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Study of Ichthyofaunal diversity of Mul and Janala Lake, Chandrapur District, Maharashtra.

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Abstract: : Review of the literature showed that the knowledge of the limnology of the lakes in Chandrapur district and the scope for the better utilization of them for sustaining fish fauna and sustainable fish production are still lacking. With this consideration comparative limnology of the two lakes in relation to their potential for aquaculture development was undertaken which would provide baseline information for the aquaculture development in these lakes Fishes from the lakes(Mul and Janala) were collected with the help of fisherman. Collected fishes were preserved in 4 % formalin and identified following the keys of Talwar and Jhingran (1991), and Jayram,(1999). Fishes were also collected from the nearby market.

In the present investigation, fishes were collected from the landing sites on the pond itself as well as from the market. 36 species of fishes belonging to 5 Orders and 16 families were recorded from the two lentic ecosystems. In the present investigation, ichthyofaunal diversity is poor and although specifically two species ie. Clarias batracus and Heteropneustesfossilis were recorded from both the pond, their availability in catches in considerably reduced and even the market surveys have indicated that they were drastically reduced in number and needed definite conservational strategies.

Keywords: Ichthyofauna, Clarias batracus and Heteropneustesfossilis, Anabas testudinius

Introduction

India has 2.4 % of worlds land mass 4 % as water resources and 16 % of worlds population therefore no scope to underutilize water resources. The aquaculture industry has to rapidly adopt better farm management techniques better and efficient species, better genetics and better water management practices.

In the report on “fish 2030-prospect for fisheries and aquaculture” (5 february 2014) by world bank, FAO and international food policy research institute (IFPRI), A. Mathiesen reported “with the worlds population predicted to increase to 9 billion by 2050 particularly in areas that have high rates of food insecurity, aquaculture, if responsibly developed and practiced, can make a significant contribution to global food security and economic growth”

The health of the environment decides the diversity and productivity of the systems. Therefore for sustaining the diversity of fish, and for sustainable management of the fish culture, it is important to know the factors controlling the quality of the lake systems. Certain changes in physico-chemical parameters, drainage of pesticides and fertilizers from the surrounding crop fields, heavy siltation during heavy rainfall, high density of fingerling stocking of selected culture fishes, poor management of fish culture and fish diseases were found to exert undesirable impacts on fish diversity and productivity.

Rational management methods by creating public awareness has to be followed for sustaining fish diversity and for sustainable fish production in these lakes for preventing any further rural economic loss. A periodic survey and monitoring of these water bodies is essential to check the water quality and prevent any disturbances to these lacustrine ecosystems. The documentation of fish species distribution in various habitats will assist in resource allocation between different user communities who depend on fishing as a livelihood strategy. This baseline information allows for informal decision making by both resource managers and users and will cater to more equitable and sustainable use of fish resources.

India is one of the mega diversity countries in the world and occupy the ninth position in terms of fresh water fish diversity (Mittermier, 1997). In India, there are c.2,500 species of fishes, of which c.930 live in fresh water and c.1570 are marine (Kar, 2003 a).

There have been extensive studies on the fresh water fishes in India, notably by Hamilton (1822) ; Hora (1921 a,b,1930, 1937,1939,1940,1943,1951, 1953); Misra (1959); Menon (1974,1999); Dey (1973); Jayaram (1981, 1999); Talwar and Jhingran (1991); Dey and Kar (1989 a,b,c,1990); Kar (1984, 1990,2003 a, b 2004, 2005 a,b,c,d,e) But most of them are concerned with taxonomy, biology and aquaculture.

The optimum fish production is totally dependent on the physical, chemical and biological qualities of water to most of the extent. Hence,successful pond management requires an understanding of water quality.

The most of the countries, fishes are cultivated in ponds and lakes (lentic water) but unfortunately such culturists are not so aware of importance of water quality management in fisheries. If they are properly guided and make aware about water quality management practices, they can get maximum fish yield in their lakes to a greater extent through applying low input cost and getting high output of fish yield. The role of various factors like temperature, transparency, turbidity, water colour, carbon dioxide, pH, alkalinity, hardness, ammonia, nitrite, nitrate, primary productivity, biochemical

oxygen demand (BOD), plankton population etc. can't be overlooked for maintaining a healthy aquatic environment and for the production of sufficient fish food organisms in ponds for increasing fish production.

Total water spread area of Maharashtra is 317000 hectare of which in Chandrapur district there are 11052 ponds and lakes with a total area under fish culture of 16768 hectares (as per fisheries department, Government of Maharastra) so for as the fish production from the lakes and reservoir is concerned it ranges between 400 to 600 kg per hectare per year (Bhendarkar et. al, 2013).

