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Towards Green and Socially-Sound Recovery
in Rural and Farm Sector

INLAND FISHERY AND MARGINALIZED COMMUNITIES: A CASE STUDY OF MANYAD RESERVOIR AT PARALA, AURANGABAD DISTRICT, MAHARASHTRA

Photo : Bhaurao Pawar

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ACKNOWLEDGMENTS

Our sincere thanks to our partners: Mr. Shantaram Pandere and Ms. Mangal Khinwasara (Lok Paryay, Aurangabad), Mr. Mahesh Patankar (MP Ensystems, Mumbai), Mr. Manish Rajanakar, Mr. Patiram Tumsare, Ms. Shalu Kolhe & Mr. Nandlal Meshram (Foundation for Economic and Ecological Development) for their domain expertise and facilitation, and Mr. Ravi Thombade, Ms. Vijaya Padekar, Mr. Shripad Konde, Mr. Eknath Bagul and Mr. Appasaheb Ghadage for community level data collection in the different clusters across Maharashtra and Mr. Subodh Kumar for Bihar.

We would also like to express our gratitude towards the Forest Department, Kalsubai Harishchandragad Wildlife Sanctuary, Govt. of Maharashtra; PO, Aurangabad, Tribal Development Department; DFO Aurangabad, Fisheries Department, Dr. Ramchandra Sabale; Mr. Kiran Auti, Gramoorja Solutions Pvt. Ltd., Pune, Mr. Nitin Ingale from Maharashtra. From Gujarat viz. Agriculture Department, Jasdan, APMC Jasdan, APMC Gondal, Agriculture University, Junagadh; Agriculture University, Anand; Agriculture University, Navsari; Mr. Pradip Kalariya and Mr. Dhaval Singh; Rajkot Dairy and TinyTech. From Bihar viz. Director, Banana Research Institute, Goraul, Dist. Vaishali, ATMA Hajipur, Dist. Vaishali; ATMA Muzaffarpur, KVK, Saraiya, Dist. Muzaffarpur, and KVK Hariharpur, Dist. Vaishali; Fisheries Department & Horticulture Department of Muzaffarpur and Vaishali districts; Sudha Cooperative Milk Society, Muzaffarpur; National Research Centre on Litchi, Mushahari, Muzaffarpur. Last but not the least, all the study participants, number of farmers, forest dwelling community members, fisherfolks, entrepreneurs, academicians, whose direct and indirect contributions made these multi-state, multi-commodity/livelihoods studies possible.

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INTRODUCTION

The fishery sector plays a very important role in the socio-economic development of India. The total quantity of fish production across the world is 178.5 million MT. The total production of fish in India was 14.16 million MT in the year 2019-20 which is around 7.9 per cent of total production across the world. In India, out of the total fishery production of 14.16 million MT, inland fish production was 10.43 million MT (73.7%) and marine fish production was 3.72 million MT (26.3%).

There is a definitive shift in production from the marine fisheries sector to the inland fisheries sector. The inland fishery production has increased exponentially from 8.87 lakh tonnes in the year 1980-81 to 104.37 lakh tonnes in the year 2019-20 (1076.7%). The disaggregated data for IMC, local fish, and brackish water shrimps from aquaculture is not available.

