IJBPAS, June, 2022, 11(6): 2839-2849

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

SEASONAL ANALYSIS OF FISH DIVERSITY FROM A RURAL POND OF BHOPAL DISTRICT, MP, INDIA

AHIRWAR JP AND ALI SA*

Department of Biotechnology and Bioscience, Saifia College of Science, Bhopal, MP (India)-462001

***Corresponding Author: Dr. sharique A. Ali:** drshariqueali@yahoo.co.in

Received 18th June 2021; Revised 19th Aug. 2021; Accepted 6th Oct. 2021; Available online 1st June 2022

https://doi.org/10.31032/IJBPAS/2022/11.6.6181

ABSTRACT

Among all water bodies ponds help to conserve variety of fish species which support fish production at commercial level. The aim of the present investigation is to document the fish diversity of a rural pond so that probable measures can be taken by the management authority for sustainable increased fish production. The present investigation was conducted on a Birah shyam khedi pond of Berasia Block of Bhopal District (M.P.) for one year from April 2018 to March 2019. The fish fauna diversity were collected in the pre-monsoon, monsoon and post monsoon season. The fish species were identified by customary keys on the field and in the laboratory.

In this pond 19 fish species in pre-monsoon season, 9 species in monsoon season and 16 species in post monsoon season were recorded. The fish fauna diversity was higher in pre-monsoon season followed by post monsoon season and was least in the monsoon season. The order Cypriniformes has shown the major Ichthyofaunal diversity in the three seasons in the selected pond.

Keywords:, Berasia block, Birah Shyam khedi pond, Fish diversity, Ichthyofaunal, Production

1. INTRODUCTION

Fish constitutes almost half of the whole vertebrates **[1]**. They live in all aquatic habitats **[2]**. Fisheries play an important role in the socio-economic development of the country. For economically backward people it gives valuable source for livelihood **[3]**.

Fishes have medicinal importance and nutritional value as well as one of chief food sources **[4]**. It provides alternate source of income and employment and promotes growth of new industries **[5]**. Fishes are also the good source of protein supply **[6]**.

On the Earth 33,000 living types of fish have been recorded **[7]** out of 39,900 types of vertebrates of which 8411 are freshwater species and 11,650 are marine **[8]**. India also has large varieties of fish species. It has 9th position in fresh water Mega biodiversity **[9]**. There are 2802 fish species found in India out of which 999 fresh water fish and 1681are salt water fish **[7]**. Central part of India Madhya Pradesh also has large area of aquatic ecosystem. Madhya Pradesh covers 3.0 lakh hectare water areas in the form of different reservoir, lakes and ponds **[10]**. Therefore, it has big scope for fish production. In Madhya Pradesh many studies have been conducted related to fish diversity. The study on diversity of Satpura dam of Sarni of Betul District **[11]**, diversity of River Narmada, Jabalpur Region **[12]**, ichthyofaunal diversity of Halali reservoir of Vidisha district **[13]**, fish diversity of Narmada river at Hoshangabad district **[14]**, fish diversity of Mansarovar Talab of Jerrapur ,Dhar District **[15]**, fish diversity of Kotwal reservoir, Morena district **[16]**. All these suggested studies have shown that districts of Madhya Pradesh are rich in fish diversity.

In Bhopal district many studies have been done at individual water bodies to find heterogeneity of fish fauna. A study was carried out on biodiversity and catch composition of ornamental fish fauna at upper Lake of Bhopal **[17]**. A study was conducted on abundance of fish fauna of Shahpura Lake with relation of Physico-Chemical parameters **[18]**. An investigation has been conducted to show a comparative study of diversity indices of lower and upper Lake of Bhopal **[19]**. A study was carried out to investigate fish biodiversity of District Bhopal at Phanda and Baresia block **[20]**. They included seven rural ponds of Berasia block for fish variety but not included pond of Birah Shyam khedi. Many experimental studies have been done to discover fish fauna of Bhopal district but selected pond of present study has not been covered. Keeping this lacuna the present investigation has been conducted to find the fish faunal diversity on seasonal basis in rural ponds of Berasia block of Bhopal District in Madhya Pradesh.

The present study focused on a rural pond. The Birah Shyam khedi pond is regulated by Nagar Palika Berasia with the help of cooperative society. The present

investigation analyzes the fish diversity in three seasons. Study also highlighted idea about dominant, common, rare and absent fish species in particular season. The outcome of present examination will be extremely productive for outline regulation plans for the conservation of fish diversity and their natural surroundings. The proper reporting of fish diversity also useful to develop statistics about fish diversity and to investigate the fish fauna in rural pond of Berasia block of Bhopal district (MP).