The optimum fish production is totally dependent on physico-chemical and biological qualities of water and if it is properly managed the fish production can be increased. Thus inland fish production of Maharashtra can be increased by an integrated approach which can boost the aquatic production upto 2000 kg per hectare per year through scientifically managed practices.

Review of the literature showed that the knowledge of the limnology of the lakes in Chandrapur district and the scope for the better utilization of them for sustaining fish fauna and sustainable fish production are still lacking. With this consideration comparative limnology of the two lakes in relation to their potential for aquaculture development was undertaken which would provide baseline information for the aquaculture development in these lakes.

The analysis of physico-chemical and biological parameters from the two lentic ecosystems under study would be of immense help in the future environment impact assessment studies and for sustainable development of these ecosystems, which remained neglected from the point of view of Limnological studies and their potential for aquaculture development.

Method and Material: Fishes from the lakes were collected with the help of fisherman. Collected fishes were preserved in 4 % formalin and identified following the keys of Talwar and Jhingran (1991), and Jayram,(1999). Fishes were also collected from the nearby market.

Result : In the present investigation, fishes were collected from the landing sites on the pond itself as well as from the market. 36 species of fishes belonging to 5 Orders and 16 families were recorded from the two lentic ecosystems under study and the list is present in the table No. 4.6.

In the present investigation, ichthyofaunal diversity is poor and although specifically two species ie. Clarias batracus and Heteropneustesfossilis were recorded from both the pond, their availability in catches in considerably reduced and even the market surveys have indicated that they were drastically reduced in number and needed definite conservational strategies.

The Anabas testudiniusis not a resident species but it is recorded from Mul lake and appears to have been accidently introduced along with the carp seed brought from the west Bengal. In both the lakes the specimens of exotic fish Tilapia mossumbica were observed but it appears that it has not fully established but its increased number in catches during the summer months and may affect the production of major carps.

Discussion

Ichthyofauna :

Ichthyodiversity refers to variety of fish species, depending on content and scale, it could refer to alleles or genotypes within piscianpopulation ,to species of life form within a fish community, and to species or life forms across aquaregimes (Burton et. al. 1992).Biodiversity is also essential for stabilization of ecosystems, protection of overall environmental quality, for understanding intrinsic worth of all species on the earth (Ehrlich and Wilson, 1991).

The genetic imprinting of various population of lentic fish species is essential since the fresh water ecosystem constitute crucial parts of their life support systems by providing nursings grounds and feeding areas (Hammer et. al 1993). Further species diversity is a property at the population level while the functional diversity concept is more strongly related to ecosystem stability and stresses, physical and chemical factors for determining population dynamics in the lentic ecosystem.

Natural waters have more stable conditions under which the fish evolve hence enlisting biodiversity and its distribution over time and space is important from the point of variations in fish fauna over time and space and enables to frame the strategies for sustainable use of water and also for its conservation.

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Ahirrao et. al. (2000) recorded 32 species of fishes belonging to 25 genera and 8 families from fresh water ecosystem in Parbhani district, M.S. Sone et.al. (2000) enlisted 12 species of fishes (8 predatory and 4 weed fish) from Ekburgii reservoir, Washim (M.S). Devashish et.al. (2006) enlisted 69 species of fishes from aquatic ecosystems in north eastern India.

Rathod et.al. (2008) recorded 12 species from Umra reservoir, Washim (M.S). Tijare et. al. (2008) recorded 32 species from the lakes of Gadchiroli district (M.S.). Ashashree et.al. (2008) recorded 18 species from valaga pond, Karnataka. Venkateswarulu et.al. (2002) recorded 27 species belonging to 5 orders and Cypriniformes species were dominant from Bhadra reservoirs, Western ghats. Dutta et.al. (2003) recorded 20 species belonging to 3 order, 4 families and 14 genera from lentic and lotic ecosystems in Doda district.

Meshram et. al. (2005) reported 67 species; 40 species were food fishes and 27 were weed fishes from the Nathsagar reservoir, Paithan. Battul (2007) recorded 18 species from 5 orders in Ekrukh lake, Solapur. Jayaraju (2001) enlisted 105 species belonging to 58 families and 7species are of shrimps from Kolleru lake (A.P.). Sakhare recorde 23 species from Jawalgaon reservoir, Solapur (M.S).

Deviprasad et.al. (2009) reported 45 species of fishes belonging to 15 family and 31 genera from major wetland of Mysore.

Murkute (2009) from three pond at Bramhpuri reported 30 species of fishes from 5 order and 14 families.