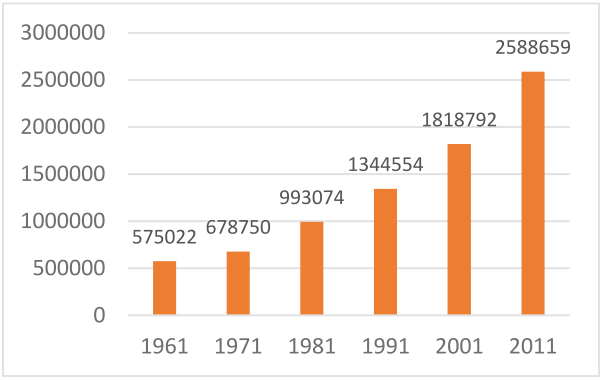
In consumption of fish, the state of Tripura has the highest consumption of 29.3 kg per capita per year. Kerala, Manipur, Odisha and Assam are the other states following Tripura. The state of Maharashtra ranks nineteenth and its average consumption of fish is 3.02 kg per capita per year. The fisheries sector is the source of livelihood for around 2.8 crore fishers, fish farmers, fish workers and fish vendors at the primary level and several crores more along the value chain. Out of the total population of fishers which includes fish farmers, fish workers and fishers, 56 per cent are male while 44 per cent are female. In marine fisheries, 54 per cent are male and 46 per cent are female while in inland fisheries, 56 per cent are male while 44 per cent are female. The highest fisher population per district is in the state of Bihar followed by West Bengal and Andhra Pradesh. Maharashtra stands ninth in terms of fisher population per district.

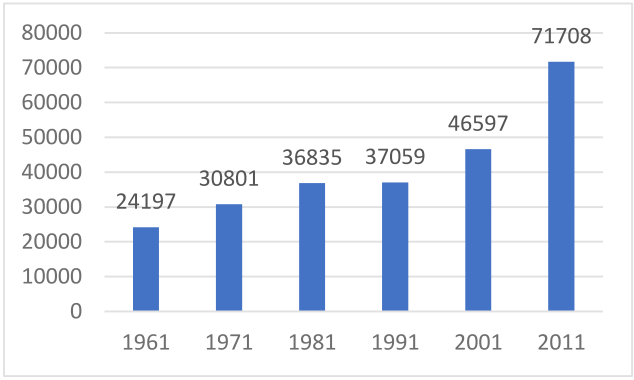
Photo : Navneet Wadkar

STUDY AREA

Parala village is located in the Aurangabad district of Maharashtra. It is at 76 km distance from Aurangabad city and 24 km from the block headquarters Vaijapur. There are 487 households in the village with a population of 2333 people. The major crops of this village are cotton, corn, *bajari,* sugarcane and onion. The *Bhil* community constitutes 23.5 per cent of the total population of the village which inhabits the inhospitable, undulating terrains of savanna scrublands.

Bhil Community Population in Maharashtra state and Aurangabad district





Source: Census of India, 2011

Bamboo-based cage for spawn rearing

Photo : Navneet Wadkar

The *Bhil* tribe constituting 23.5 per cent of the population of the village, resides in the reserved forests whose terrain is of the savanna grassland type. The *Bhil* community is a Scheduled Tribe in Gujarat, Maharashtra, Madhya Pradesh and Rajasthan. The community's main source of livelihood is agriculture and animal husbandry. 79 families in Parala village obtained land rights over 137.2 ha in the reserved forest area after 20 years of struggle for the land titles.

Demographic characteristic	Frequency
Population	2333
Total area	3155.33 ha
Cultivable area	2123.28 ha
Irrigated area	143 ha
Dryland	1953.18 ha
Forest land	712.63 ha
Grazing land	272.47
Number of wells	448
Number of borewells	12

Source: (IUF Dairy Division, n.d.)