2. MATERIAL AND METHODS

Bhopal is a district as well as capital of Madhya Pradesh. It has two blocks Berasia and Phanda. Berasia is 43 km away from Bhopal city at latitude 23.6279 N and longitude of 77.4314 E. In the Berasia block the pond of Birah Shyam Khedi was selected for the present investigation. It is managed perennial pond with an area of 296 hectare. It is constructed for irrigation and fish culture. The Birah Shyam khedi pond **(Figure 1)** has shown proper water level in present study period. There was no control on cattle entry in this pond. In Birah shyam khedi pond sewage water was mixing from nearby villages. The bottom of ponds holds clay and collects direct sunlight.

Fishes were observed and collected on seasonal basis. These were pre-monsoon from February to May, monsoon from June to September and post monsoon from October to January for time period of one year from April 2018 to March 2019.In two months of monsoon season, fishing was banned. It implements from 16 June and ends on 15 August every year **[21]**. During these two months fish diversity data was not collected.

Fishes were collected with the help of native fishermen by using differing types of nets together with gill nets, cast net, hand nets etc. Fishes specimens were collected from separate fish landing sites also. Unidentified fishes were preserved in 4% formaldehyde solution at the field. Later on these fishes specimens dropped at Biotechnology & Bioscience laboratory, Saifia College Bhopal were preserved in 10% formalin solution in distinct specimens jar accordant with the scale of specimen. The fish species were identified by customary keys of **[22-25]**. Visual examination were conjointly administered if the water was clear, to grasp the distribution of fish species. The fishes abundance were categorized into three classes particularly dominant (76-100% of total catch), common (51- 75% of the total catch) and rare (below 50% of total catch), assumptive that fishing efforts were constant for every catch.

The Ethical Committee for Animal Experimentation and Research, Saifia College of Science, Bhopal, India affirmed the utilization of creatures (approval number SSC/06-06-22/, dated October 26, 2006). The exploration work of the institution is done in exacting consistence with the Guidelines for Use of Laboratory Animals in Medical Colleges (2001) of the Indian Council of Medical Research, just as with the Breeding of and Experiments on Animals Amendment Rules (2001) and the Prevention of Cruelty to Animals Act 1966.

Figure 1: Satellite view and on-site view of Birah Shyam Khedi Pond

3. RESULT AND DISCUSSION

3.1 Pre-monsoon Season- *Catla catla, Cirrhinus mrigala, Hypophthalmichthys molitrix, Channa marulius* and *Notopterus notopterus* were dominant species in pre-monsoon season. *Cyprinus carpio, Labeo calbasu, Labeo rohita, Labeo bata, Ctenopharyngodon idella, Heteropneustes fossilis* (Bloch), *Channa punctata* and *Oreochromis mossambicus* were common species. *Puntius saphore, Mystus seenghala, Wallago attu, Claris batrachus, Mystus bleekeri,* and *Mastacembelus armatus* (Lacepede) were rare species in pre monsoon season **(Table 1)**. In pre-monsoon season 5 fish species were dominant, 8 species were common and 6 species were rare. Total 19 fish diversity was found in pre-monsoon season.

In pre-monsoon season 9 fish species were belonged to order Cypriniformes which constitute 47.37%, 5 species were belonging to order Siluriformes which constitute 26.32%, 3 species were belonging to order Perciformes which constitute 15.79%, 1 species was belonging to order Osteoglossiformes which constitute 5.26% and 1 species was belonging to order Synbranchiformes which constitute 5.26% of total fish species **(Figure 2)**. The fish species belong to family Cyprindae were 9 and constitute 47.37%, 3 species were belonged

to the Chandidae family which was 15.79%, 2 species were belonged to both Bagridae and Clariidae family which were 10.53%, only 1 species was belonged to Heteropneustidae, Mastacembelidae and Notopteridae which constitute 5.26% for each **(Figure 3)**.

3.2 Monsoon Season-*Catla catla, Cirrhinus mrigala* and *Hypophthalmichthys molitrix* were dominant fish species. *Cyprinus carpio, Labeo calbasu, Labeo rohita* and *Ctenopharyngodon idella* were found common species in monsoon season. *Labeo bata* and *Notopterus notopterus* found rare species in monsoon season. *Mastacembelus armatus* (Lacepede), *Oreochromis mossambicus, Channamarulius, Channa punctata,* Heteropneustes fossilis (Bloch), *Mystus bleekeri, Claris batrachus, Wallago attu, Mystus seenghala, Puntius saphore* are absent in monsoon season **(Table1)**. In monsoon season 3 fish species were dominant, 4 species were common and 2 species were rare. Total 9 fish diversity was found in monsoon season.

