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Fish biodiversity and fisheries potential of reservoir Udaisagar (Udaipur, Rajasthan)

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Abstract

The present study on “Fish Biodiversity, and Fisheries of Reservoir Udaisagar (Udaipur, Rajasthan)” was conducted during September, 2008 to September, 2009. The reservoir has a fairly rich fish fauna and so far 31 species representing 9 families have been recorded in the present investigation, of these, 12 species predominantly contributed to the commercial fisheries of this reservoir. During study period, the Indian major carps dominated the catch by contributing 90 percent to the total landings from this reservoir. Besides Indian major carps, minor carps and catfishes were reported to be 8.84 and 0.9 per cent, respectively. Among the Indian major carps, the *Catla catla* (70%) dominated the groups followed by *Labeo rohita* (25%) and *Cirrhinus mrigala* (5%).

Keywords: Biodiversity, fisheries, Indian major carp, fauna, species, reservoir

1. Introduction

Biodiversity may be defined as the variety, and variability of flora, fauna and microbes in an ecosystem. In recent years, the sustainable utilization of available biodiversity has assumed great significance in the face of increasing environmental threats. The overexploitation of biological resources to feed the growing human population, especially in densely populated third world countries, is so vivid that most of the resources, be it terrestrial or aquatic, have developed symptoms of impairment which is a matter of serious concern for all. Biodiversity conservation has, thus become a necessity so as to protect this planet from disintegration.

Fish constitutes almost half of the total numbers of vertebrates in the world. They live almost all conceivable aquatic habitats; c.21, 723 living species of fish have been recorded out of 39,900 species of vertebrates (Jayaram, 1999) [14]. Of these, 8,411 are freshwater species and 11,650 are marine. India is one of the mega biodiversity countries in the world and occupies ninth position in terms of freshwater mega biodiversity (Mittermeier and Mittermeier, 1997) [24]. In India, there are c. 2,500 species of fishes; which, c.930 live in freshwater and c. 1570 are marine (Kar, 2003a) [17]. Out of these 400 species are commercially important which includes wild and culturable species (Das and Kapoor, 1990) [5]. The aquatic eco systems have been subjected to various forms of environmental stress, during the past few decades. Most of such environmental problems are man-made and thus increased human activities in the catchment area of various aquatic systems have affected the natural processes of these systems adversely thereby threatening the survival and growth of biotic communities.

Fisheries in the state of Rajasthan are mainly of capture type wherein fisheries exploitation is practiced through open bid system. However, in the recent years, water bodies are auctioned on long lease and therefore, fish seed is also stocked for better returns. The water bodies have been categorized into A, B, C and D class waters on the basis of annual revenue (Anonymous, 2004) [1].

In view of the above, the present study on the fish biodiversity and fisheries of reservoir Udaisagar, Udaipur (Rajasthan) has been made as there is no such study conducted earlier on this water body.

2. Materials and Methods

A. Study Area

The Udaisagar reservoir, under investigation is situated 18 km away from Udaipur (Rajasthan) near the village Bichari. This reservoir originates from Berach river near the village Bichari. The catchment area of Udaisagar reservoir is semi-hilly and rocky.

B. Sample Collection

In order to study the biodiversity, samples of fishes were collected from the commercial catches and sample netting during fishing year 2008 at landing centre of Udaisagar reservoir. As far as possible fishes were identified in the field itself using standard manuals (Day, 1994; [8] Talwar and Jhingran, 1991) [33]. Species that could not be identified in the field were preserved in 4 percent formalin and brought to the laboratory for identification.

D. Statistical Analysis

The data collected during the present investigation were processed for statistical analysis was done as per the method described by Snedecor and Cochran (1981) [31].

3. Results

Fish Biodiversity

The fish faunal varieties found in the present investigation have been depicted in Table.1. This table clearly indicates that total 31 fish species belonging to 9 families were found from the Udaisagar reservoir. Thus, fish faunal structure appears fairly rich.

Out of the recorded 31 fish species, only 12 species viz., *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Labeo gonius*, *Labeo*

calbasu, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Puntius sarana*, *Puntius sophore*, *Amblypharyngodon mola*, *Heteropneustes fossilis*, *Wallago attu*, *Mystus seenghala* and *Mastacembelus armatus* contributed to the commercial catch of this reservoir (Plate1). Indian major carps have dominated the fishery of the reservoir followed by the minor carps and catfishes (Table.2). In general, the Indian major carps appear to contribute around 90 per cent to the total landings of the Udaisagar reservoir. While the per cent contributions of minor carps and catfishes in the total catch were only 8.84 and 0.9, respectively. Amongst the Indian major carps, *Catla catla* dominated by (70%) followed by *Labeo rohita* (25%) and *Cirrhinus mrigala* (5%) (Fig.1 and 2).

