

# Fish and Fisheries of Ana Sagar Lake, Ajmer, Rajasthan, India

Sanchita Rose<sup>1</sup> and Abhimanyue Singh Rathore<sup>2</sup>

<sup>1</sup>Department of Zoology, Dayanand College, Ajmer, Rajasthan, India

<sup>2</sup>Department of Zoology, B.N.University, Udaipur 313 001, Rajasthan, India

(Received 17 August, 2022; Accepted 10 October, 2022)

## ABSTRACT

The present study on fish and fisheries was conducted during January, 2019 to December, 2019. The Ana Sagar lake has a rich fish fauna which is exploited for commercial fishing thus fetching annual revenue of Rs1.46 crores to the state govt. The fish production is achieved through culture-cum-capture fisheries in the Ana Sagar lake. These fishes occurring in commercial landings which belongs to 5 orders, 5 families and 16 species. Out of these cyprinidae family predominantly contributed to the catch composition. The fish species composition in the commercial catch of Ana Sagar comprises of carps, cat fishes and other miscellaneous varieties. The total fish catch composition showed variations in the present study when compared to the past trends. The total fish production recorded recently was 5,50,943 kg in the year 2021 from Ana Sagar lake which is higher than the preceding years. At present the catch mainly consists of Indian major carps, cat fishes and exotic carps namely *Oreochromis mossambicus*, *Cyprinus carpio* and *Hypophthalmichthys molitrix* etc. Beside these species hybrid of rohu x catla is recorded for the first time from Ana Sagar.

**Key words :** Fish and Fisheries, Ana sagar lake, Ajmer

## Introduction

Biodiversity means variability of organism in the environment. Aquatic ecosystem consists of various species of fishes, aquatic plants and other miscellaneous species. Fish biodiversity denotes variability among fish species; it may possibly also speak of genotypes in fish population comprising of various species across aquatic ecosystems (Burton *et al.* 1992).

Fishes are excellent source of protein for humans since long time. Many species of fishes are consumed as food as well as their by products are used commercially in the entire world. The entire ranges of products are very useful and provide great nutrition, economic, medicinal, industrial, aesthetic and religious values for human beings. India

is the second largest fish producing country in the aquaculture next to China (FAO, 2014).

Rajasthan is the largest state and spread over in the north-western part of India and one of the border state of the country. It is endowed with diverse water resources including river, lakes, reservoirs and tanks. This makes it more potential state from fish production point of view. Fish production of Rajasthan in recent past was 0.54 lakh tonnes in 2017-2018 (Anon, 2019).

In the heart of Rajasthan Ajmer district forms a triangle in shape and its most important feature is the range of mountain - the Aravallis which act as a strong barrier dividing the plains of Marwar from the erstwhile Mewar which is the high table land. There are two natural lakes namely Pushkar and Budha Pushkar and two man-made lakes Ana Sagar

and Foy Sagar occurring in Ajmer district. Out of these Ana Sagar and Foy Sagar are located within the municipal limits of Ajmer city which are exploited for commercial fisheries. The present study is restricted to Ana Sagar lake of Ajmer.

Ana Sagar Lake was made mainly for catering the needs for irrigation and water storage purpose for the city of Ajmer. Beside other uses, now this lake is also used for commercial fisheries for the last several years. The lake has been utilized for fish culture since 1979-80 by Fish Farmer Development Agency (FFDA). Thus, the Ana Sagar lake is important for commercial fish production through culture-cum-capture fisheries and giving annual revenue of Rs 1.46 crores to the State Govt. The present study on the fish and fisheries of Ana Sagar lake Ajmer has been made to exhibit current scenario of fish and fisheries of this water body.

## Materials and Methods

### Study Area

Ana Sagar lake is the largest lake in Ajmer situated on northern side across the main tributary of Luni River which rises from Aravalli Hills (Fig. 1). Geographically it is located on 26° 70' - 26° 29' N latitude and 74° 36' - 74° 37' E longitude. The catchment area of Ana Sagar Lake is 56 Km<sup>2</sup> with a maximum depth 4.4m and storage capacity 4.75 million m<sup>3</sup>.

