analysed using a variety of hydro-geochemical analytical tools, including the Piper Diagram, Schoeller-Berkaloff Diagram, Stiff Diagram, US Salinity Laboratory Diagram, Water Quality Index, Salinity Index, Sodium Percentage, Sodium Absorption Ratio, Magnesium Hazard, and other hydro-geochemical tools. The hydrochemical facies of the water were investigated, and it was discovered that it belonged to the Ca-HCO3 water type. Two factors, both of which were geological in nature and had an impact on reservoir water quality, accounted for 81.992 percent of the variance in the data. Although there was considerable variation in water quality over time and across geographical boundaries, the variation was statistically negligible. Increases in the Water Quality Index were seen at three separate sites throughout the monsoon, pre-monsoon, post-monsoon, and winter seasons. The water from the reservoir was confirmed to be safe to drink, use in agriculture, and use in industry during the 2017-18 growing season.

Farooq, Humaira & Farooq (2019) The purpose of this research, which is one of only a handful of its sort from the region, was to investigate the reservoir ecology of Tral, Kashmir, as a case study. This reservoir was constructed between 1969 and 1970 to help ease the water supply shortage in the surrounding area. This year, we performed water chemistry and plankton study at four different places across the reservoir from July through November of this year. Upon investigation, it was discovered that the reservoir's water quality index (WQI) fell into the outstanding quality class (50), with all sites having WQIs between 27.88 and 29.91 and meeting WHO drinking water standards. One-way ANOVA (Analysis of Variance) revealed that overall hardness (F=11.46, 0.001) and magnesium hardness (F=5.88, 0.0010), as well as total phosphorus (F=4.78, 0.0020) all differed statistically from one another (P0.05). The phytoplankton population was composed of the genera Bacillariophyceae (14), Chlorophyceae (08), and Cyanophyceae (3), whilst the zooplankton population was composed of the genera Cladocera, Rotifera, and Copepoda (2). By obtaining measurements at several locations across the reservoir, Arc GIS was used to build a bathymetric map of the reservoir. Researchers in the area of hydrobiology used Canonical Correspondence Analysis (CCA) to uncover a positive relationship between planktonic density and pH, temperature, nitrate, and calcium concentrations.

Adedeji et al., (2019) A range of physico-chemical approaches were used to investigate the water quality of Lake Ribadu in Adamawa (Nigeria). In this study, it was discovered that transparency and dissolved oxygen were negatively associated, however water temperature was shown to be favourably related. Khan and Bari (2019) conducted a study on fish ponds in Noakhali, Bangladesh, to determine the physical and chemical factors present. They discovered that phytoplankton had an inverse connection with transparency, as well as an inverse relationship with the concentration of dissolved oxygen. It has been shown that the temperature of the water has a positive influence on the growth of zooplankton.

Sharma Dushyant Kumar and Uchchariya Rakhi (2018) A study of the physicochemical qualities of water at Pagara Reservoir in Madhya Pradesh's Joura District Morena was conducted between June 2016 and May 2017. The water in the reservoir is suitable for drinking and fish culture, according to tests that measured its temperature (20.42 to 34.72oC), transparency (122.5 cm), pH (6.71 to 8.09), alkalinity (55 to 135 mg/l), chloride (22 to 34.89 mg/l), and free carbon dioxide (3.42 to 8.98 mg/lit). It is important to emphasise the need of attentive reservoir management as well as the development of the reservoir as a tourism attraction.

DUSHYANT KUMAR SHARMA (2017) Pagara Dam, located on the Asan River in the Morena region of Madhya Pradesh, is about 13 kilometres from the town of Jaura and is the state's largest dam. Construction of this dam resulted in the irrigation of nearby towns. As things are, the dam's water may be used for drinking, agriculture, and a variety of other uses. The dam's water is also used for fish farming, which is carried out by the fisheries department and local fishermen. Fish diversity in water bodies is influenced by a range of factors including geographic location, changing aquatic biological conditions, and the overall health of the water body. The ichthyofauna of the Pagara reservoir was the subject of this inquiry. During the course of the examination, a total of twenty (20) different fish species were discovered. Among the fishes discovered were major carp, minor carp, cat fish, and indigenous fish species. Major carp and minor carp were the most abundant species. Nothing that looked like an ocean-dwelling fish was to be seen. For the most part, the Cypriniformes, an order of fish, ruled the roost.