Further, in the case of minor carps, *Labeo gonius* dominated with a contribution of 63% followed by *Puntius* species viz., *P. sarana*, *P. sophore* (26%). Other fishes species, formed 11% of the total minor carp catch. The catfishes have also made a smaller contribution to the landings of the Udaisagar reservoir, the highest catfish landing being of *Wallago attu* (65%) followed by *Mystus seenghala* (15%) and others i.e., *Mystus aor*, lesser silurids and bagrids. The species of air breathing and cat fishes are represented by *H. fossilis* and three species of *Channa*.

Table 1: List of fish fauna represented in the catch from Udaisagar reservoir, Udaipur

	Family	Species	
		Scientific name	Local name
A.	Cyprinidae	1. <i>Catla catla</i> (Ham.)	Catla
		2. <i>Cirrhinus mrigala</i> (Ham.)	Mrigal or Narain
		3. <i>Labeo rohita</i> (Ham.)	Rohu
		4. <i>Labeo gonius</i> (Ham.)	Sarsi
		5. <i>Labeo kalbasu</i> (Ham.)	Kalaunt
		6. <i>Labeo boggut</i>	
		7. <i>Labeo pengusia</i>	
		8. <i>Amblypharyngodon mola</i> (Ham.)	Malwa
		9. <i>Punitus ticto</i> (Ham.)	Puthi
		10. <i>Punitus sophore</i> (Ham.)	Puthi
		11. <i>Punitis sarana</i> (Ham.)	Puthi/Kharpata
		12. <i>Punitus punctulus</i> (Ham.)	
		13. <i>Punitus amphibius</i> (Ham.)	
		14. <i>Punitus dorsalis</i> (Ham.)	
		15. <i>Tor tor</i> (Ham.)	Mahseer
		16. <i>Rasbora daniconius</i> (Ham.)	Chal
		17. <i>Oxygaster clupeoides</i> (Ham.)	Silues chal
		18. <i>Ctenopharyngodon idella</i>	Grasp carp
		19. <i>Hypophthalmichthys molitrix</i>	Silver carp
B.	Siluridae	20. <i>Heteropneustes fossilis</i> (Bloch)	Singhi
		21. <i>Wallago attu</i> (Bloch & Schneider)	Lanchi
C.	Notopteridae	22. <i>Notopterus notopterus</i> (Pallas)	Patola
D.	Bagridae	23. <i>Mystus seenghala</i> (Sykes)	Singhara
		24. <i>Mystus dor</i> (Ham.)	Pitar
E.	Mastacembelidae	25. <i>Mastacembelus armatus</i> (Lacepede)	Bam
F.	Channidae	26. <i>Channa marulius</i> (Ham.)	Sawal
		27. <i>Channa striatus</i> (Bloch)	Kabra
		28. <i>Channa punctatus</i> (Ham.)	Girhi
G.	Centropomidae	29. <i>Chanda nama</i> (Ham.)	Chalputhi
H.	Belonidae	30. <i>Xenentodon cancelai</i> (Ham.)	Suhia
I.	Cobitidae	31. <i>Nemacheilus botia</i> (Ham.)	Botia

Table 2: Per cent composition of prominent fish species in total landings from Udaisagar reservoir during period 2008-09

S. No.	Fish group	Per cent composition	
		In group	In total fish production
1	Major Carps		
	<i>Catla catla</i>	70	63
	<i>Labeo rohita</i>	25	22.5
	<i>Cirrhinus mrigala</i>	5	4.5
2	Minor Carps		
	<i>Labeo spp.</i>	63	5.6
	<i>Puntius spp.</i>	26	2.34
	Miscellaneous	11	0.9
3	Cat Fishes		
	<i>Wallago attu</i>	65	0.59
	<i>Mystus seenghala</i>	15	0.13
	Miscellaneous	20	0.18