### Collection of fish sample

Fish samples were collected from the commercial catches at landing centre of Ana Sagar lake which is located on the western shore of lake during the present study which was conducted between 2018 to 2019. The fishes were picked up randomly and identified using standard manuals and keys (Talwar and Jhingran, 1991 and Day, 1994).

### Results and Discussion

The fish species composition in the commercial catch of Ana Sagar comprises of carps, cat fishes and other miscellaneous varieties (Table 1). At present the catch mainly consists of Indian major carps and cat fishes beside exotic carps namely *Oreochromis mossambicus* *Cyprinus carpio communis*, *Ctenopharyngodon idella*, *Clarias gariepinus* and *Hypophthalmichthys molitrix*. These fishes taxonomically belong to 5 orders, 5 families and 16 species.

Many scientists and researchers reported fish fauna of Rajasthan based on earlier field studies. (Mohan and Ramkishore, 2013; Banyal and Kumar, 2020; Bhoi *et al.* 2021). A total of 116 species of fishes belonging to 9 orders 23 families and 58 genera were recorded from Rajasthan by Kumar and Asthana (1993).

Mohan and Ramkishore (2013) studied on fish fauna and reported about 160 fish species belonging to 9 orders, 30 families and 75 genera in the state.

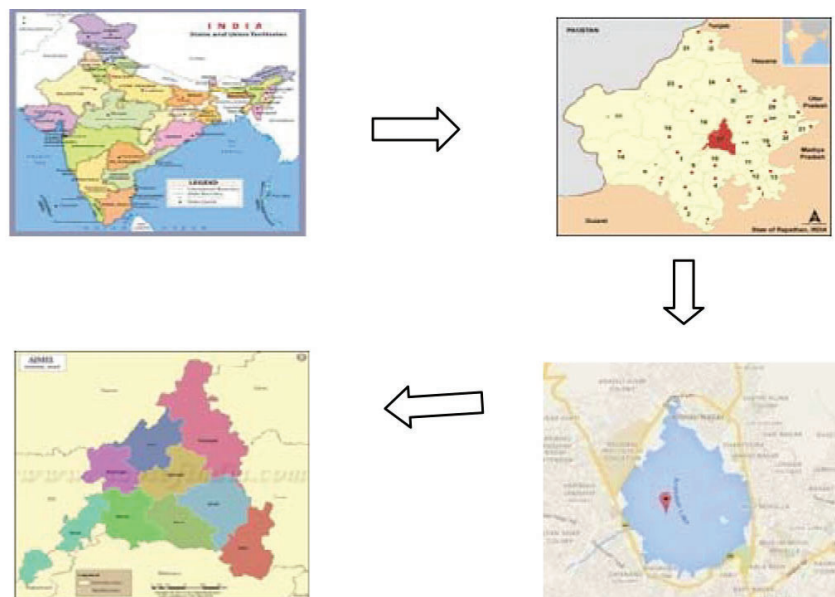


Fig. 1. Location of Ana Sagar

They also explained 81 fish species which were found dominant from cyprinidae family. Banyal and Kumar (2020) also studied on the ichthyofaunal diversity of the Mej River in Bundi district, Rajasthan. They described about 11 species belonging to 9 genera, 6 families and 4 orders.

Bhoi *et al.* (2021) also conducted study on ichthyofaunal diversity of Amarpura dam in Dungarpur and explained a rich fish fauna in waterbody including 26 species belonging to 6 order and 9 families.