MATERIAL AND METHOD

3.1 Meteorological Data

According to Morena's Meteorological Agency, figures on air temperature, relative humidity, and precipitation percent were supplied for a two-year period commencing on June 1, 2018 and ending on May 1, 2020.

3.2 Collection of Water Samples

Water samples were collected from each of the four sampling sites over a period of two years. During the drawing of the samples into double-stoppered polyethylene vials, there was no bubbling of air to be seen. Each morning, samples were collected between the hours of 8 a.m. and 11 a.m. The research made use of physico-chemical analytical methods such as those described by Trivedy and Goel (1986), the American Public Health Association (1989), Saxena (1998), and Khanna and Bhutani (2002), among others. When water samples were obtained, the temperature, clarity, and pH of the water were assessed on-site, while the remaining parameters were analysed in the lab after samples were collected.

3.2.1 Collection of water samples for planktonic samples

The two sampling sites each yielded phytoplankton and zooplankton samples, which were analysed separately.

3.3 Statistical Analysis

3.3.1 Correlation coefficient

Using the Correlation coefficient, scientists were able to determine the connections between various physico-chemical and biological properties. In statistics, the correlation coefficient is used to assess the strength of a link between two variables.

Correlation coefficient (r) = $\frac{n\Sigma xy-(\Sigma x)(\Sigma y)}{\sqrt{\{n\Sigma x^2-(\Sigma x)^2\}\{n\Sigma y^2-(\Sigma y)^2\}}}$

Where,
n = Total number of pairs of variables
Σx = Total of first variable
Σy = Total of second variable
Σx^2 = Sum of squared first variable
Σy^2 = Sum of squared second variable

RESULTS

4.1 Climatic and Physico-Chemicals Parameters

in a table are the results of climatic and Physico-chemical observations.

4.2 Climatic Parameters

4.2.1 Air Temperature

The Meteorological Department provided average monthly air temperatures (minimum and maximum) from June 2018 to May 2020 for the research period. (June 2018 to May 2019), the average low temperature ranged from 29.22°C to 8.95°C (June 2018 to May 2019). (June 2019 to May 2020). The coldest month of the year was January 2019, while the hottest month was June 2018. Between June 2018 and May 2019, the month's average maximum temperature ranged from 20.77°C to 41.8°C and 22.67°C to 43.45°C, respectively (June 2019 to May 2020).

4.2.2 Humidity

The Meteorological Department measured humidity every day between 8:30 a.m. and 5:30 p.m. The month-by-month average humidity was recorded. Between 42.15 and 91.1 percent of humidity was found at 8:30 a.m., the period at which the water samples were collected, on an average monthly basis (June 2018 to May 2019). (June 2019 to May 2020). According to the National Oceanic and Atmospheric Administration (NOAA), 91.1 percent humidity was reported in July 2018, whereas 84.72 percent was recorded in August 2019. Monsoon was the wettest season, followed by winter, while summer was the driest.

4.2.3 Rainfall

Between June 2018 and May 2019, the total monthly rainfall varied from 0 mm to 80 mm and 0 mm to 42.66 mm (June 2019 to May 2020). The wettest months were July 2018 (from June 2018 to May 2019) and September 2019 (from September 2018 to September 2019). (June 2019 to May 2020).

Table 1 From June 2019 to May 2020, Jaura, District Morena's climatic parameters (average monthly values) of air temperature, rainfall, and humidity are shown