In monsoon season 8 fish species were belonged to order Cypriniformes which constitute 88.89%, no species were found of the orders Siluriformes, Perciformes and Synbranchiformes. Only 1 species was belonged to order Osteoglossiformes which constitute 11.11% of total fish species **(Figure 2)**. The fish species belong to family Cyprindae were 8 and constitute 88.89%, no species was found of the family Chandidae, Bagridae, Clariidae, Heteropneustidae and Mastacembelidae. Only 1 fish species was found of Notopteridae which constitutes 11.11% **(Figure 3)**.

3.3 Post monsoon- *Catla catla, Cirrhinus mrigala and Hypophthalmichthys molitrix* were dominant species in postmonsoon season. *Cyprinus carpio, Labeo calbasu,Labeo rohita, Ctenopharyngodon idella, Mystus seenghala* and *Notopterus notopterus* were common species. *Labeo bata,Claris batrachus, Mystus bleekeri, Heteropneustes fossilis (Bloch), Channa punctata, Channa marulius* and *Mastacembelus armatus* were rare species. *Puntius saphore, Oreochromis mossambicus* and *Wallago attu* were absent in post monsoon season **(Table 1)**. In post monsoon season 3 fish species were dominant, 6 species were common and 7 fish species were rare. Total 16 fish diversity was recorded in post monsoon season.

In post monsoon season 8 fish species were belonged to order Cypriniformes which constitute 50%, 4 species were found of order Siluriformes which constitute 25%, 2 species were found of order Perciformes

which constitute 12.5%, 1 species was found of order Osteoglossiformes which constitute 6.2 5% and 1%, 1 species was found of order Synbranchiformes which constitute 6.2 5% total fish species **(Figure 2)**. The fish species belong to family Cyprindae were 8 and constitute 50%, 2 species were found of the families Chandidae and Clariidae which was

12.5% for each, 1 species was found of families Bagridae, Heteropneustidae hora, Mastacembelidae and Notopteridae which constitute 6.25% **(Figure 3)**.

In present study 3 fish species *Catla catla, Cirrhinus mrigala* and *Hypophthalmichthys molitrix* were found naturally dominant in all the seasons. The fish species belonging to order Cypriniformes were dominant with 9 species. The present investigation shows that the diversity of fish fauna was higher in pre monsoon season and least fish diversity was found in monsoon season.

Similar finding for dominant species *Catla catla, Cirrhinus mrigala* and *Hypophthalmichthys molitrix* along with other species were reported at Kotwal reservoir, Morena district **[16]**. In present study order Cypriniformes were dominant with 9 species similar findings shown at Phanda and Berasia Block of Bhopal District for 18 water bodies that order Cypriniformes was dominant **[20]**. The order Cypriniformes was dominant with 26 species at Harsi Reservoir **[26]**, at Halali reservoir **[13]**, at Narmada river of Jabalpur region **[12]** and at Mansarovar Talab of Jeerapura, Dhar **[15]**.

The present investigation shows that the diversity of fish fauna was higher in pre monsoon season and least fish diversity was found in monsoon season similar results reported at Kotwal reservoir, Morena district **[16]**. The variation found in all the fish species in three seasons may be due to change in physico-chemical parameters of pond water in three seasons similar variation in fish species reported due to Limnological parameters of water at Chambal River of Madhya Pradesh, India **[27]**. Previously, we have reported 19 fish species in Birah shyam khedi pond but not categorized on seasonal basis **[28]**. Hence, the present study has been taken to analyze the diversity of fishes in Birah shyam khedi pond of Berasia block of Bhopal district (MP) on seasonal basis.