Wasudha Meshram (2010) reported 27 species from 5 orders and 13 families from Gondia.

Gopal Paliwal (2013) from Navegaon tank distt. Gondia recorded 51 species from 6 order belonging to 17 families and 31 genera.

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Potential of MUL and JANALA lake for aquaculture development:-

In India the water spread area in which aquaculture is practiced consist of 5.912 million hectares of which Maharashtra state has the area of 3,17000 hectare . In Chandrapur district there are about 1152 pond and lakes and area under aquaculture is about 16,768 hectares. The average fish production ranges between 400 to 600 kg per hectare per year which can be increased by an integrated approach up to 2000 kg per hectare per year.

Fish is an inexpensive source of protein and an important cash crop in many regions of world and water is the physical support in which they carry out their life functions such as feeding, swimming, breeding, digestion and excretion (Bronmark and Hansson, 2005), water quality is determined by various physicochemical and biological factors, as they may directly or indirectly affect its quality and consequently its suitability for the distribution and production of fish and other aquatic animals (Moses, 1983).

All living organisms have tolerable limits of water quality parameters in which they perform optimally. A sharp drop or an increase within these limits hasadverse effects on their body fuctions (Davenport, 1993; Kiran, 2010). So, good water quality is very essential for survival and growth of fish. As we know fish is an important protein rich food resource and there has been sharp increase in demand of fish products due to increasing population pressure in this century. Thus to meet the demand of present food supply, water quality management in fish ponds is a necessary step that is required to be taken up.

In most of the countries, fishes are cultivated in ponds (lentic water) but unfortunately such culturists are not so aware of importance of water quality management in fisheries. If they are properly guided and make aware about water quality management practices, they can get maximum fish yield in their ponds to a greater extent by applying low input cost and getting high out put of fish yield. The role of various factors like temperature, transparency, turbidity, water colour, carbon dioxide, pH, alkalinity, hardness, ammonia, nitrite, nitrate, primary productivity, biochemical oxygen demand (BOD), plankton population etc. can't be overlooked for maintaining a healthy aquatic environment and for the production of sufficient fish food organisms in ponds for increasing fish production.

India needs nearly 10.0 million tones of fish annually to bring up per capita consumption of the people of the country (presently 9 kg against 12 kg of the world). With this objective, the country was heading well to achieve annual total fish production of 7.7 million tones with inland production of 4.6 million ton a few years back, to be in the second rank globally. However, all of a sudden, there seemed to be a crunch in fish production of the country. As per FAO's report published in 2012, in

global fish production of 2010, China ranked first (15.66 million t), followed by Indonesia (5.38 million T), and India (4.69 million t). Similarly ,in aquaculture production of 2010, China was at top (47.83 million t) followed by Indonesia (6.27 million t) and India (4.65 million t). Thus, at a time when India was heading towards second rank in global fish production it dropped down to third rank. The declining trend in country's fish production could be the impact of climatic change when the year 2010 was declared as the World's Warmest Year by WMO and the Warmest Decade by Indian meteorologists. (Sharma and Das, 2012). Pillai (2012) has also observed that erratic monsoon in India with El-Nino effect during the year 2010 resulted in deficient rainfall thereby impacting the fish production adversely. It is also reflected from low fish production of open waters (Particularly reservoirs), subduedly recorded at 0.04 million t in 2010. Further, some management lapses in exploitation of open waters like overfishing and environmental reasons may also be responsible for the low fish production. Therefore, the fishery resources of open waters, particularly reservoirs and lakes, have to be developed and tapped up to increase the annual fish yield of the country in the years to come (Desai, 2013).

In the present investigations, in table No. 4.7 to 4.8. fish production in Janala and Mul lake from 2011 to 2012 is shown. In Janala lake the lowest fish production was recorded in the year 2008-2009 i.e. only 0.4 Quintal per hectare and the highest per hectare production was recorded in the year 2003-2004. In the year 2008-2009 the lowest production was due to less recruitment of seed of the fish species available in the lake and not stocking of fish seed from external sources due to their non availability in that year. However the fish production is very less and there is good scope for increasing fish production by introducing more seed from nearby fish seed farm.

In Mul lake minimum fish production was recorded in the year 2006-2007. Even though the lake was stocked with about 350000 fry and fingerling. The maximum production was recorded in the year 2011-2012 with a per hectare production of 5.4 Quintal.

In both the lakes stocking of seed from external sources is the only tool for improving productivity.

