

FISH DIVERSITY, PRODUCTIVITY AND MANAGEMENT STATUS OF ISAPUR RESERVOIR, MAHARASHTRA STATE

JITESH V. KESHAVE, ANANTHAN P S

Abstract: The present study was envisaged to understand the fish diversity, productivity and management status of Isapur Reservoir in Maharashtra state. Fresh water Prawns and carps dominated the reservoir fishery followed by catfishes, Vam and Murrels. Majority of fish species found in the reservoir have high food value. The reservoir is usually stocked with fingerlings of Indian major carps and Fresh water Prawns. Annual fish production during 2011-12 was 4,43,939 kg and the productivity of the reservoir was estimated as 65.04 kg /ha/yr. Gillnet, cast net were the major gear employed along with prawn traps and angling rods. All the catch of reservoir was marketed by contractor himself in the local and distant markets. Though the fish production from reservoir is augmenting but the welfare measures of fishers are still under ignorance. Pointing out the immediate fishers' needs and implementation of better management practices can lead to establish better reservoir fisheries development model at Isapur.

Keywords: Fisheries, Productivity, Management, Crafts-Gears.

Introduction: India has 19,370 reservoirs spread over 15 states with an estimated 3.15 million ha surface area at full capacity, and this is expected to increase due to execution of various water projects in the country (NFDB, 2011). Out of which 2,73,750 ha is present in Maharashtra State in the form of small (1,19,515 ha), medium (39,181 ha) and large (1,15,054 ha) reservoirs (DoF, Maharashtra). Though Maharashtra State has significant reservoir resources, the extent of their utilization for fisheries and its potential for creating sustainable livelihood in distress conditions and remote areas need to be understood. Very little information exists about the reservoir fisheries in Maharashtra; for details like, fisheries management systems, fish production trends and utilization pattern are not available. In most reservoirs, fisheries had been developed as a tertiary activity and the fisheries component was not included during the planning phase of reservoir construction (Vass and Sugunan, 2009).

The Isapur Reservoir, among the largest in Maharashtra, is built across the river Penganga near Isapur village in Pusad Taluka of Yavatmal District. The reservoir was impounded in 1982 and this is the biggest dam in the district having water spread area of 6,660 ha. The reservoir has great importance in regards of its ichthyofaunal diversity and has become one of valuable sources for livelihood and employment generation in the region for many fishing communities. In spite of its fisheries importance, literatures regarding the fish diversity, fish productivity, fisheries management systems, fish production trends and utilization pattern are almost scanty. The present study was, therefore, conducted to understand the fish diversity, fish productivity, fisheries management systems, fish production trends and utilization pattern of Isapur Reservoir.

Materials and methods: The Isapur Reservoir, located in Yavatmal 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 four landing centres of Isapur reservoir namely; Isapur (Dam site), Sawargaon, Salwadi and Mop using gillnet, cast net, prawn trap and angling needles 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 composition 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. The fish productivity was calculated by using following formula given by Agarwal, 1990.

$$P = \frac{NS}{S} \quad \text{Where,}$$

P = Fish Productivity (kg/ha/yr)

N = Constant including natural mortality 0.25 and accidental mortality 0.40 i.e. 0.65

S = Number of fish seed stocked per hactor per year

3. Results and discussion

The morphometric, hydrographic features of

reservoir and prevailing climatic conditions play an important role in fish productivity of reservoir. The hydrographic features of Isapur Reservoir are given in table 1.

Particulars	Isapur Reservoir
Name of the river	Penganga
Year of impoundment	1982
Location of reservoir	332 km from Nagpur on Nagpur-Pusad road and 100 km from Yavatmal, on Yavatmal-Pusad Road.
Area of reservoir	6,660 ha
Irrigation potential / command area	1, 34,280 ha from Yavatmal, Nanded and Parbhani districts.
Area at Full Reservoir Level (F.R.L.)	6,660 ha
Area at Dead Storage Level (DSL)	1,219 ha
Catchment area (sq. km)	4,650 km ²
Height of the dam (in meters)	29 m
Major Fishing Villages	Mop, Jawla, Boraja, Horkad, Shiwni, Amti, Sawargaon, Isapur (Bogda) Bori, Jamnaik 1, Jamnaik 2, Salwadi, Morgaon.
Fish landing points	Mop, Isapur, Bogda, Jamnaik 1, Salwadi, Boraja