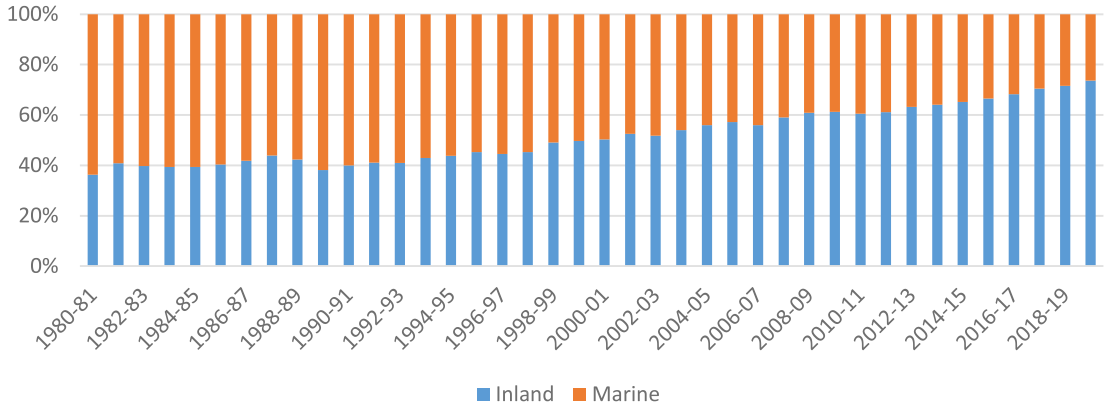
APPROACH

The primary data was collected through focussed group discussions (FGDs) and in-depth interviews with fishers in Parala village. Mapping exercises were conducted with fishers to understand the fisheries value chain. Secondary information sources include published documents of the Fish Market Price Information System (FMPIS), the Fortnightly Report of the National Fisheries Development Board (NFDB) and the Handbook on Fisheries Statistics etc.

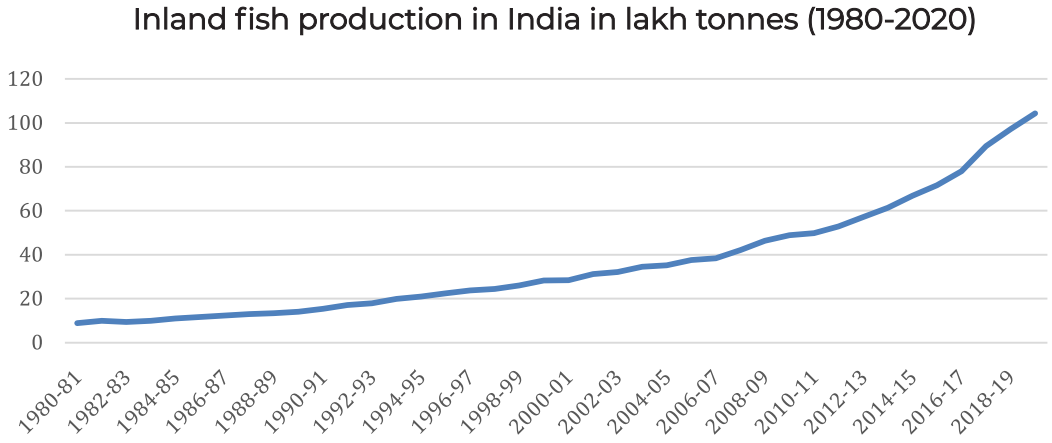
National, State, and District Scenarios

1. At the global level, the top seven fish-producing countries capture fish accounting for almost 50 per cent of total captures, with China producing 15 per cent followed by Indonesia (7%), Peru (7%), and India (6%) of the total fish production. India is the fourth-largest fish-producing and second-largest aquaculture nation in the world after China.
2. There is a definitive shift in production from the marine fisheries sector to the inland fisheries sector as inland fishery production has increased from 8.87 lakh tonnes in the year 1980-81 to 104.37 lakh tonnes in 2019-20 (1076.7%).

Share of inland and marine fisheries in terms of production (1980-2020)