Months	Air temperature (°C)		Humidity (%)		Rainfall (mm)
	Minimum	**Maximum**	**at 8:30 AM**	**at 5:30 PM**	
June 2019	27.92	39.16	58.4	37.82	17.17
July 2019	27.52	34.6	83.37	54.17	21.16
August 2019	27.67	33.17	84.72	50.55	32.93
September 2019	26.86	33.12	81.98	49.24	42.66
October 2019	21.95	35.55	62.82	39.6	0
November 2019	15.12	31.1	62.2	35.87	0
December 2019	10.4	25.34	69.56	38.14	4.25
January 2020	7.15	22.67	73.67	37.42	1
February 2020	10.97	26.6	64.45	29.95	16.2
March 2020	16.16	33.96	55.54	27.86	0
April 2020	20.9	39.4	56.02	27.95	2.12
May 2020	27.45	43.45	51.07	25.45	0
Minimum	**7.15**	**22.67**	**51.07**	**25.45**	**0**
Maximum	**27.92**	**43.45**	**84.72**	**54.17**	**42.66**

4.3 Physico-Chemical Parameters

4.3.1 Water Temperature

Water temperatures at Pagara dam fluctuated between June 2018 and May 2019 and June 2019 and May 2020, ranging from 21.1 degrees Celsius (June 2018 to May 2019) to 23.9 degrees Celsius (June 2019 to May 2020) during the course of the study period. February 2019 and 2020 saw average low water temperatures of 21.1 degrees Celsius and average high-water temperatures of 23.85 degrees Celsius, respectively, with the lowest temperatures occurring on average in February 2019. The months of June 2018 and July 2019 had the highest average temperatures, with 34.72 degrees Celsius and 32.07 degrees Celsius, respectively. Throughout the study period, the greatest water temperatures were recorded in the summer and the lowest in the winter. In accordance with the statistics, the temperature of the water increased consistently from March to July, and then decreased from August to October, respectively.

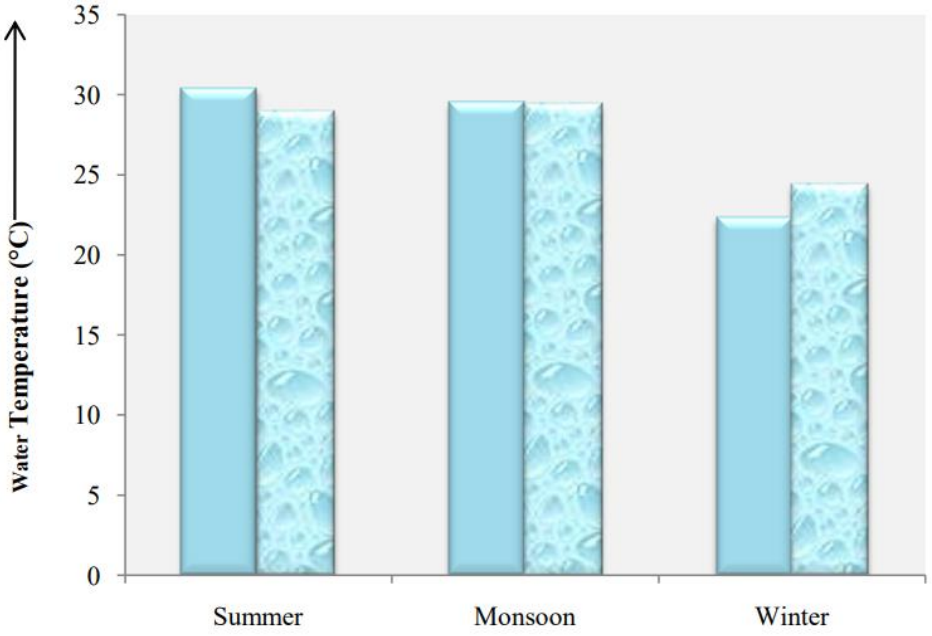

Fig. 1 Different seasons of Pagara Dam's Water Temperature (°C) from June 2018 to May 2020

4.3.2 Transparency

Pagara dam's transparency ranged from 132 cm to 181.5 cm (June 2018 to May 2019) and 158.5 cm to 196 cm (June 2018 to May 2019). (June 2019 to May 2020). The winter months of January and December had the most transparency, while the months of September 2018 and August 2019 saw the least, both during the monsoon season.

