

Fish and fisheries management status of Itiadoh reservoir, Maharashtra State

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ABSTRACT

A reservoir fishery has been identified as one of the engines of future growth in India. Since literature on effective governance, institutional framework and sustainable management practices of Indian reservoirs were scanty, the present study documented the fisheries and management status of Itiadoh Reservoir. IMC were dominating the fishery followed by exotic carps, catfishes, snakeheads, tilapia and spiny eels. Annual fish production during 2011-12 (Study period) was 95,412.5 kg and the productivity was 18.4 kg /ha/yr. Gill net was the only gear employed to exploit fishery of reservoir. It was observed that banned season does not exist in Itiadoh reservoir. Reservoir produce was mainly marketed through Vidarbha Vibhagiya Machhimar Sangh Limited, Gondia a Department of Fisheries affiliated marketing agency in the region. The reservoir needs immediate attention for development of fisheries in a scientific and sustainable manner to augment the fish production.

Key words : Fish, Fisheries, Management, Reservoir, Maharashtra

Introduction

It is a fact that inland fisheries sector has become the mainstay of increasing fish production in the country and this trend is expected to continue in future. Although the major chunk of this production is projected from aquaculture, but increase in fish production from inland capture / open-water ecosystems is also expected in a big way. It needs to be examined as to how inland open-water fishery can contribute to this target and what could be its future role. Considering constant or net decline in fish catch from rivers over the years, measures are necessary for efficient and generous utilization of river associated systems for fisheries to enhance the fish production, productivity and livelihoods for the inland fishers. At many fora, reservoirs are recognized as the sleep-

ing giant and most important water resource for inland fisheries development in the country. Thus, any attempt to increase productivity in inland fisheries has to rely heavily on reservoirs (NFDB, 2011). These water-bodies have become the prime inland fisheries resource of India due to many reasons. Development of reservoir fisheries has many economic and social advantages. The marine capture fishery is fast approaching a plateau and the inland aquatic ecosystems like rivers face degradation due to anthropogenic habitat changes. The aquaculture development projects are capital intensive and constrained by many environmental risks. In view of these and considering the enormous resource size and untapped production potential, the reservoirs have become the focus of future fisheries development plans in India (Ayyappan *et al.* 2011).

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The Itiadh reservoir is one of the largest reservoirs in Maharashtra, which is built across the river Gadhvi near Gothangaon village, in Arjuni-Morgaon Taluka of Gondia District. Gadhavi is the tributary of Venganga River. The name of the reservoir is given after the name of British Engineer "Itia", who planned this major irrigation project. It is the second largest reservoir in Vidarbha region and largest in Gondia district. The impounded Itiadh Reservoir with a catchment area of 46,910 km² falls under the category of "large reservoirs" and is mainly fed by the rivers Gadhavi. It is important in view of its ichthyofaunal diversity and has been an important source of livelihood and employment generation for many fishing communities surrounding it. In spite of its fisheries importance, studies with regard to the ichthyofaunal diversity, eco-fishery status and population dynamics are limited; the only noteworthy one being that of Srivastava *et al.* (1985) who studied the limnology and fisheries of the reservoir. In this context and in view of the increasing importance of reservoir fisheries in the region, an appropriate study on the current status thereof, was the need of the hour. The present study was, therefore, visualised to assess the ichthyofaunal diversity and eco-fishery status, besides, addressing the management practices of Itiadh Reservoir.

Material and Methods

The Itiadh Reservoir located in Gondia District of Maharashtra was selected to study the fisheries and management status for a period of one year from June 2012 to May 2013. Fish sampling was done at five landing centres of Itiadh reservoir namely; Gothangaon (Dam site), Ramnagar, Sanjaynagar, Yerandi and Palandur using gillnet and the commercially important species were only taken into consideration. During the selection of these landing centres it was considered that these landing centres will represent all the three stretches of the reservoirs i.e. Lower, Middle and Upper in view to covering entire reservoir region. The fishes were either collected personally or fishermen were instructed to collect during every sampling operation. Fishes were identified based on standard taxonomic literature (Talwar and Jhingran, 1991; Jayaram, 1999) and grouped into two categories based on their abundance viz., Major and Minor. Data on fish catch (total catch, year-wise catch), data on fish seed stocking (total stocking, year-wise stocking) and species com-

position were collected either during personal visits or from the daily records in the landing centres and also through questionnaires given to the fishers. Data on fishing methods, types of gear, mesh size, stocking details, harvesting, marketing channel and problems encountered were collected through questionnaire.