Source: Handbook on Fisheries Statistics, 2020



Source: Handbook on Fisheries Statistics, 2020

3. Indian Major Carps *(IMC)* include commonly cultivated freshwater carp varieties such as catla *(Labeo catla)*, rohu *(Labeo rohita)* and mrigal *(Cirrhinus mrigala)*. Disaggregated data for IMC, other local fish, and brackish water shrimp from aquaculture is not available. The major carps such as *Catla, Rohu* and *Mrigal* contribute 57 per cent of total fish landings in 2019 followed by exotic carps such as Common, Silver, Grass, Crucian, Tilapia, Tench, Tawes and Gauramy carps. Andhra Pradesh, West Bengal, Uttar Pradesh and Odisha are the leading producers of major and exotic carp (Fisheries Statistics Division, 2020).
4. Tripura has the highest consumption of fish at 29.3 kg per capita per year. Kerala, Manipur, Odisha and Assam are other states with comparatively higher per capita consumption of fish.
5. The highest fisher population per district is in the state of Bihar followed by West Bengal and Andhra Pradesh. Bihar has 38 districts in which the fisher population is around 60,27,375 (Fisheries Statistics Division, 2020).
6. The total fish seed production in the year 2019-20 was 5,217.1 crore fry. Fish seed production in India has increased by 52.9 per cent between 2010-11 and 2019-20. West Bengal, Jharkhand and Assam are the three top fish seeds-producing states. Maharashtra stands eighth and produced 136.62 crore seeds i.e., 2.6 per cent of the total production of seeds in the year 2019-20 (Fisheries Statistics Division, 2020).
7. Andhra Pradesh, West Bengal and Uttar Pradesh are the top three states in inland fishery production. Maharashtra ranks sixteenth in inland production with 1.18 lakh tonnes of inland fish production in 2019-20. The overall inland fish production in Maharashtra has been consistently decreasing in the last five years.

Sr. No.	State	Total Inland Fish Production
1	Andhra Pradesh	36.1
2	West Bengal	16.19
3	Uttar Pradesh	6.99
4	Odisha	6.6
5	Bihar	6.41
6	Chhattisgarh	5.37
7	Assam	3.73
8	Telangana	3
9	Karnataka	2.29
10	Jharkhand	2.23
16	Maharashtra	1.18

Total India Inland Fish Production (2019-20) = 104.37 lakh tonnes

Source: Handbook on Fisheries Statistics, 2020

8. Maharashtra is the topmost state for inland fisheries resources of rivers and canals, small and large reservoirs (both in terms of number and area), and tanks and ponds but it ranks sixteenth in inland fishery production.

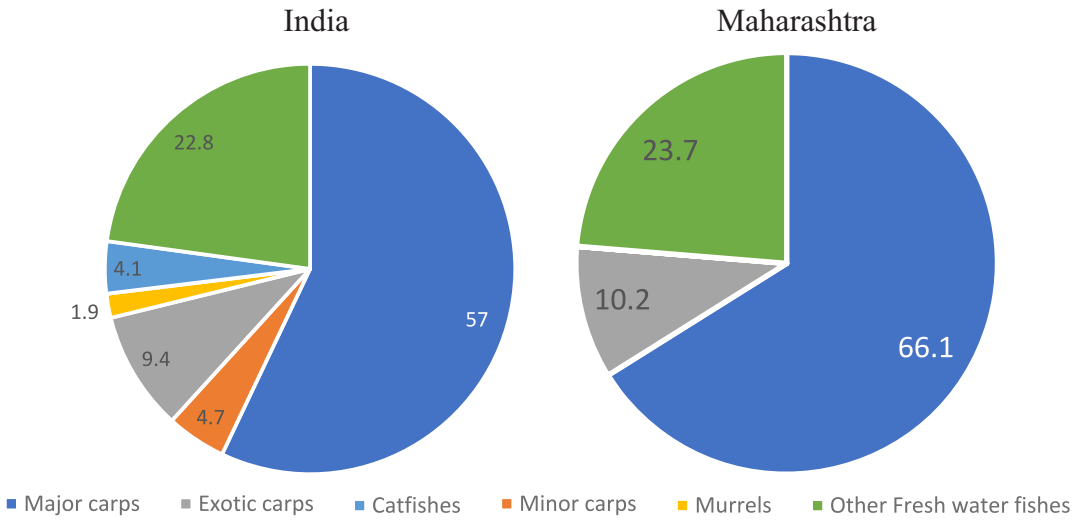
State-wise ranking of inland aquatic fisheries resources