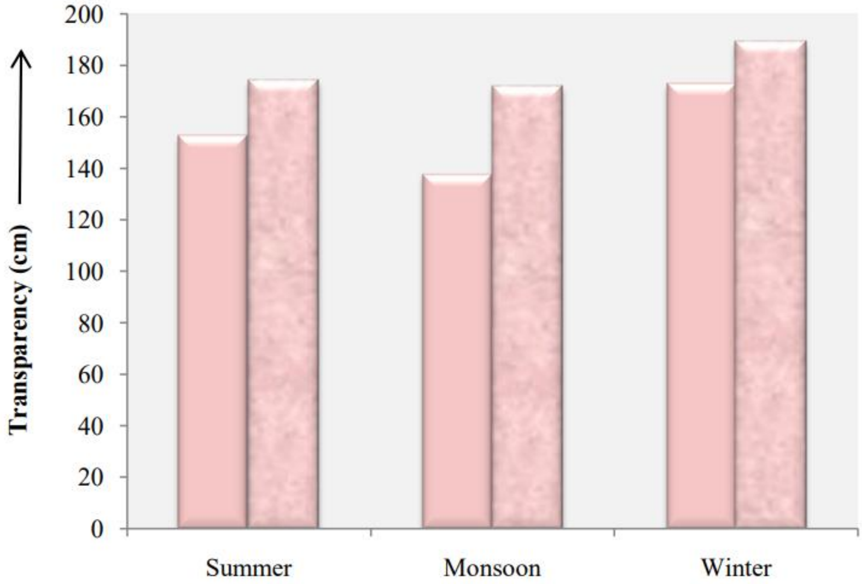

Fig. 2 Seasonal changes in Pagara Dam's Transparency (cm) between June 2018 and May 2020.

4.3.3 Turbidity

From June 2018 to May 2019, the turbidity at Pagara Dam ranged from 0.7 NTU to 6.6 NTU and from 0.97 NTU to 6.47 NTU (June 2019 to May 2020). During the monsoon (5.88 NTU and 5.48 NTU), the water was more discoloured than it was in the summer (3.46 NTU and 2.95 NTU). Site D reported the highest turbidity (6.9 NTU and 7.4 NTU) in September 2018 and site C in August 2019, while site B recorded the lowest (0.5 NTU and 0.7 NTU) in January 2019 and February 2020.

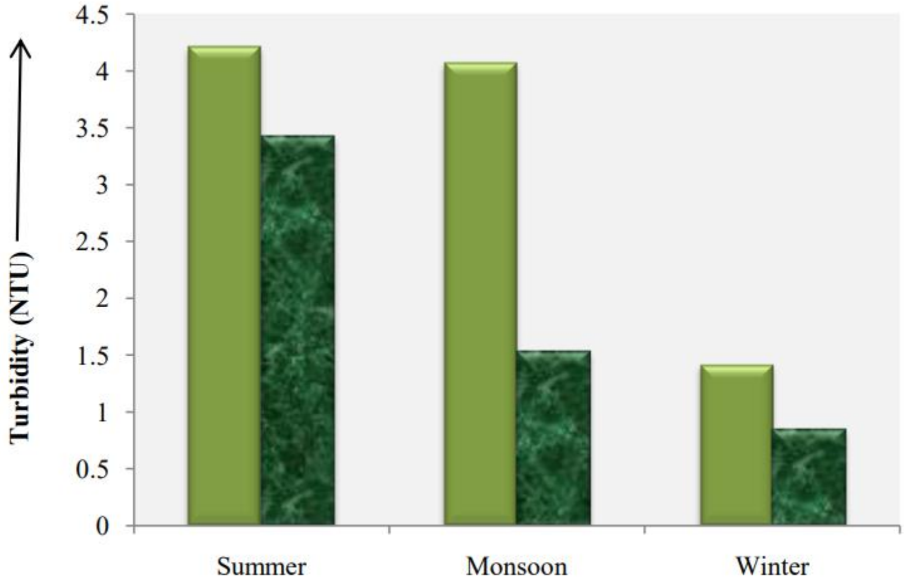

Fig. 3 From June 2018 to May 2020, Pagara Dam's turbidity (NTU) will change seasonally

4.3.4 Conductivity

From June 2018 to May 2019, the conductivity of the water varied between 173.25 s and 383 s, and between 162.75 s and 404.25 s, respectively (June 2019 to May 2020). In terms of conductivity, the greatest conductivity months were May 2019 and May 2020, while the lowest conductivity months were December 2018 and December 2019.