Results and Discussion

Geographical and morphometric features and prevailing climatic conditions play a vital role in fish production of reservoirs (Odyuo, 2012). The morphometric and hydrographic details of the reservoir are presented in Table 1. Mean depth has a great bearing on productivity (Rawson, 1952; Hayes, 1957; Desai, 2006; Odyuo, 2012) as shallow lakes have greater part of their water in the euphotic zone, facilitating better mixing and circulation of heat and nutrients; hence, higher productivity. The average depth of Itiadh reservoir was 26.7 m and production was also relatively good. The similar results were reported by Odyuo (2012) in the case of Doyang reservoir, the average depth of Doyang Reservoir was 21.06 m but the fish production was found to be relatively good. Sugunan (1980) reported average depth ranging from 31.08 to 39.18 m in Nagarjunasagar Reservoir with an annual yield ranging between 1.75 kg ha⁻¹ to 9.4 kg ha⁻¹. Some of the deep reservoirs such as Chamera (43.5 m) and Govindsagar (55.0 m) in Himachal Pradesh are productive due to other favourable factors such as limno-chemical parameters and good management practices (Vass and Sugunan, 2009). Sugunan (1995) asserted that the mean depth, may not show any direct correlation with productivity, either at primary or tertiary level, citing an example that the Vidur Reservoir in Tamil Nadu, although one of the shallowest (mean depth 2.1 m) of all reservoirs in the country, does not have rich plankton diversity. Thus, it appears that in Indian reservoirs, depth is not always a constraint to productivity (Cited in Odyuo, 2012).

Fish and Fisheries

The Itiadh Reservoir comprised the fishery of 21 species belonging to 9 families. The important species composition of the reservoir is presented in Table 2. Among the families Cyprinidae (Indian major carps) dominated the fishery. Among the catfishes the family Sisoridae, Bagridae and Siluridae

were predominant. The other families which contributed to the species diversity were *Notopteridae*, *Channidae*, *Mastacembelidae*, *Cichlidae* and *Salmostamatidae*. The abundant fish species included *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* and falls under major fish category. Other important ichthyofauna which contributes at some extent comprised of *Ompok bimaculatus*, *Ompok pabda*, *Heteropneustes fossilis*, *Channa marulius*, *Channa striatus*, *Mystus seenghala*, *Mastacembelus armatus*, *Wallago attu*, *Salmostomata spp.*, *Oreochromis mossambicus*, *Notopterus notopterus*, *Notopterus chitala*, *Labeo calbasu*, *Cirrhin areba*, *Labeo gonius*, *Labeo fimbriatus* etc. and falls under minor category.

Fish Production

The projected total fish production of Itiadh Reservoir during 2011-12 was 95,412.5 kg. Year-wise fish catch is shown in Fig. 3. The catch was observed to reach its peak in the months of June – September and during remaining months it shows declining trend. The present productivity of the reservoir was worked out to be 18.4 kg ha⁻¹ yr⁻¹.

Trends in catch composition

Since 2002-03 there was a gradual increase in the major carp's production. From 2007-08, there is a tremendous increase in the production and it reached to a maximum of 92,550.500 kg in 2011-12. As regards the local major, it showed somewhat similar trend from 2002-03 to 2006-07. From 2007-08 there was a tremendous decrease in the local major production and which was unrecoverable till 2011-12. During 2009-10 there was slight increase in the production, but it again went down to the lowest of 2,862 kg in 2011-12. The local minor also showed continued decrease in the production over the period. Presently, there are five landing-cum-assembling centers which are 15-20 km away from each other i.e. Gothangaon, Yerandi, Tidka, Jhanshinagar, Pallandur. The peak production was in the months of July-August, which were 20-30 tons for all years.