Mean depth of any reservoir bears direct impact on productivity (Rawson, 1952; Hayes, 1957; Desai, 2006; Odyuo, 2012) as shallow lakes possess most of the part of their water in the euphotic zone, which facilitate better mixing and circulation of heat and nutrients; hence, it results in higher productivity. The average depth of Isapur reservoir was 29.2 m which is deeper to get good euphotic condition, in spite of this the reservoir was relatively better with its production. 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. So it appears that, in Indian reservoirs depth was not a constraint for productivity.

Fish Diversity: The Isapur reservoir comprises the fishery of 9 species belonging to the 6 families. The important ichthyofaunal based on their approximate share are given in table no. 2.

Local name	Scientific name	Most abundance	Approx share
Catla	<i>Catla catla</i>	June-October	16.35
Rohu	<i>Labeorohita</i>	June-October	12.57
Mrigal	<i>Cirrhinus mrigala</i>	June-October	9.21
Zinga	<i>Macrobrachium rosenbergii</i>	June-October	43.26
Pabda	<i>Ompok pabda</i>	June-October	9.19
Murrel	<i>Channa spp.</i>	June-October	1.18
Silver	<i>Hypophthalmichthys molitrix</i>	June-October	7.09
Eel (Vam)	<i>Mastacembelus armatus</i>	June-October	1.14
Sandkhol	<i>Thynnichthys sandkhol</i>	-	-

Source: Reservoir leasee and Authors' survey
Among the families encountered, Palemonidae (*Macrobrachium rosenbergii*) and Cyprinidae (Indian major carps and exotic carps) dominated the fishery,

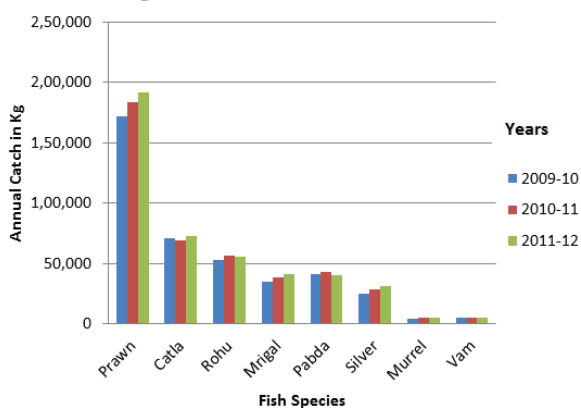
followed by catfishes (Bagridae), Vam (*Mastacembelidae*) and Murrels (*Channidae*). The fresh water prawns and Carps are considered as Major fishes where, Pabda, Murrels and Vam are

considered as minor fishes as per their abundance.

B. Madhusoodana et al., 2006 reported thirty six species of fishes belonging to 10 families, 6 subfamilies and 21 genera from Periyar Lake of Kerala. Odyuo et al., 2012 recorded 90 species belonging to 19 families from Doyang reservoir of Nagaland. Hiware and Pawar recorded 43 fish species from NathSagar Dam Paithan of Maharashtra. Krishna & Ravi Shankar reported 31 ichthyofauna in secrete lake, Durgamcheru, Ranga Reddy District. As compare to these large reservoirs, the fish fauna reported till from Isapur reservoir is very less.

Fish Productivity: The exploited total fish production of Isapur Reservoir during 2011-12 was 4,43,939kg, it is due to the good stocking in the reservoir. The Year-wise fish catch is shown in Fig. 1 which shows the continuous increase in the catches of all species over the period. 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 64.05 kg/ha/year, which is very good as compared to national average catch from large reservoir i.e. 11 kg/ha/yr (Ayyappan et al. 2011).