The region expects full utilization of water of the water spread area upto an optimum level. Vidharbha region has a high number of small reservoirs. Therefore stocking policy is to be evaluated on its biogenic capacity for a reservoir. There is scope for increasing production from these potential resources by adopting new technology. High value fish can be introduced by eliminating the low value fish so as to raise the total yield and revenue. A proper system is required for pooling of fish, its preservation and supply to meet demand of fish.

The physico-chemical and biological characteristics of water quality of both lakes under study are within the permissible limit that are condusive to the fish growth. Hence if the fish seed is stocked in suitable number in combination of fish seed of common carp and Chinies carps in suitable combination, the overall seed production can be definitely increased.

In both the lakes fish stocking and harvesting is performed by the members of the fisheries cooperative societies. The members performs the fish culture practices with traditional methods and if they are made aware about the recent development in seed production and management technology definitely the fish yield per hectare may be increased. Secondly as for as Mul lake is concerned if local municipal authority, takes the initiative to prevent the entry of domestic sewage, which increases the organic load and as a consequence of this fish growth and production decreases, would help to increase the fishery potential of the lake.

In both the lakes stocking of proper species of fishes particularly Indian major carps, along with the common carp and Chinise carps in suitable proportion be promoted to enhance the fish production.

1) Table : 4.6 : Ichthyofaunal diversity in Mul and Janala Lake

Sr. No.	Zoological Name	Common Name	Status	Remarks	Mul Lake	Janala Lake
	Class : Osteichthyes SubClass : Actinopterygii Order : Steohlossiformes Sub-Order : Notopteridae **Family : Notopteridae**					
01	*Notopterusnotopterus* (Pallas)	Featherback	C	It is a food fish	+	+
	Order :Cypriniformes Sub-Order : Cyprinoidei **Family : Cyprinidae** **Subfamily : Abramidinae**					
02	*Oxgasterbacaila* (Hamilton)	Chelliah	C	It is good eating & also larvicidal	+	+
03	*Oxygasterclupeoides* (Bloch)	Chela	C	It provides good dish for poors meal	+	+
	Sub-family :Rasborinae					
04	*Brachydanio rerio* (Hamilton)	Zebra- danio	C	It is a good aquarium fish	+	+
05	*Rasbora daniconius*(Hamilton)	Common rasbora	C	It is efficient larvicidal fish and consumed by poor classes	+	-
	Sub-family :Cyprininae					
06	*Catlacatla*(Hamilton)	Catla	C	One of the fastest growing fish &	+	+

				good food Value		
07	*Cirrhinusmrigala* (Hamilton)	Mrigal	C	It is an excellent species for stocking the ponds	+	+
08	*Cirrhinusreba*(Hamilton)	Reba Carp	C	Good food fish	+	+
09	*Ctenopharyngodonidella*(Valenciennes)	Grass Carp	Exo	Introduced in India from Japan in 1959 (V.G. Jhingran 1983)	+	-
10	*Cyprinus carpio*(Linnaeus)	Common Carp	Exo	Introduced in India from Bangkok in 1957 (V.G. Jhingran 1983)	+	+
11	*Labeocalbasu* (Hamilton)	Kanas	**C**	It is a excellent food fish	+	+
12	*Labeofimbriatus* (Bloch)	Fringed lipped Carp	C	It is a excellent food fish	+	-
13	*Labeorohita* (Hamilton)	Rohu	C	It is esteemed excellent as food & great economic importance	+	+
14	*Osteobramacotio*(Hamilton)	Cotio	C	It is useful larvicidal fish	+	+
15	*Puntius sarana* (Hamilton)	Olive barb	C	Much valued as food	+	+
16	*Puntius ticto* (Hamilton)	Khavli barb	C	Consumed by locals	+	+
	Family: cobitidae					
17	*Lepidocephalichthysguntea*(Hamilton)	Loach	U	Inhibits clear standing water	+	-
	Order: Siluriformes Family: Bagridae					
18	*Mystusaor* (Hamilton)	Long whiskered cat fish	C	Use as a food by locals	+	+
19	*Mystuscavasious* (Hamilton)	Gangetic mystus	C	This fish is highly esteemed as food	+	-
20	*Mystusvittatus* (Bloch)	Shingur	C	Esteemed as food for its pleasant smoky flavor	+	+
	Family :Siluridae					
21	*Ompokbimaculatus* (Bloch)	Butter Catfish	C	It is a excellent food fish	+	+
22	*Wallago attu* (Schneider)	Boal	C	Species is good for eating and also good game fish	+	+
	Family :Clariidae					