According to previous reports by Hingorani (1993) 12 fish species occurred in Ana Sagar Lake comprising of *Labeo rohita*, *Labeo bata*, *Heteropneustes fossilis*, *Mystus aor*, *Cirrhinus mrigala*, *Catla catla* (revised name- *Gibelion catla*), *Channa marulius*, *Cirrhinus reba*, *Puntius sp.*, *Tricogaster fasciatus*, *Chela baccaila* and *Gambusia sp.*

Lamrod (1995) also studied the ichthyofauna of Ana Sagar Lake, Ajmer and reported 13 fish species which occurred in Ana Sagar lake namely, *i.e.* *Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*, *Cirrhinus reba*, *Notopterus notopterus*, *Labeo calbasu*, *Labeo gonius*, *Labeo bata*, *Puntius sarana*, *Puntius sophore*, *Mystus seenghala*, *Wallago attu* and *Channa marulius*. Thus, in this study a few new species were added to list and a few old one were not recorded. Such discrepancy in results may arise due to limitations of sampling procedure adopted.

According to the present study, it is evident that during the last 25 years drastic changes have been seen in the commercial catches. Some of these fish groups are replaced by other fish species including

exotic fishes (*Oreochromis mossambicus*, *Cyprinus carpio communis*, *Clarias gariepinus*, *Ctenopharyngodon idella*) and indigenous species namely *Chitala chitala* and hybrid of Rohu X Catla together with other miscellaneous varieties. Interestingly, the hybrid of Rohu X catla is recorded in the commercial catch for the first time from Ana Sagar lake. This hybrid have characteristics of both *Labeo* and *Catla* parents. The occurrence of hybrids indicates possibility of natural spawning in the inflowing riverine water and mixing of gonadal products, however, this is a remote possibility in Ana Sagar lake. Thus, there is more probability that such Rohu x Catla hybrids have got entry in this lake with incoming seed stocking which is regularly done by the contractors.

These observed alterations in the fish biodiversity spectrum of Ana Sagar therefore, are created by either deliberate or accidental entry of the exotic fishes with fish seed stocking which is regularly done as per the conditions of lease. In addition, anthropogenic factors and entry of domestic sewage in sizeable quantity and most importantly lack of proper scientific management of fisheries in Ana Sagar Lake might be probable causes of changing biodiversity scenario.

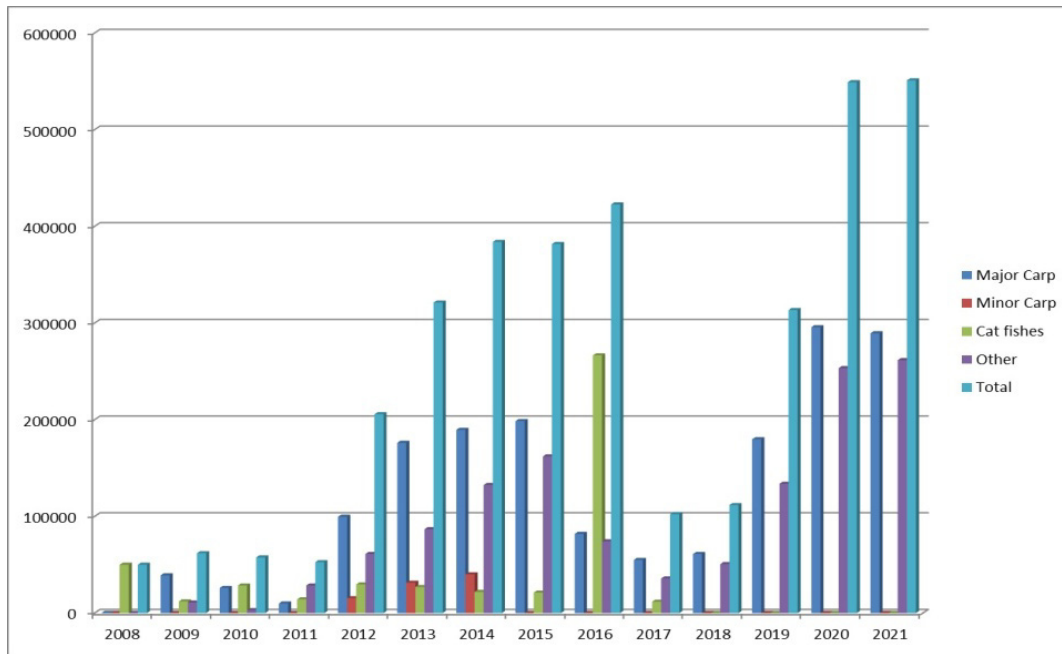
As indicated in Figure and Table 2 the total fish production during the period 2008 to 2021 exhibited large variations in the catch. The fish production of Ana Sagar reported by Lamrod (1995) was 50,67,500 kg in the year 1986-87. That fluctuated till 1991-95. After this fish production of Ana Sagar increased to