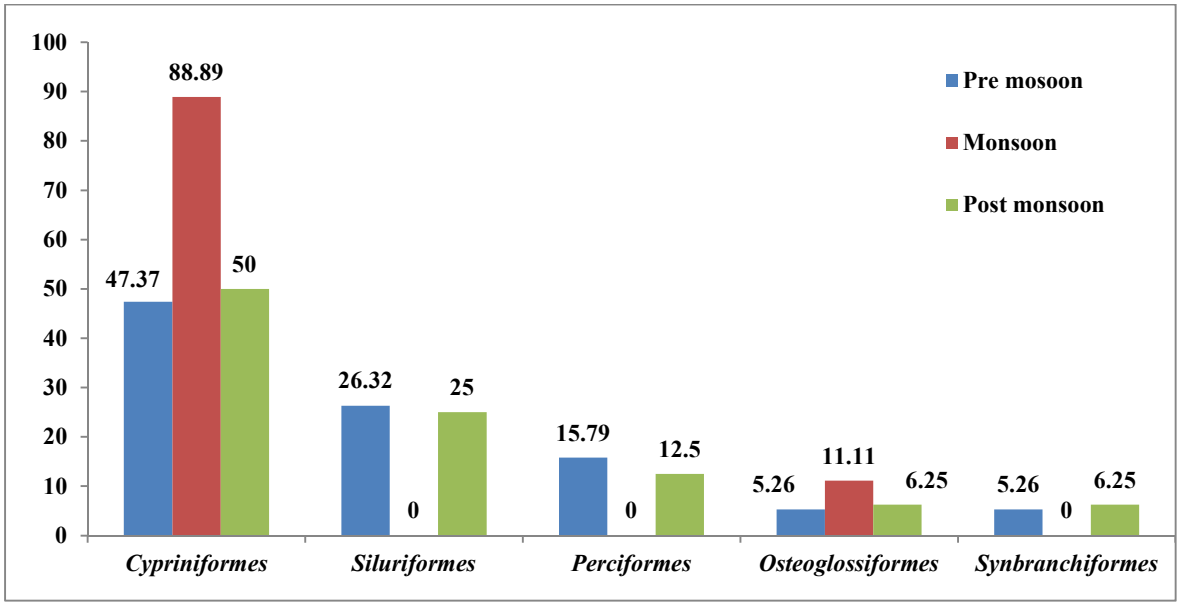

Figure 2: Percentage of fish species in an Order

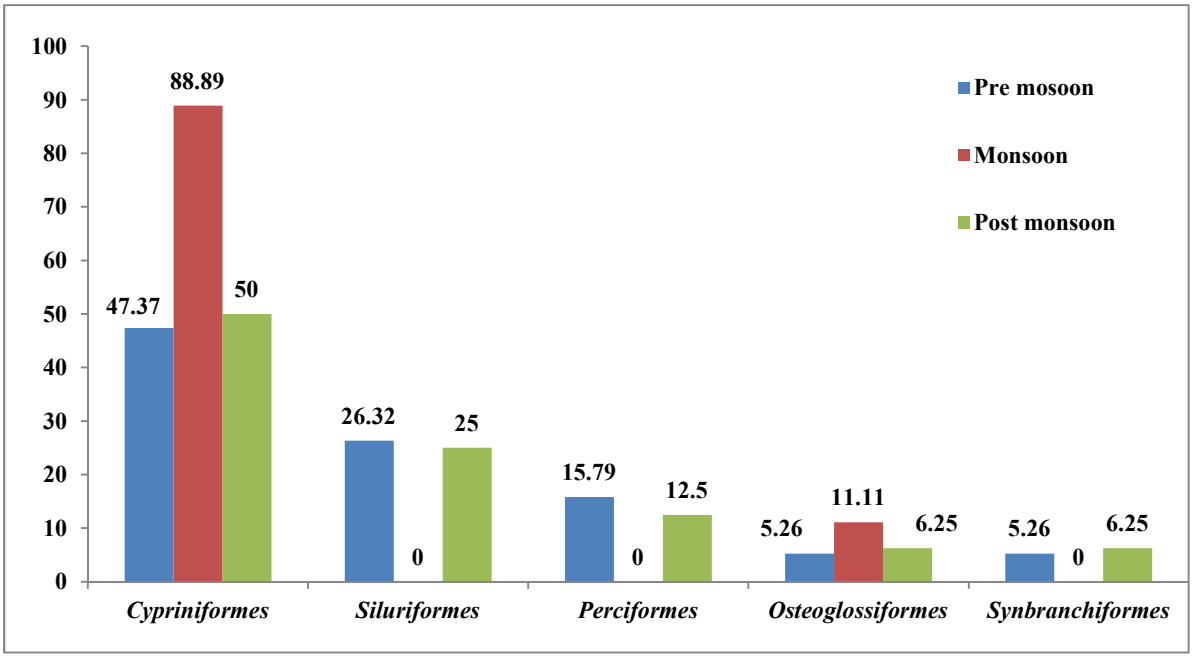

Figure 3: Percentage of fish species in a family

Table 1: List of fishes identified from Birah shyam khedi pond of Berasia Block of Bhopal district during April 2018 to March 2019 on the seasonal basis