23	*Clarias batrachus*(Linnaeus)	Magur	EN	As per IUCN 1988 & Menon 2004	+	+
	Family:Heteropneustidae					
24	*Heteropneustesfossilis*(Bloch)	Stinging Cat fish	C	It is considered to be very good nourishing & tasty fish	+	+
	Order**:** Atheriniformes Sub-order**:** Exocoetoidei **Family :Belonidae**					
25	*Xenentodoncancila*(Hamilton)	Freshwater Gar fish	C	This fish is good for eating with potherbs	+	+
	Order**:** Perciformes Sub-order**:** Percoidei **Family :Centropomidae**					
26	*Chanda ranga*(Hamilton)	Indian Glass fish	C	Good aquarium fish	+	+
	Family: Nandidae					
27	*Nandus nandus*(Hamilton)	Mottled Nandus	C	Good food value	+	-
	Family: Chchlidae					
28	*Tilipiamossambica*(Peters)	Tillapia	Exo	Introduced in India from Bangkok in 1952 (V.G.Jhingran 1983)	+	+
	Sub-order**:** Gobioidei **Family :Gobiidae** **Sub-family : Gobinae**					
29	*Glossogobiusgiuris*(Hamilton)	Bar-Eyed Goby	U	It is a good food fish	+	-
	Sub-order**:** Anabantoidei **Family :Anabantidae**					
30	*Anabas testudineus*(Bloch)	Climbing perch	C	Due to presence of accessory respiratory organ it is hardy and has good flavor	+	-
	Family :Belontidae					
	Sub-order**:** Channidei **Family: Channidae**					
31	*Channa striatus*(Bloch)	Striped Snake head	C	It prefers stagnant mudy waters and carnivorous in habit	+	+
32	*Channa punctatus*(Bloch)	Spotted Snake head	C	This fish prolific breeder and development is	+	+

				rapid		
33	*Channa marulius*(Hamilton)	Giant snake head, Marad	U	It is favorite sporting species and highly esteemed as food	+	-
	Sub-order: Mastacembeloidei **Family: Mastacembelidae**					
34	*Mastacembaluspuncatus*(Hamilton)	Spiny Eel	C	It is a good food fish	+	+
35	*Mastacembalusarmatus*(Lacepede)	Spiny Eel	C	It is a good food fish	+	+
36	*Mastacembalusaculeatum*(Bloch)	Lesser Spiny Eel	C	It is a good food fish	+	+

Table No. 4.7 : Showing Fish Production in Mul Lake

MUL Lake

Name of Lake	Area of lake in hectare	Year of stocking	Quantity of seed stocked	Quantity of Harvested	State of fish stocked	Production per hector (in Quintal)
MUL Lake	26.11 hq.	2002-03	150,000	37.92	Fingerling	1.4
		2003-04	110,000	67.19	Fingerling	2.5
		2004-05	240,000	40.19	Fing + Fry	1.5
		2005-06	230,000	62.76	Fing + Fry	2.4
		2006-07	350,000	32.59	Fing + Fry	1.2
		2007-08	310,000	104.46	Fing + Fry	4.0
		2008-09	11,000	71.80	Fingerling	2.7
		2009-10	600,000	108.34	Fry	4.1
		2010-11	556,500	98.07	Fry + Fingerling	3.7
		2011-12	3,750	141.16	Fingerling	5.4

Table No. 4.8 : Showing Fish Production in Janala Lake

Janala Lake

Name of Lake	Area of lake in hectare	Year of stocking	Quantity of seed stocked	Quantity of Harvested	State of fish stocked	Production per hector (in Quintal)
Janala Lake	26.62 hq.	2002-03	2,40,000	47.97	Fing + Fry	1.8
		2003-04	2,20,000	61.88	Fing + Fry	2.3
		2004-05	3,20,000	44.26	Fing + Fry	1.6
		2005-06	2,15,000	39.87	Fing + Fry	1.4
		2006-07	1,35,000	23.68	Fing + Fry	0.8
		2007-08	20,000	--	Fingerling	--
		2008-09	--	13.14	--	0.4
		2009-10	1,00,000	--	Fry	--
		2010-11	1,50,000	43.54	Fry	1.6
		2011-12	27,500	25.02	Fingerling	0.9

Table No. : 4.9		
Year 2001 to 2012 **Fish production and Fish stocking in Chandrapur District**		
Year	**Stocking (Lacks)**	**Production (Megaton)**
00-01	851	9197
01-02	745	6738
02-03	1014	9443
03-04	1177	14215
04-05	1281	14654
05-06	1323	14469
06-07	956	14306
07-08	1059	15943
08-09	1153	15600
09-10	934	7354
10-11	741	9036
11-12	866	12352
12-13	--	11787

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