Type of Inland fisheries source	Rank 1	Rank 2	Rank 3
Rivers and canals	Uttar Pradesh	Maharashtra	Odisha
No. of small reservoirs	Maharashtra	Chhattisgarh	Odisha
Area of small reservoir	Maharashtra	Chhattisgarh	Andhra Pradesh
No. of medium and large reservoirs	Maharashtra	Karnataka	Bihar
Area of medium and large reservoirs	Maharashtra	Karnataka	Telangana
Area of tanks and ponds	Maharashtra	Telangana	Andhra Pradesh
Area of brackish water	Odisha	West Bengal	Andhra Pradesh

Source: Handbook on Fisheries Statistics, 2020

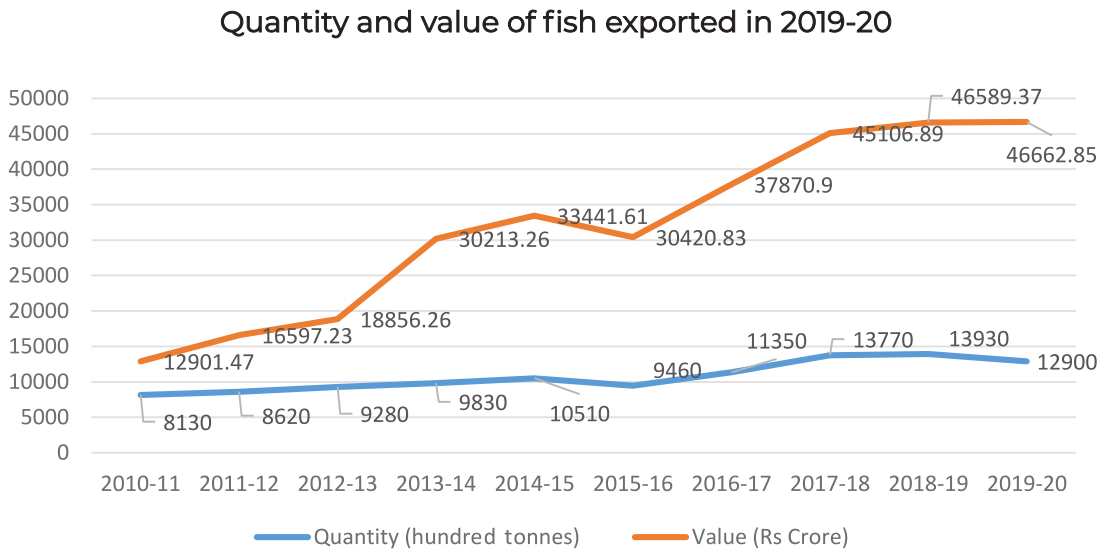
9. About 57 per cent of total fish landings in 2019 were major carps such as *Catla, Rohu* and *Mrigal*, followed by exotic carps such as Common, Silver, Grass, Crucian, Tilapia, Tench, Tawes and Gauramy carps. Andhra Pradesh, West Bengal, Uttar Pradesh and Odisha are leading producers of major and exotic carps. Of the total inland fish landing in Maharashtra in 2019-20, 0.78 lakh tonnes (66.1%) are of major carps, 0.12 lakh tonnes (10.2%) are of exotic carps and 0.28 lakh tonnes (23.7%) are of other freshwater fish.

Species-wise percentage of inland fish landing in India and in Maharashtra (2019-20)



Source: Handbook on Fisheries Statistics, 2020

10. Between the years 2010-11 to 2019-20, the quantity of fish products exported has increased from 8.13 lakh tonnes to 12.90 lakh tonnes with an increase of 58.7 per cent. During the same period, the export of fish in terms of value increased from Rs. 12,901.47 crore to Rs. 46,662.85 crore i.e. an increase of 262 per cent. USA, China, South East Asia, the European Union, Japan and the Middle East are the major markets to which fish production is exported. USA and China are major markets both in terms of value and quantity.