S. No.	Order	Family	Scientific name	Common name	Pre monsoon	Mon soon	Post monsoon
1	Cypriniformes	Cyprindae	*Catla catla*	Catla	+++	+++	+++
			Cyprinus carpio	Badhas	++	++	++
			Cirrhinus mrigala	Mrigal	+++	+++	+++
			Labeo calbasu	Kalaunt	++	++	++
			Labeo rohita	Rohu	++	++	++
			Labeo bata	Rahia	++	+	+
			Puntius saphore	Kharpata	+	–	–
			Ctenopharyngodon idella	Grasp carp	++	++	++
			Hypophthalmichthys molitrix	vikit	+++	+++	+++
2	Siluriformes	Bagridae	*Mystus seenghala*	Singhara	+	–	++
			Wallago attu	Padhin	+	–	–
		Clariidae	*Claris batrachus*	mangur/cat fish	+	–	+
			Mystus bleekeri	(Kittu,Kaitiya	+	–	+
		Heteropneustidae	*Heteropneustes fossilis* (Bloch)	Singhi	++	–	+
3	Perciformes	Chandidae	*Channa punctata*	Gaidiya	++	–	+
			Channa marulius	Sawal	+++	–	+
			Oreochromis mossambicus	Tilapia	++	–	–
4	Osteoglossiformes	Notopteridae	*Notopterus notopterus*	Patola	+++	+	++
5.	Synbranchiformes.	Mastacembelidae	*Mastacembelus armatus* (Lacepede)	Bam	+	–	+

+++ = Dominant, ++ = Common, + = Rare, _ = Absent

4. CONCLUSION

The results of the present research indicate that pre-monsoon season has shown maximum fish species diversity followed by post monsoon season. Monsoon season has shown minimum fish species diversity in present investigation. The results also show that selected pond is rich in fish diversity which indicates the Berasia block is rich in fish diversity. The fishermen of nearby villages sold collected fish in Berasia market for their earning. This examination would open new ways for approaching Ichthyofaunal research in rural areas of the country.The research simultaneously as producing benefits, increase information about the nature and elements of the fishery. Fisheries keep on assuming a significant part, and in numerous spaces stay satisfactory to fulfill means and may much offer an important wellspring of money pay for farmers. The advantages of aquaculture in rural areas to identify with wellbeing and nourishment, work, pay, decrease of

weakness and homestead supportability. For Sustainable fish production, it is important to monitor this water body of Berasia block. A study has been conducted to pointed featured issue of pond fish culture in Bhopal area like washing and bathing, water contamination and upkeep of ponds **[29]**. Some essential steps should be taken by concern authority to forestall combination of sewage water from close by villages and to prevent cattle entry. Farmers should be made mindful of utilizing chemical fertilizers and pesticides in proper sum in their farming grounds so the normal natural surroundings of these ponds stay unaffected.

Acknowledgment:

The authors extend heartfelt gratitude to the secretary of Saifia college of Science, Bhopal India for encouragement.

REFERENCES

[1] Nelson, JS., Grande, TC and Wilson, MVH(2016). Fishes of the world. 5: 1-711.

[2] Arthington, A.H., Dulvey, N.K., Gladstone W. and Winfield (2016). Fish conservation in freshwater and marine realms: status, threats and management. Aquatic Conservation: Marine and freshwater Ecosystems. 26 (5): 838–857.

[3] Devi, NBL., Ngangbam, AK., Immanuel, S. and Ananthan, PS. (2012). Study of ishers' socioeconomic and cultural profile around the Loktak lake of Manipur, India. IOSR Journal of Agriculture and Veterinary Science. 1(5): pp 48-56.

[4] Ullah, S. and Ahmad, T. (2014). Nutritional and Medical Importance of Fish: A Mini Review. Reviews of Progress. 2(2): 867-876.

[5] Kumar, D., Mehta, R., Yadav, R., Kumar, S. and Kumar, M. (2018). Studies on fisheries status and socio-economic conditions of fisher community in Dholi region, Muzaffarpur, Bihar, India. Journal of Entomology and Zoology Studies. 6(3): 76-80.

[6] Mohanty, BP., Mahanty, A., Ganguly, S., Mitra, T., Karunakaran, D. and Anandan, R. (2019). Nutritional composition of food fishes and their importance in providing food and nutritional security. Food Chem. 293: 561-570.