**Table 1.** List of fishes observed in the present study

	Order	Family	Species
1	Oteoglossiformes	Notopteridae	1. <i>Chitala chitala</i>
2	Cypriniformes	Cyprinidae	1. <i>Puntius sarana</i> 2. <i>Puntius ticto</i> 3. <i>Labeo rohita</i> 4. <i>Labeo bata</i> 5. <i>Catla catla</i> (revised name- <i>Gibelion catla</i> ) 6. <i>Cirrhinus mrigala</i> 7. <i>Ctenopharyngodon idella</i> 8. <i>Cyprinus carpio communis</i> 9. <i>Hypthalmichthys molitrix</i> 10. <i>Rohu-Catla Hybrid</i>
3.	Siluriformes	Clariidae	1. <i>Clarias maghur</i> 2. <i>Heteropneustes fossilis</i> 3. <i>Clarias gariepinus</i> (Thai magur)
4.	Perciformes	Channidae	1. <i>Channa punctatus</i>
5	Chichliformes	Cichlidae	1. <i>Oreochromis mossambicus</i>

**Table 2.** Share of various fish group in catch of Ana Sagar Landing Center in 2008-2021

Year	Annual fish production (in Kg) of Ana Sagar, Ajmer				Total
	Major Carp	Minor Carp	Cat fishes	Other	
2008	0	0	50000	0	50000
2009	39000	0	12000	10900	61900
2010	26000	0	28500	3000	57500
2011	10000	0	14150	28500	52650
2012	99590	15282	29612	61150	205634
2013	176054	31425	26976	86698	321153
2014	189524	39991	21866	132445	383826
2015	198544	0	21146	162023	381713
2016	81867	0	266443	74271	182581
2017	54964	0	11608	35751	102323
2018	61070	0	0	50639	111709
2019	179748	0	0	133720	313468
2020	295684	0	0	253328	549012
2021	289387	0	0	261556	550943

**Fig. 2.** Share of various fish group in catch of Ana Sagar landing centre.

1,26,26,700 kg during 1993-94. According to the present analysis of the fish production of Ana Sagar in 2008 was 50,000 kg, which was exclusively shared by the cat fishes. This substantially increased in the subsequent years and in this subsequent period there was a decline in the total catch between the years 2016 to 2018.

In 2019 again there was rise in the total catch to 3,83,826 kg, with increased share of Indian major carps. In the year 2020- 2021 the total fish production increased to attain maxima of more than 5 lakh

kg. This rise of Indian Major Carps can be explained for either adequate seed stocking or autostocking due to natural spawning of these fishes in the upstream areas of lake. Minor carps were visible in the catch in appreciable quantity only in the year 2012, 2013 and 2014. As regards cat fishes, in the year 2008 the share of cat fishes was astonishingly comprised of almost 100% to the total catch which declined in the subsequent years with notable oscillations. However, Cat fishes were not visible in catch after 2018. The share of other miscellaneous varieties of fishes

to the total catch was the highest and more than 2.61 lakh kg during 2021. Minor carp *Puntius sarana* and *Puntius ticto* are surprisingly not found now in the catch. These species are declined in water body due to impact of other fishes particularly invasive exotic fish Tilapia. If these minor carps are caught in net by chance, the fisherman release it again in the water body before they pull out rest of the catch from lake. So commercially these species are not considered very useful by the fisherman. Further *Heteropneustes* and *Channa* species are known to get shelter in the pits and several wells located within this Lake basin. Thus, they are rarely found in the catch. The apparent enhancement in the fish production is mainly due to establishment of invasive species Tilapia in Ana Sagar owing to its prolific breeding, parental care and omnivorous feeding habits. Such an invasion and explosion in population has also noticed in Jaisamand lake (Ujjania *et al.*, 2015). In view of increasing share of Tilapia in the total catch in Ana Sagar, it is likely that there will be further expansion of Tilapia population in this lake, therefore, there is urgent need to adopt proper scientific fishery management procedures for conservation of fisheries of indigenous fish fauna.