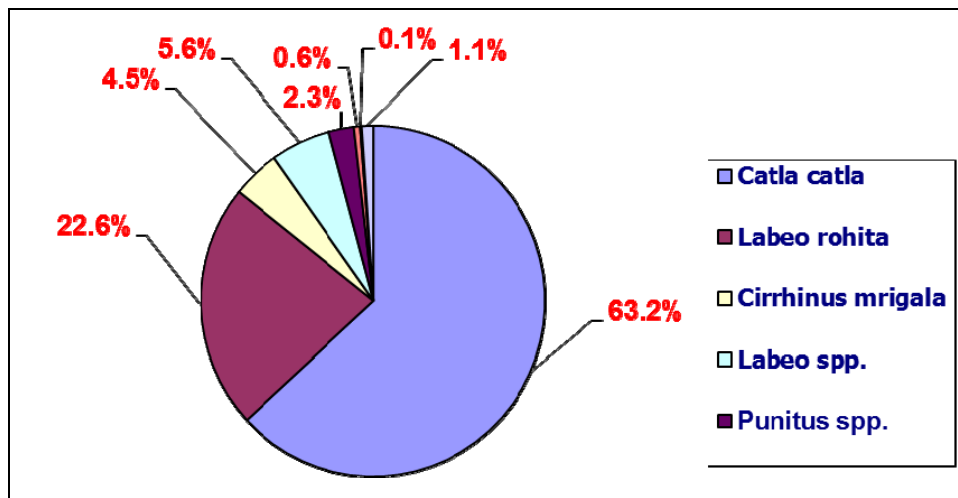


Fig 1: Per cent composition of prominent fish species in total landings from Udaisagar reservoir

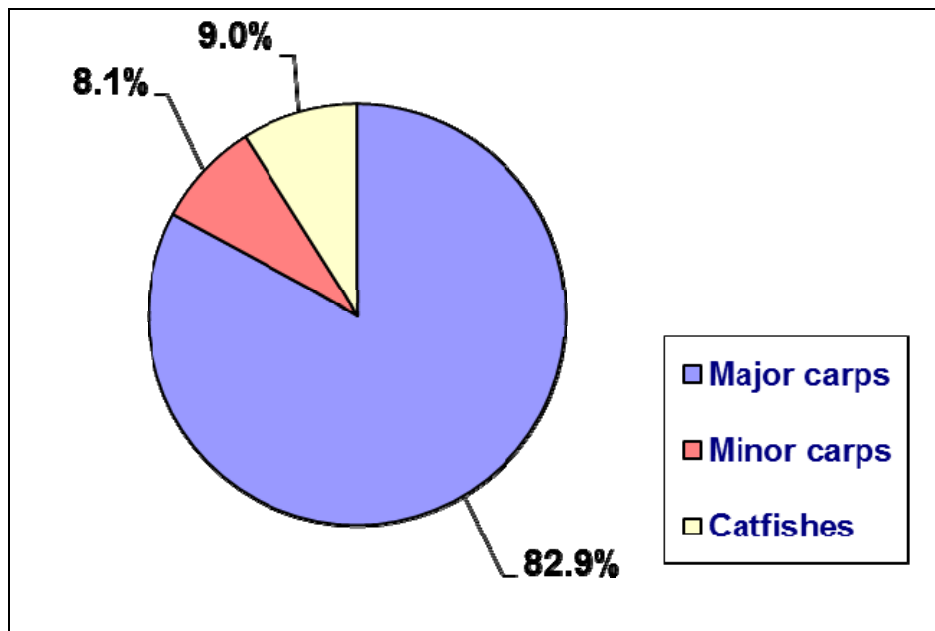


Fig 2: Per cent composition of prominent fish groups in total landings from Udaisagar reservoir during 2008-09



Plate 1: Plates Showing Prominent Fish Species of Udaisagar Reservoir

4. Discussion

Datta and Majumdar (1970)^[7] made an extensive survey at 93 collection stations in 14 districts of Rajasthan from which fishes were obtained and reported 75 fish species. Other notable contributions on the fish fauna of the Rajasthan are of Mathur (1952)^[20], Krishna and Menon (1958)^[18], Datta *et al.* (1961)^[6] and Moona (1963)^[25]. Paleogeographical features of Rajasthan waters with the distribution of fishes were discussed by Hora and Mathur (1952)^[12], whereas studies on fish fossils was made by Borooch (1950)^[2] and Tiwari (1968)^[34]. Other intensive studies on fish fauna were conducted in different districts of Rajasthan with a number of new additions to the fauna (Dhawan, 1969^[9]; Mathur and Yazdani, 1969^[23]; Mahajan *et al.*, 1981^[21]; Johal and Dhillon, 1981^[15]; Sharma and Johal 1982^[29], 1984^[30], Johal and Sharma, 1986^[16], Kumar and Vijayan, 1988^[20] Jain, 2000^[13] and Rajkumar, 2005^[28]). Further, fisheries aspects of one of the

biggest reservoir in Rajasthan Rana Pratap Sagar and Mahi Bajaj Sagar were discussed by Choudhary (1978)^[3], Choudhary, (1995)^[4] and that of Jaisamand reservoir were studied by Durve (1976)^[10] Vijay kumar (2007)^[35].