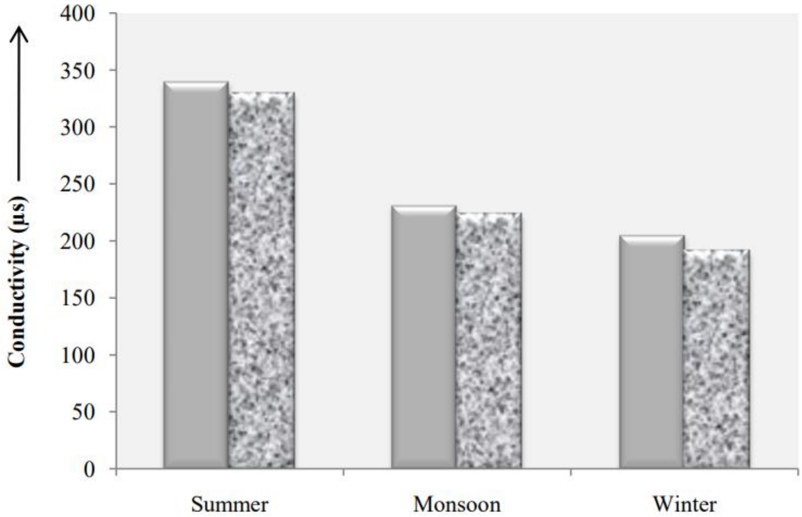

Fig. 4 From June 2018 to May 2020, the conductivity (s) of Pagara Dam will vary according to the season

4.3.5 Total Dissolved Solids

Between June 2017 and May 2019, the total dissolved solids in Pagara Dam ranged from 85.5 to 194.25 mg/lit and 103.25 to 228 mg/lit, respectively (June 2019 to May 2020). May 2019 and May 2020 recorded highest total dissolved solids of 183.54 mg/lit and 119 mg/lit, respectively, while December 2018 and December 2019 recorded lowest total dissolved solids of 102.45 mg/lit and 119 mg/lit, respectively.

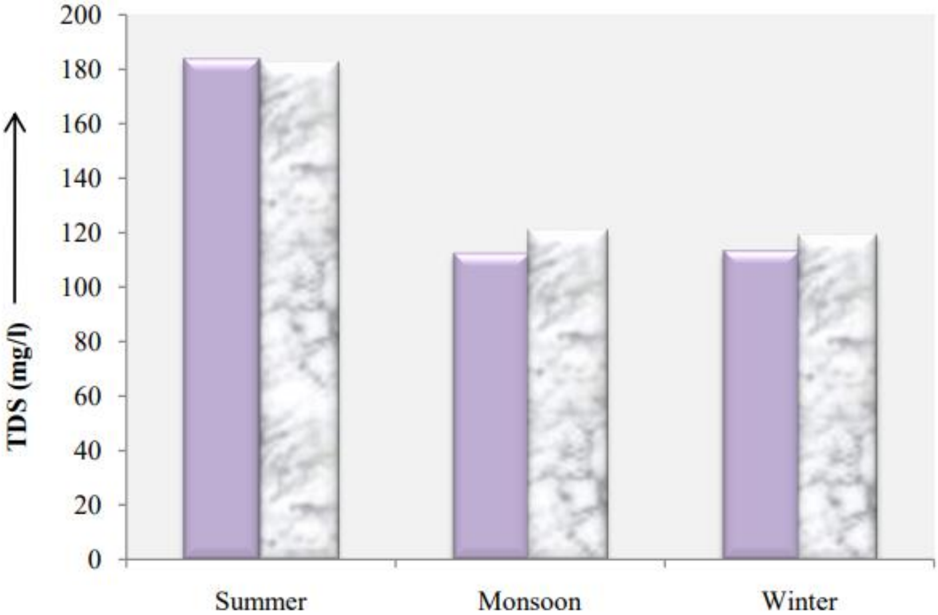

Fig. 5 Seasonal variations in Total dissolved solids (mg/l) in different seasons of Pagara Dam, from June 2018 to May 2020