Fisheries Management

Management of reservoirs is of utmost importance not only to augment fish production but also to maintain it at a sustainable level. Practical management of fish populations in reservoirs depends on the degree of environmental control that can be applied, on those factors that limit the size of the population, and on the goals of the fishery. Several man-

agement measures have been devised to substantially increase production in the reservoirs (Odyuo, 2012).

Institutional Framework

The Itiadh Reservoir is owned by Irrigation Department and fishing rights of the reservoir has been transferred to Fisheries Department, Gondia. The Fisheries Department itself plays a role of leasing agency which has been leasing out the reservoir from 1974-75. The lease amount is equally divided between Fisheries Department and Irrigation Department. Presently, the reservoir is leased out for five year to the Itiadh Jalashay Co-operative Society Limited, Ramnagar, Taluka Arjuni-Morgaon, District Gondia for fisheries purpose (As per the Government leasing resolution, 2001 that every reservoir above 200 ha is only given on lease to the co-operative societies in the reservoir region) and the lease amount is 1,26,440 per year. It is the only Co-operative society on this reservoir. The Society was registered in 2001 with 201 initial members, before which there was no organized Co-operative society in the vicinity of the reservoir region. Hence till 2001 the reservoir was given to the contractor on lease for fisheries.

Co-operative society

The Society which was registered in 2001 with 201 initial members today has 302 active members with 200 as share capital per member. The co-operative society has its own body of 11 members which used to change at every year. All the fishers in the reservoir region are the members of co-operative society. The co-operative has given fishing licenses to all its members to avoid poaching from the reservoir. The fishing license fee is 1/week/fisher member. The co-operative has started to take reservoir on lease from 2001. The reservoir site is divided into five landing centers like, Gothangaon, Yerandi, Tidka, Jhanshinagar and Pallandur for effective management. By considering this the co-operative society has assigned its three persons at each landing centers i.e. one Head of the center and other two are guards. The head of the center mainly keeps all records of daily fish catch at individual landing center and disposes the catch assembled at landing center specified to the trader (which is assigned by federation) at decided prices. The trader paid the week's payment on every Sunday and hence fisher's wages also paid on every Sunday. One guard helps

him to weigh the fish while the heaps watch and ward to prevent poaching from reservoir. The cooperative pays 1700 / month / head for their jobs.

Crafts and Gears

The fishery of Itiadh reservoir was mostly single gear oriented i.e. only Gill net was employed in the reservoir for exploiting the fishes. The crafts used in Itiadh reservoir was of non-motorized type as they are considered too expensive. It is momentous to note that even large water bodies like Nagarjunasagar, Tungabhadra and Krishnarajasagar have no motorised craft for fishing or for fish transport (Sugunan, 1995). All the fishers at Itiadh reservoir were having their own boats. They had bought these boats in a group of three (i.e. 3 fisher/boat) with 50% subsidy from DoF. There are total 120 boats; out of which 70 are wooden and 50 are tin boats. Out of the total boats, 40 boats had been bought with 50% subsidy in 2007 and next 40 boats in 2010. The dimensions of the boat are length 11 feet and Width 2 feet, while cost for each boat was 6,000. On an average, each fisher has 30 – 40 kg of gill nets. They use only gill nets of different mesh

sizes from 5" to 14". They did not use cast net at all. Fishers of the reservoir mostly use the gill nets of 6", 8", 9" and 10" mesh sizes. The fishers purchased their fishery requisites from the private shops of Sakoli, Gondia, Bhandara and Nagpur. From 1976 to 2010, fishers were getting 3 kg twine every year with 50 % subsidy while September, 2010 onwards, every year they are getting 5 kg twine with 50 % subsidy from DoF. On an average 250 nets per day were employed in the reservoir. Most of the fish caught from the reservoir are sold to the Vidarbha Vibhagiya Machhimar Sangh Limited, Gondia, which is a Department of Fisheries suggested marketing agency in the region who further market all the fish produce from the reservoir.