[7] Jayaram, KC. (1999). The fresh water fishes of the Indian Region. Narendra Publishing House, Delhi.

[8] Mittermeier, RA. and Mittermeier, CG. (1997). Mega diversity Earth's Biological nation. In *Global fresh water biodiversity sea wind cemex*, Mexico City. pp 1-140.

[9] www.fishbase.org, version (06/2021).

[10] Directorate of Fisheries, Bhopal, Madhya Pradesh, India.

[11] Solanki, MS.and Tharani, M. (2015). Survey and Conservation of Fish Diversity of Satpura Dam of Sarni of Betul District (M.P). Periodic Research.3 (3): 37-39.

[12] Saini,D. and Dube, KK.(2017). Fish diversity studies of River Narmada, Jabalpur Region (M.P). International Journal of Fisheries and Aquatic Studies. 5(5): 13-16.

[13] Ghulam, M., Asad, MK. and Hussai, S. (2017). Ichthyofaunal diversity of Halali reservoir Vidisha, (MP). Journal of Entomology and Zoology Studies. 5(3): 1500-1503.

[14] Kakodiya, SK. and Mehra, S.(2018). Fish Diversity of Narmad River at Hoshangabad, Madhya Pradesh. IJRAR. 5(3): 2349-5138.

[15] Sharma, S., Patel, BS.and Pir,Faisal. (2018),Status of Fish Diversity of Mansarovar Talab of Jeerapura, Dhar (M.P) India. International Journal of Environmental Sciences; 8(1):1-6.

[16] Narway, K., Chakravarty, S., Jain, A., Pailan, GH. and Dasgupta, S. (2019), Fish diversity and fisheries of kotwal reservoir, Morena, Madhya Pradesh. Journal of Entomology and Zoology Studies. (6): 316-323.

[17] Sharma, R.and Borana, K. (2014). Biodiversity and Catch Composition of Ornamental Fish Fauna Inhabiting Upper Lake of Bhopal, Madhya Pradesh.Global Journal of Multidisciplinary Studie. 3(8): 70-75.

[18] Bhargava, S., Zaffar, T. and Chauhan, R. (2014). Abundance of Fish Fauna of Shahpura Lake with Rrference to Physico Chemical Parameters. World Journal of Pharmacy and Pharmaceutical Sciences. 3(8): 1637-1643.

[19] Rana, S. and Shammi, QJ. (2015). Comparative Diversity Indices of Lower and Upper Lake of Bhopal. American Research Journal, 2(1): 744-746.

[20] Meena, D. and Saxena, G. (2016).Fish Biodiversity of District Bhopal at Phanda and Berasia block

(M.P). International Journal of Pharmacy & Life Science.7 (12): 5388-5399.

[21] M.P. Fisheries Act, 1948 section – III, page-7.

[22] Jayaram, KC. (1981).The Freshwater Fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka, Zoological Survey of India, Calcutta.

[23] Qureshi TA, Qureshi NA. Indian Fishes publishers Brij Qureshi TA, Qureshi NA (1983). Indian Fishes publishers Brij Brother, Sultania Road Bhopal, M.P. PP 5-209.

[24] Jhingran, VG. (1991). Fish and Fisheries of India 3rd Edition. Hindustan Publication Corporation, Delhi.

[25] Shrivastava, G. (1998). Fishes of U.P. and Bihar. 7thEdn.Vishwavidalaya Prakashan, Chowk Varanasi India.

[26] Ahad, N., Rao, R. (2019). Assessment of fish diversity of Harsi reservoir, Madhya Pradesh, India. International Journal of Zoology and Applied Biosciences.4 (1): 466-471.

[27] Bose, R., Bose, AK., Das, AK., Parashar, A. and Roy, K. (2019). Fish Diversity and Limnological Parameters Influencing Fish Assemblage Pattern in Chambal River Basin of Madhya Pradesh India. Proceedings of the National Acedemy of Sciences India. Biological Sciences. 89(2): 466-471.

[28] Ahirwar, J.P. and Ali, Sharique. (2020). Comparative analysis of fish diversity from three rura Cooperative managed ponds of Bhopal district, MP, India. International Journal of Entomology Research. 5 (4): 99-104.

[29] Chourey, P., Meena, D., Varma, A. and Saxena, G. (2015). A Study on Problems of Pond Fish Culture in Bhopal district, (M.P.) India. International Journal of Theoretical & Applied Sciences. 7(1): 35-37.

[30] https://maps.google.com