Source: Handbook on Fisheries Statistics, 2020

11. The highest quantity of fish (both marine and inland) has been exported from Pipavav port in Gujarat, Vizag port in Andhra Pradesh and Kochi port in Kerala. In terms of the value of fish exported in the year 2019-20, the percent share of Vizag port is the highest followed by Calcutta port in West Bengal and Krishnapatnam in Andhra Pradesh. 10.45 per cent of total exported fish has been exported from the JNP in Maharashtra and its share in terms of value is 9.34 per cent. Out of the total quantity and value of fish exported abroad, quantity and value of frozen shrimps are the highest. Compared to the year 2018-19, the export of fish, both in terms of value and quantity, is increasing in these markets except in South East Asia.

12. In the year 2019-20, out of total fish production (marine and inland) of 121.8 lakh tonnes of fish, 64.94 lakh tonnes (53.3%) were sold fresh in the market, 16.81 lakh tonnes (13.8%) were sold in frozen form, 5.20 lakh tonnes (4.3%) were sold in cured form, 0.36 lakh tonnes (0.3%) in canned form, 3.38 lakh tonnes (2.8%) were reduced to fish oil and other products, and 0.08 lakh tonnes (0.07%) were sold in the offal form for reducing them to various fish products.

FISHING IN MANYAD RESERVOIR, PARALA, MAHARASHTRA, INDIA

1. Manyad is a small river and a tributary of Girna river in the larger Tapi river basin. The Manyad reservoir with a water spread area of 90 ha is situated near the Parala village. The rivulets *Junone, Gondandara, Parala, Wadaji, Darwandi Kharwandi* and *Mandapuri* drain into the Manyad reservoir. The area around the reservoir is a Reserved Forest. Approximately 60 tribal fishers from the village are dependent on fishing in the Manyad reservoir and in other small reservoirs for their livelihoods.

2. A fishing co-operative has been registered with the Fisheries Department without informed participation of the local community, by a person not belonging to the community, accessing credit and defaulting on it in an allegedly fraudulent manner. The *Bhil* community has organized itself over land rights and has protected its fishing rights over this reservoir which formed part of its traditional habitat. Through a long-drawn struggle using non-violent methods, spanning over three decades, 79 *Bhil* families secured Individual Forest Rights over 137.171 ha of forest land in 2011 under the Forest Rights Act, 2006.

3. Some 40 members have fishnets and are therefore actively involved in fishing while the remaining members provide the labour required for catching fish. The daily wages for fish catching are Rs. 30-40 per kilogram of fish.

4. There are around fourteen types of fish species found in the Manyad reservoir including major carps, minor and exotic carps and local fish varieties. The exotic fish Choch *(Xenentodon cancila)* is carnivorous and attacks fingerlings of herbivorous fish species and reduces the overall production.

Sr. No.	Local Name	Zoological Name
1	Catla	*Labeo catla*
2	Kombda	*Cyprinus carpio*
3	Rohu	*Labeo rohita*
4	Silver	*Hypophthalmichthys molitrix*
5	Gavatya	*Ctenopharyngodon idella*
6	Mrigal	*Cirrhinus cirrhosus*
7	Khekada (Piwala, Kala, Dholi)	*Barytelphusa cunicularis*
8	Malya	*Garra mullya*
9	Zinga	*Macrobrachium sp.*
10	Choch	*Xenentodon cancila*
11	Vam	*Mastacembelusar matus*
12	Dok	*Channa gachua*
13	Muri	*Nemacheilus sp.*

5. In 2021, the tribal fisher group collected contributions from members to purchase spawn locally referred to as *Jira*. The size of the spawn (Jira) is 1-2 cm. The size of semi fingerlings is 3 cm and that of fingerlings is 7-10 cm. In 2021, the fisher group purchased 900 boxes of spawn from the nearest available supplier at the rate of Rs. 115 per box. The spawn had a mix of Rohu, Mrigal, Grass Carp and Common carp species.