Stocking Management

Stocking is necessary tool to increase the fish productivity. The Itiadh Reservoir is usually stocked with fingerlings of Indian major carps. Seed is mainly brought from Departmental Itiadh Fish



Fig. 1. Wooden Boats used at Itiadh



Fig. 2. IMC catch



Fig. 3. Gill net operation at site

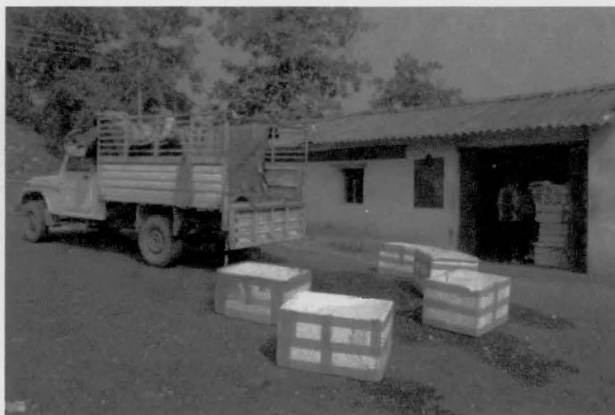


Fig. 4. Transportation facilities

Seed Farm, Gothangaon. If failed to provide then it is brought from the primary co-operative societies like, Heti-Girola, Mahuli, Tadgaon, and Khodsiwani. These primary co-operatives produce fish seed by using bundh breeding techniques like, Mograbandh, Wet bundh and Dry bundh and seed production is mainly done during July-August. The stocking is done at the rate of catla (50%), rohu (25%), mrigal (25%). Fish stocking has proven to be one of the most successful tangible tools in reservoir fishery management (Jenkins, 1961). The year-wise

stocking details are given in Table 4. The fish catch is sold off to the traders of Vidarbha Vibhagiya Machhimar Sangh Limited Gondia (VVMS) at landing centres, where it is packed in Thermocole boxes and disposed to different places for further marketing. The region does not have any ice plant or cold storage facility in the vicinity of the reservoir. Presently, the ice blocks are procured from Gondia, Lakhani and Nagpur at the rate of 400/ladi (one ladi= 150 kg). Nearly 80% catch of the Itiadh reservoir was consumed locally within a year. On an av-

Table 1. Morphometric and Hydrographic features of Itiadh reservoir

Particulars	Itiadh Reservoir
Name of the river	Gadhavi
Year of impoundment	1970
Location of reservoir	168 km from nagpur on Nagpur-Gothangaon road (via Sakoli) in Arjuni-Morgaon Taluka of Gondia district.
Area of reservoir (Total)	7,410 ha
Area of reservoir (Average)	4,473 ha
Irrigation potential / command area	32,400 ha from Gondia, Bhandara and Chandrapur districts.
Area at Full Reservoir Level (F.R.L.)	7,410 ha; Depth- 26.7 mtrs
Area at Dead Storage Level (DSL)	1,536 ha; Depth- 14.1 mtrs
Catchment area (sq. km)	46,910 km ²
Height of the dam (in meters)	29.85 m
Fish landing points	Gothangaon, Yerandi, Tidka, Jhanshinagar, Pallandur.

Source: Irrigation Department and Author's survey

Table 2. Species composition at Itiadh reservoir

S.N.	Local name	Scientific name	Most abundance	Approx. share (%)
1.	Catla	<i>Catla catla</i>	July-August	90%
2.	Rohu	<i>Labeorohita</i>	July-August	
3.	Mrigal	<i>Cirrhinus mrigala</i>	July-August	9%
4.	Sawada	<i>Ompok bimaculatus</i>	June-September	
5.	Pabda	<i>Ompok pabda</i>	June-September	
6.	Singta	<i>Heteropneustes fossilis</i>	June-September	
7.	Murrel	<i>Channamarulius</i>	June-September	
8.	Murrel	<i>Channa striatus</i>	June-September	
9.	Katwa	<i>Mystus seenghala</i>	June-September	
10.	Vam	<i>Mastacembelus armatus</i>	June-September	
11.	Sawada	<i>Wallago attu</i>	June-September	
12.	Persi	<i>Salmostomata spp.</i>	June-September	
13.	Tilapia	<i>Oreochromis mossambicus</i>	June-September	
14.	Bhadar	<i>Notopterus notopterus</i>	June-September	
15.	Bhadar	<i>Notopterus chitala</i>	June-September	
16.	Calbasu	<i>Labeo calbasu</i>	June-September	
17.	Reba	<i>Cirrhinoreba</i>	June-September	
18.	Gonus	<i>Labeo gonius</i>	June-September	
19.	Labeo	<i>Labeo fimbriatus</i>	June-September	
20.	Weed fish	<i>Ambus cola</i>	All time No contribution to the fishery	
21.	Small mouth yellow fish	<i>Barbus spp.</i>		