### Conclusion

The present study of fish biodiversity is observed to understand fish and fisheries of Ana Sagar lake of Ajmer. Due to urbanization, over fishing and pollution fisheries is greatly affected. From the present study of catch composition it can be concluded that water quality of Ana Sagar was fairly congenial for supporting good aquatic productivity. Fish biodiversity and growth of individual fishes could have been better in this urban lake with proper scientific fisheries management inputs. Thus, in order to maintain the age old carp and cat fish fisheries in this lake, there is need for scientific fisheries management to ensure dual objectives of better fish production and yet maintaining biodiversity of Ichthyofauna.

### Acknowledgement

Authors are thankful to administration of B.N. University especially Head of the Zoology Department Dr Sangeeta Rathore for their support in conducting this research work. I also express my deep gratitude

to Dr L.L. Sharma, former Dean, College of Fisheries, MPUAT, and Udaipur for the consistent advice and encouragement and for critically going through this manuscript. I also express sincere thanks to Dr N.C. Ujjania, Professor, Department of Aquatic Biology, Veer Narmad South Gujarat University, Surat for the kind motivation and technical support for completion of the work. I also express my thanks to Department of Fisheries, Govt. of Rajasthan, Ajmer for providing necessary information.

### References

- Burton, P.J., Balisky, A.E., Coward, L.P. Cumming, S.G. and Kneeshaw, D. D. 1992. The value of managing for biodiversity. *The Forestry Chronicle*. 68 (2): 225-237.
- FAO, 2014. The State of World Fisheries and Aquaculture (SOFIA) 2014.
- Anon, 2019. *Handbook on Fisheries Statistics (2018)*. Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India, New Delhi: 190.
- Banyal, H.S. and Kumar, S. 2020. A preliminary study on the Ichthyofaunal diversity of the Mej River in Bundi District, Rajasthan. *Rev. Zool. Surv. India*. 120(4) : 401-407.
- Bhoi, M., Choudhary, L., Vyas, T. and Bharadwaj, S. 2021. Study of ichthyofaunal diversity of Amarpura dam district Dungarpur (Raj.). *International Journal of Ecology and Environmental Sciences*. 3(1) : 102-105.
- Day, F. 1994. The fishes of India: Being a natural history of the fishes known to inhabit the seas and freshwater of India, Burma and Ceylon. Indian Reprint, *Jagmandir Book Agency*, New Delhi, 1,2.
- Talwar, P.K. and Jhingran, A.G. 1991. *Inland Fishes of India and Adjacent Countries*. Oxford and IBH Publishing Company, New Delhi, 1,2.
- Kumar, C. R. A. and Asthana, A. 1993. The fish fauna of Rajasthan. *Indian Rev. Life Sci*. 13 : 133-148.
- Lamrod, Ram Niwas, 1995. *Studies on the distribution, Behaviour and Eco management of food fishes of fresh water lakes of Ajmer*. Ph.D. Thesi,s Maharshi Dayanand Saraswati University, Ajmer. PP.185.
- Mohan, D. and Ramkishore, 2013. Ichthyofauna of Rajasthan. *Faunal Heritage of Rajasthan*. 257-275.
- Talwar, P.K. and Jhingran, A.G. 1991. *Inland Fishes of India and Adjacent Countries*. Oxford and IBH Publishing Company, New Delhi, 1,2.
- Ujjania, N.C., Dubey Monika, Sharma, L.L., Balai, Vijay Kumar and Srivastva, R.M. 2015. Bioinvasion of exotic fish tilapia (*Oreochromis mossambicus* P. 1852) in Lake Jaisamand, India. *International Journal of Fisheries and Aquatic Studies*. 3(2): 174-177.