CONCLUSION

According to the conclusions of this study, the water from the Pagara Dam is completely safe to drink and drink from. According to the findings of the study, the water is also suitable for fish farming. It was also discovered that the physical, chemical, and biological aspects of water are not only related, but are also influenced by the environment in which it is found. According to the findings of this study, the reservoir has a vast and diversified fish population. Proper conservation measures must be implemented in order to guarantee the long-term survival of the reservoir and the diversity of its species. Improved management and scientific procedures may make it feasible to increase the amount of fish produced. There are various ways in which the reservoir may be better used for aquaculture. In order to ensure that fishermen have access to the required resources in order to improve fish breeding and marketing, the government should take the initiative. When it comes to economic development and job creation, greater output from sustainable fisheries and aquaculture has the potential to act as a catalyst for community development.

Natural beauty abounds in the region around Pagara Dam, which is quite breathtaking. Approximately 15 kilometres from the dam lies the village of Jaura in the Morena province of Uganda. The development of Pagara Dam as a tourist site has a great deal of promise. The government and local administration must work together in order for the area to become a popular tourist attraction for both residents and tourists from around the state. The following are some of the options available in this situation:

1. Although the dam is just a short distance from the town of Jaura, the road leading to the dam is in a poor state of repair. There has to be more attention paid to the approach road.
2. The dam region has poor cell and internet connectivity. There should be more and better access to these resources.
3. In order to draw more visitors, the dam's area may be used for boating.

REFERENCES

1) Pramanik, Arun Kumar & Majumdar, Deepanjan & Chatterjee, Abhik. (2020). Evaluation of Hydrochemical Facies and Suitability of Water in Tilaiya Dam Reservoir of the Jharkhand State in India. Analytical Chemistry Letters. 10. 684-702. 10.1080/22297928.2020.1853604.
2) Farooq, Humaira & Farooq, Junaid & Ullahbhat, Sami & Sofi, Mohd & Tajamul Islam, Sheikh. (2019). Hydrobiological Study of the Panner Water Reservoir, Tral Kashmir.
3) Adedeji H.A., Idown T.A., Usman M.A. and Sogbesan O.A. (2019) Seasonal variations in the physico-chemical parameters of lake Ribadu, Adamawa state Nigeria. Int. J. Aqua. Stu. 7(1): 79-82.
4) Sharma Dushyant Kumar and Uchchariya Rakhi. (2018). Studies on physico–chemical parameters of Pagara Reservoir, Joura, district Morena (M.P.). E-ISSN: 2347-5129 P-ISSN: 2394-0506
5) DUSHYANT KUMAR SHARMA. (2017). A STUDY OF ICHTHYOFAUNA OF PAGARA DAM OF MORENA DISTRICT, MADHYA PRADESH. Indian J.Sci.Res. 7(2): 51-57, 2017 1Corresponding author ISSN: 0976-2876 (Print) ISSN: 2250-0138 (Online)
6) Abell R., Thieme M.L., Revenga C., Bryer M., Kottelat M., Petry P. (2008) Freshwater ecoregions of the World: a new map of biogeographic units for freshwater biodiversity conservation. Bioscience. 58: 403–414.
7) Achionye N., Chioma G. and Isimaikaiye A. (2010) Fauna and Flora composition and water quality of a reservoir in Ilorin, Nigeria. Int. J. of Lakes & Rivers 3 (1): 7-15.
8) Adadu M.O., Omeji S. and Garba A.A. (2019) Seasonal diversity and abundance of zooplankton community index in river Okpokwu, Benue state, Nigeria. Int. J. Fish. Aqua. Stu. 7(5): 217-223.
9) Agarwal A.K. and Rajawar G.S. (2010) Physico-chemical and microbiological study of Tehri dam reservoir, Garhwal Himalaya, India. J. American. Sci. 6(6): 65-71.
10) Ahirro S.D. and Pedge S.S. (2011) Water quality of Tridhara: A Holy place in Parbhani district, Maharashtra. Limnology current perspective (Ed. V.B. Sakhare) Daya Publishing House, Delhi pp. 14-17.