A total of 116 species of fish belonging to 9 orders 23 families and 58 genera were recorded from Rajasthan by Kumar and Asthana (1993)^[19].

The outcome of the present study from the biodiversity and fisheries point of view is that in the Udaisagar reservoir in all 31 species, 9 families (Table.1) were recorded to contribute to the Ichthyofauna of the reservoir. Dhawan (1969)^[9] recorded 39 fish species from the Pichhola and fatch sagar lakes of Udaipur. Out of 31 species observed in Udaisagar reservoir, majority are important food fishes, but only 12 species form the commercial catch of the Udaisagar reservoir. In the commercial fish catch, Indian major carps viz., *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* dominated contributing

90 per cent of the total fish landing followed by minor carps and catfishes which respectively formed only 8.84 per cent and 0.9 per cent of the total fish catch. The relative abundance of different groups of fishes forming the total catch appeared I.M.C. > Minor carp > Catfishes.

Accepting that there is meagre contribution to the recruitment from the natural breeding, the projected picture of fishable stock appears satisfactory. The relative contribution of major and minor carps was 90 and 8.84 per cent. Further, the fishery is largely contributed by two Indian major carps. viz. *Catla catla*, *Labeo rohita*. The contributions of catfishes to the total catch were 0.9 per cent. Out of the three Indian major carps, *Catla catla*, and *Labeo rohita* contribute 70.0 and 25 per cent in total fish production.

The relative abundance of IMC species was in the order of *Catla catla* > *Labeo rohita* > *Labeo calbasu* > *Cirrhinus mrigala*. Present dominance of *Catla catla* and *Labeo rohita* in Udaisagar reservoir is probably attributable to the regular stocking of these two species.

A. Fisheries Potential

From the available catch records it was observed that total fish production in the year 2008-09 was 90,000 kg., in Udaisagar reservoir. According to Natarajan (1972)^[26] in any water body the fish production potential is affected by certain factors such as lack of understanding of the ecology, paucity of quality seeds, faulty stockings, exploitation policies and presence of predatory and weed fishes. Sugunan (1995)^[29] emphasized that fish productivity is related to morphometric, hydrological and ecological features of a particular water body because the yield is partly a function of biotic and abiotic factors influencing production process of that ecosystem.

Species wise fish composition in total catch has direct influence on production of economically important fish like carps. It is well known that carps have different types of breeding and feeding patterns and presence of weeds and catfishes may directly affect carp fish production. Durve (1976)^[10] reported that fish production of Jaisamand (Udaipur) increased after heavy stocking of fingerlings of major carps. During the present study, major carps visibly dominated the catch, particularly due to continuous stocking and partly due to relatively lower population of large predatory fishes. The total fish production was around 90,000 kg during 2008-09 from this reservoir (Anonymous. 2004)^[1]. Thus, there was a large gap between potential fish yield and actual fish harvest. There is an ample scope for increasing fish production which could be achieved through sustainable management practices. According to Sugunan (1995)^[32] the estimated production potential of small (less than 1000 ha), medium (1000-5000 ha) and big reservoirs (above 5000 ha) in India are 200-300, 75-100 and 50-75 kg ha⁻¹ y⁻¹ respectively. Dwivedi *et al.* (2005)^[11] stated that the annual fish production of large reservoirs of India is 20 to 150 kg ha⁻¹ y⁻¹ while average fish production of small reservoirs is varies from 50 to 200 kg ha⁻¹ y⁻¹. On the other hand, Pandey (2006)^[27] recorded 57.89 kg ha⁻¹ y⁻¹ average fish production in Kidari Jheel in U.P.

Considering all these projections Udaisagar fish production 200 kg/ha should be 210 tonnes. From this it is evident that present production is 90 tonnes only which can be easily double by taking suitable fish stocking measures.

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