6. The average water spread of the Manyad reservoir is 57.3 ha. As per the standard fingerling release rate of 5,000 per hectare, it was required to release about 30,000 fingerlings or 20 lakh spawns into the system to achieve an average survival rate of 15 per cent. However this scientific methodology is not followed and spawns are released with respect to financial contributions from members of the fishing co-operative.

7. Traditionally, the community starts fishing on *Sankranti* (mid January) and the fishing season lasts till the onset of monsoon in June. The fishers do not have any boats and use inflated tire tubes as rafts and catch fish using fishnets. Fishnets are available in nearby Nandgaon, Vaijapur and Yeola markets for Rs. 300-600 per kilogram.

8. The main fishing zones in the Manyad reservoir are *Chulangan Doh* and *Khalacha Mel*. As cold storage facilities are not available, the caught fish is usually kept temporarily in the reservoir water till the arrival of traders and sold collectively from the landing site near *Khalacha Mel*. Apart from these introduced fish species, some local fish such as *Choch, Ger, Dhebari, Pokal* and *Mangur* are found in the *Waracha Mel* zone.

9. The largest quantity by weight of fish caught was of the Catla species followed by the *Kombada* (common carp) and Mrigal species. The catches by weight of *Rohu* and *Gautya* (grass carp) were comparatively lesser. The Catla and Mirgal reportedly grow to a maximum size of 15-20 kg in the Manyad reservoir.

10. The fish catch is usually bought by traders from Nandgaon, Yewala and Loni. The fish catch is sold at a flat rate of Rs. 100 per kilogram. The *Bhil* fishermen of Parala face troubles from some local farmers who try to stop them from fishing as their land was submerged when the reservoir was created, but for which they have already received compensation from the government. They also demand a share of caught fish. The *Bhil* fishers reported that nearby villagers also catch the fish without permits, which they estimate could be equivalent to the fish caught by them as members of the group.

12. As per the FMPIS Fortnightly report, the average

Fish harvest in Manyad reservoir in 2022

Month (2022) Avg. size	Catla 2-2.5kg	Mrigal 3kg+	Rohu 1-1.5kg	Gautya 1-1.5kg	Kombada 3-3.5kg	Total
April	250	150	100	50	100	650
May	300	200	110	80	150	840
June	200	125	180	100	225	830
Total	**750**	**475**	**390**	**230**	**475**	**2320**

prices of Catla, Common carp, *Rohu* and Mrigal were Rs. 177, Rs. 164, Rs. 173 and Rs. 139 respectively. The price of fish also varies as per the size and bigger-sized fish fetch a higher price. In Parala village, the total fish catch is sold to traders at the blanket cost of Rs. 100 per kilogram. The Manyad reservoir is surrounded by forest land and farmers in the catchment area practice subsistence farming. Therefore, the bioaccumulation of pesticides and other chemicals is probably negligible in this cluster. Fish from the Manyad reservoir is recognized for its superior quality in local markets. All these factors indicate the potential to significantly increase the productivity and income for the *Bhil* community.

13. With an average water spread of close to 60 ha, the fish production potential of the Manyad reservoir is about 30,000 kg fish, considering an average productivity of 500 kg/ha. There is immense potential for production enhancement in this naturally well-endowed waterbody that receives nutrition from the surrounding natural forest areas.

Comparative of fisher and trader's income

Particulars	Cost/ Income (Rs)
Cost of seeds	1,05,000
Cost of fishnets	30,000
Total input cost	1,35,000
Gross income	4,64,000
Net income of fishers	3,29,000
Net income per fisher	8,225
Traders cost transport	32,000
Trader cost of preservation (ice, container, etc.)	23,200
Trader's gross profit	7,42,400
Trader's net profit	2,23,200
Licious and hotel	350-450 per Kg

Source: Study Data and FMPIS Fortnightly Report 2021

SITE-SPECIFIC RECOMMENDATIONS

1. There is a need for capacity building of the fisher group to promote a scientific approach to fishing, quantity of spawns or fingerlings to be released, transportation, enterprise development and alternative catch methods etc. At present, no scientific method is followed to release the spawns. Similarly, care needs to be taken while transporting and releasing the spawn to avoid shocks of fluctuations in the temperatures.