Figure 1 Total year-wise/species-wise fish catch details of Isapur reservoir for 2009-10 to 2011-12



Source: Reservoir lease

The fish productivity from Isapur reservoir is much better when compared with Pong dam 4.1 to 25.08 kg/ha/yr, Rihand – 3.7 to 14.24 kg/ha/yr, Tenughat – 0.53 to 1.471 kg/ha/yr, Kangsabati – 0.55 to 1.10 kg/ha/yr, Kodana 6 kg/ha/yr. Gandhisagar 0.52 to 13.3 kg/ha/yr, Hirakud – 10.5 kg/ha/yr, Santhamur 3.5 to 11 kg/ha/yr, Tungabhadra 5.54 kg/ha/yr. Pilit 08 – 35.30 kg/ha/yr and Shardarsagar 42 to 56 kg/ha/yr. The fish production of 7 kg/ha/yr in Nizamsagar, 8 kg/ha/yr in Bhadha and 6 kg/ha/yr in Panam reservoirs (Srivastava and Tamot, 2002), which reveals that proper and scientific management can lead to augment in production.

Fisheries Management Status: 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 management measures have been devised to substantially increase production in the reservoirs (Odyuo, 2012).

Institutional framework: This reservoir is owned by Irrigation Department and fishing rights of the reservoir transferred to Maharashtra Fisheries Development Corporation (MFDC), Nagpur. The MFDC itself plays a role of leasing agency here and started to lease out the reservoir from 1995 onwards. The MFDC does not play any role in the management of the reservoir except collecting monthly reports of the reservoir production and the yearly lease amount. Presently the reservoir is leased out to Mr. Abdul Sheth a private contractor for a five year period i.e. from 2010 to 2015 and leasing amount is ₹ 18,26,786/year. The reservoir site is divided into five landing-cum-assembling centers namely, Isapur (Bogda), Mop, Jamnaik 1, Salwadi and Boraja for effective management. The contractor has assigned 6 persons at each centre that includes one centre head who manages fishing labor and keeps all records of production, two drivers, one boatman who transport the catch to main centre Isapur (Bogda), and two weighing persons to weigh the catch of fishers. In addition two supervisors oversee the total dam site. The Isapur (Bogda) and Mop are the main centers where all the catch of the day are assembled via vehicle, motor boats etc. Finally the whole catch of the day is taken to i.e. Isapur (Bogda) from where it is distributed to the major local and distant markets of Mumbai and Kolkata.

Crafts and Gears: The Isapur Reservoir exploits variety of fish species, the gears used vary according to the different regions of the water body where they are operated. The gears mainly employed at Isapur reservoir was Gill nets and Cast nets. Fishers used the Gill net of size from 2.5” to 12”. All cast nets were of size 5” only. On an average each fisher at Isapur reservoir had 15-20 kg of Gill nets. 50 fishers were mainly using the cast nets in the reservoir and each had two Cast nets. The fishers were mostly using 10” Gill nets to catch the IMC from reservoir and for other fish cast net and Gill nets of size 5” to 7”. The Gill nets of mesh size 2.5” were mostly employed for catching Pabda, Murrel and Prawns. About 40 fishers were using traps at Isapur reservoir and each fisher had 150 traps. The traps were mainly used to catch Prawns. The fishers themselves prepared traps of “bamboo sticks”. Mostly women were engaged in this activity. These fishers were only engaged with prawn fishing with the help of traps. For this they were getting ₹ 80/kg of prawn. About 30-40 fishers were

engaged in multiple angling to catch Pabda fish. Each fisher was having 100-200 hooks. Angling was mostly carried out during peak season only. These fishers were mostly engaged with angling only; they did not catch any other fish. For 1 kg of Pabda fish they were getting ₹ 70 as labor charges. As far as crafts concerned, the fishers' were provided with the motorized and non-motorized wooden boats by the contractor and Thermocole boats were bought by fishers themselves. Presently there are a total of 192 boats, out of which 7 are motorized (size – length 15 ft., width 6 ft.), 125 are wooden (Size- length 10 ft., Width 2 ft.) and 60 are Thermocole boats. The costs of motorized, wooden and Thermocole boats were ₹ 1,75,000 / boat, ₹ 10,000/boat and ₹ 500/boat respectively. No subsidies for fishers' fishing instruments were available from government at Isapur as there was no registered Fishers' Co-operative Society in the vicinity.