Source: Co-operative society and Author's survey

Table 3. Year-wise/category-wise fish catch details of Itiadoh reservoir 2002-03 to 2011-12 (in kg)

S.N.	Year	Major Carps	Local Major	Local Minor	Total
1.	2002-03	52,554.5	8,037.3	1,236.000	61,827.8
2.	2003-04	55,444.3	6,930.5	630.500	63,005.3
3.	2004-05	56,160	8,489.3	653	65,302.3
4.	2005-06	61,304	6,130.5	681.250	68,115.8
5.	2006-07	58,769.8	7,263.3	-	66,033
6.	2007-08	66,344	4,234.5	-	70,578.5
7.	2008-09	71,354	3,004.3	751	75,109.3
8.	2009-10	77,268	4,110	822	82,200
9.	2010-11	88,095	2,724.3	-	90,819.3
10.	2011-12	92,550.5	2,862	-	95,412.5

Source: DoF, Gondia District

Table 4. Fish seed stocking details of Itiadoh reservoir during 2002-03 to 2011-12

S. N.	Year	Seed stocked (Fingerlings, size 80-100 mm)	Species stocked	Stocking Density (Per hectare)*
1.	2002-03	13,00,000	IMC	267
2.	2003-04	14,00,000	IMC	288
3.	2004-05	13,80,000	IMC	284
4.	2005-06	14,70,000	IMC	302
5.	2006-07	15,00,000	IMC	308
6.	2007-08	15,86,000	IMC	326
7.	2008-09	17,00,000	IMC	350
8.	2009-10	16,00,000	IMC	329
9.	2010-11	18,00,000	IMC	370
10.	2011-12	22,00,000	IMC	452

Source: DoF, Gondia District

*Stocking density is calculated by considering the average area of reservoir i.e. 4,862 ha

the Co-operative, about 2 to 3 quintals of fish are poached daily. However; there is a timely need for strict enforcement and monitoring of such illegal fishing practices, which still exists in the region of reservoir. Mesh size regulation is not being adopted for any of the fishing methods employed. Marketing facilities, post-harvest facilities and proper link roads are the immediate needs of fishers of Itiadoh Reservoir. The present study would help to develop some strategic plans to improve the existing fisheries management framework at the Itiadoh Reservoir region. This would help policy makers, administrators, researchers and extension personnel to find out the ways and means to strengthen the existing fisheries policy in the Itiadoh Reservoir region.

erage daily 250 kg of fish was needed locally. Except "Chadan" period (Breeding season) that is July – August, the overall catch of reservoir is 3 – 4 quintals per day which is totally consumed locally i.e. Nagpur, Gondia, Bhandara, kurkheda, Arjuni-Moregaon, NavegaonBandh, and Lakhandur etc. Sometimes it is not even sent to Nagpur, Gondia and Bhandara as the entire catch gets consumed in the reservoir vicinity only. But during the Chadan period when the catch goes (20 – 30 tons for these two months) it is totally transported to Howrah and Delhi markets. Around 20% of fish catch was consumed in external markets (Howrah and Delhi) in a year.

Conclusion

The Itiadoh Reservoir has become an important source of livelihood for many fishing communities in the villages of reservoir vicinity. As many as 302 fisher families belonging to 20 villages are depended on the fisheries of Itiadoh Reservoir. No close season is observed in the Itiadoh reservoir except for 9 days of Navaratra Festival, during which no one in the reservoir region eats fish due to traditional norms. According to members of co-operative society there is a natural breeding ground in the reservoir region located at Pallandur site from where the river water enters into the reservoir. Fishers do fishing near the breeding grounds during breeding season as it is considered a peak fishing season, called 'Chadan' (Mating period). The brood fish seemed to have good demand in nearby markets/among consumers and separate rate sheets are made for those brood fishes. Poaching is reported to be one of the major problems at the Itiadoh reservoir inspite of 18 guards employed by the co-operative. According to

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