2. Access to quality spawn is critical for successful production as well as for avoiding unintended entry of invasive species. Currently, the local fisher group does not have access to quality and affordable spawn. They need to establish linkages with quality suppliers who are reliable and provide onsite safe delivery and release.

3. Formal recognition of community rights over fishing in the reservoir is important. The Forest Rights Act, 2006 offers scope for claiming Community Forest Rights (CFRs). There is a need to pursue this which would most likely be a long-drawn out process to formally establish the rights. This would also enable the community to better access financial assistance.

4. The local fish species such as *Gani, Botarya,* and *Bilona* prey on spawn. Therefore, it is recommended to release fingerlings instead of spawn. A low-cost cage culture is recommended to be established to rear the spawn upto the fingerling stage in a protected environment. A typical cage structure with three 10ft x 10ft sections for spawn to semi-fingerling stage and a 25m x 25m pen structure for semi-fingerling to fingerling stage using bamboo, plastic drums and green nets as the main material can be constructed with investments of Rs. 50,000 to Rs. 75,000. This, apart from the fisher groups'

own needs, can become an enterprise in itself to sell fingerlings to nearby fisher groups.

5. In terms of technological inputs, green transport in terms of EV motorbikes with attached ice boxes would enable the Bhil community to transport the fish direct to consumer markets around the cluster and hotels in Aurangabad, which is a major tourism centre in the state. Live fish transportation facility would also help cater to consumers' preferred choices and also realize a better price, up to 50 to 100 per cent markup.
6. Native fish species are largely ignored and over time, this has resulted in the neglect and degradation of the wetland ecosystem. Government policies, programmes and market mechanisms have encouraged mono-culture of Indian Major Carps (IMCs) and other exotic carp species, which have led to ecological degradation and spread of invasive exotic species. Eco-restoration of wetlands helps natural regeneration of native fish species, which do not require external inputs, are valued for their taste and cultural significance, and provide year-round harvest as against the once a year harvest of IMCs. Native fish species fetch up to 3 to 4 times more money even in local markets. Keeping these aspects in mind, it is recommended to avoid releasing exotic grass carps and common carps, instead limiting IMCs and actively promote the regeneration of aquatic flora species including *Hydrilla verticillata*, *Ceratophyllum demersum* and *Vallisneria spiralis* and consequently, of native fish populations. As a co-benefit, the regeneration of aquatic flora contributes to the improved colour and taste of IMC fish species as well.
7. The Manyad river basin has a high productivity of *Barytelphusa cunicularis* crab species. The livelihood and opportunity programmes and policies need to consider sustainable wild crab harvesting in addition to developing fisheries in the Manyad river.
8. Collectivization of the fisher group from the *Bhil* community as a Farmer Producers Company (FPCs) is recommended. Given the socio-cultural background and the low-level of education among the community members, there should be a greater emphasis on capacity building, exposure to the industry and markets and handholding for relatively a longer period than the standard 3 years considered under the FPO promotion schemes of NABARD and state governments.
9. Testing for residues of harmful elements such as pesticides and other pollutants like heavy metals becomes even more critical in case of fish due to bioaccumulation and biomagnification. While nutrient testing is relatively more accessible, testing facilities for pollutant residues are restricted and costly. At present, in Maharashtra the testing facility is available in CSIR-NEERI, Nagpur and costs Rs. 7,000 per reference pollutant. There is a need for developing more accessible testing infrastructure especially focussed on pollutants, pesticides, and weedicides in a decentralized manner, involving a network of universities, colleges and various research institutions. This would also help in instituting better prices for pollution-free fish produce and in turn, create an incentive to reduce pollution of water bodies.

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Waam, Choch, Debari, Dok fish (Left to right)

Photo : Satish Awate

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