Stocking Management: Stocking is the main reason for the dominance of Fresh water Prawn and Indian major carps like Catla catla in Isapur Reservoir. A similar trend was observed in Rihand where the reservoir turned to a 'catla mine' after its impoundment in 1962 due to stocking of catla seeds in the initial years (Desai, 2006).

Six crore prawn seed of 10 mm size was brought from the Bharuch (Gujarat), Andhra Pradesh and Kolkata for ₹ 10,80,00,000 @ ₹ 1.8 per seed (including transportation cost). Two crore IMC seed was mainly brought from the Andhra Pradesh for ₹ 1,00,00,000 @ 50 paise/seed (including transportation cost).

The stocking in the Isapur reservoir is done by contractor and MFDC also stocks 40 lakh fingerlings per year in the reservoir through its funds. Mainly 6 crore Prawn seed and 2 crore IMC spawn are stocked per year in the reservoir; before stocking Prawn seed and IMC spawn is reared for one month in happa to attain 50 mm and 80-100 mm size for Prawn and IMC seed respectively. The survival rates for one month rearing of IMC spawn and Prawn seed are assumed to get 80% for IMC and 90% for Prawn and stocking is mainly done at Jamnaik, Mop and Bogdain the month of April. During 2011-12 contractor had stocked 1,92,00,000 IMC seed and 5,40,00,000 Prawn seed after survival with the stocking density of 2,883 and 8,108 for IMC and Prawn respectively.

Utilization Pattern: All the catch caught from the reservoir is sold to contractor, who further sells it in local and distant markets. The region does not have

any ice plant or cold storage facility in the vicinity of the reservoir, which is one of the major problems in fish marketing at Isapur region. The contractor was buying the ice from Kalamnuri, Washim and Hingoli at the rates of ₹ 160/ladi (one ladi equals to 200 kg) and supplying. On an average 600 kg of fish is consumed locally per day in the reservoir region. About 46,900 kg catch/year (22.2%) of the IMC, Murrel, Vam and Silver are consumed locally in the nearby villages of reservoir and 1,64,159 kg catch/year (77.8%) in the major and minor markets like, Pusad, Resod, Washim, Parbhani, Nanded, Nagpur and Yavatmal etc. The 100% catch of prawn (1,92,080kg/year) and Pabda (40,800 kg/year) is sold in the external markets, Mumbai and Kolkata respectively.

Conclusion: The Isapur reservoir is playing very important role in providing the livelihood and employment opportunities to 378 fishers' families in the reservoir vicinity. Though the fish production from reservoir is augmenting but the welfare measures of fishers are still under ignorancelike, presently there is no registered co-operative society in the reservoir vicinity so the fishers are failing to get government subsidies and other welfare measures. The fishing is closed for 1 month after the stocking of prawn seed and fish seed (IMC) in April month to avoid the catching of the seed in the net; otherwise there was no such conservatory closing season. The contractor and fishers were not aware about the breeding season of fishes. Mesh size regulation is not being adopted for any of the fishing methods employed. So it needs strict enforcement and monitoring of such illegal fishing practices, which still exists in the region of reservoir. Marketing facilities, post-harvest facilities and proper link roads are the immediate needs of fishers of Isapur Reservoir. The Isapur reservoir is a potential resource for fishery and it deserves attention not only for augmenting production but also for improving the socio-economic status of the fishers' living in the surrounding villages. The present study would help to plan appropriate strategies for developing sustainable fisheries model and improving fishers' welfare measures at Isapur reservoir.

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Ph.D. Research Scholar, Senior Scientist
 Central Institute of Fisheries Education (CIFE)
 Indian Council of Agricultural Research (ICAR)
 Fisheries University Road, Versova, Mumbai - 400 061.
 E-mail: jiteshkeshave278@gmail.com, ananthan@cife.edu.in