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Fish catch assessment of the Tiru reservoir, Udgir, District-Latur, Maharashtra

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Abstract
The present investigation was carried out to assess the fish productivity of the Tiru reservoir and its potential towards fish culture. The assessment was based on the study of fish diversity from August 2017 to July 2018. All together 15 species of fishes has been reported from the Tiru reservoir. *Labeo rohita* contributed highest (19%) in the total fish catch followed by *Cirrhinus mrigala* (18%), *Catla catla* (15%), *Cyprinus carpio* (13%) and *Wallago attu* (9%), etc. According to the current study, Indian Major Carps made up more than half of the entire catch that was reported in the reservoir. The Tiru reservoir yielded the productivity of 125 kg/ha/year. The few factors that contribute to the improved productivity from Tiru reservoir include frequent fish stocking, improved management practices, and significant nitrogen and phosphorus enrichment from nearby Soybean fields.

Keywords: Fish productivity, ichthyofauna, Tiru reservoir

Introduction
Water is essential for both human life and environmental health (Dogan *et al*., 2016) [4]. Inland waterways offer essential and varied habitat and ecosystem services, sustaining high levels of biodiversity, in addition to water supplies for a variety of human applications (Palmer *et al*., 2014) [16]. Inland capture fisheries made a substantial contribution to food production, nutritional assistance, and it also provides a means of income to the traditional fisherman. Fish fulfils the nutritional requirements and provides a healthy source of food to the human beings. For the purposes of irrigation, electricity generating, flood control, and industrial water demands, man-made reservoirs are lakes that are formed by storing river water (Jhingran, 1988) [10]. As a result, the reservoir has been recognised as a viable and untapped water supply that may be exploited for fish farming. The reservoir now has an average annual output of 30 kg/ha, although a smaller reservoir had an estimated annual production of 49.9 kg ha. (Karnataka and Kumar, 2014). It is possible to achieve high fish output because of their simple management, which includes ranching. Although Indian reservoirs have the capacity to generate 250 kg/ha, this is insufficient to meet the population's demand, which is constantly increasing (Paul *et al*., 2017) [17].

During 2017-18 total fish production in the Maharashtra state was estimated at 606013 t and valued at 7735 crores, out of which 131020 t (Table 01 and Fig. 01) with value of 1447 crores came from Inland sources & 474992 t valued at 6288 crores from Marine sources. During 2015-16 state contributes in Marine, Inland and total fish production of India was 12.1%, 2.0% and 5.4% respectively at all India level.

Inland fish production during 2017-18 has shown decreasing trend of 34.54% over the previous year (2016-17). During 2017-18 the growth rate in production of Konkan (66.67%) was considerably high followed by Latur (29.38%), Pune (13%), Amravati (6.11%) and lease increment in the Aurangabad region (0.36%). In the Nagpur region the production has been decreased considerably up to 62.31% over the previous year and Nasik region has also reported shortfall of 7.46% in the production.

Marathwada region comprises of Aurangabad region and Latur region. Aurangabad region includes Aurangabad, Jalna, Beed and Parbhani districts; whereas Latur region covers Nanded, Hingoli, Latur and Osmanabad districts. The District-wise area available for fish culture in the form of tanks and reservoir is given in the Table 02 and the fish production trends are given in Table 03; Fig. 02.

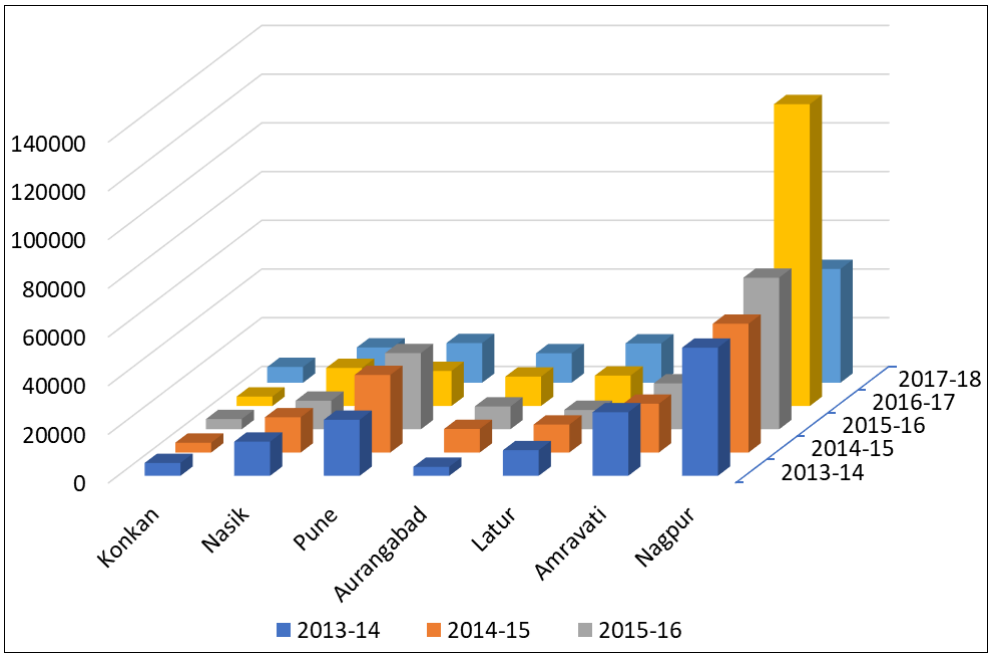


Fig 1: Inland Fish production trends of Maharashtra

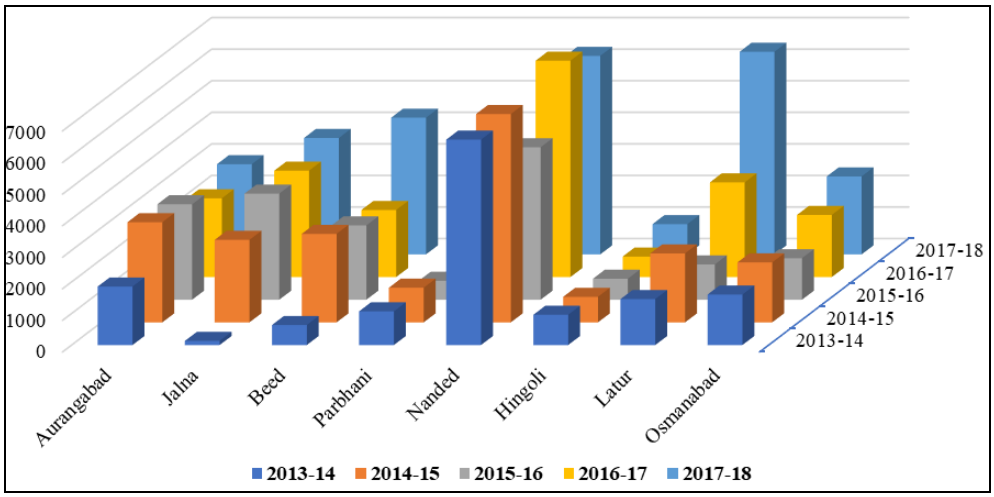


Fig 2: Inland Fish production trends of Marathwada region

Table 1: Region-wise Inland Fish Production (tones) of Maharashtra

Region	2013- 14	2014-15	Trend	2015- 16	Trend	2016-17	Trend	2017-18	Trend
Konkan	5279	4030	-23.66	4195	+4.09	3876	-7.60	6460	+66.67
Nasik	14026	14469	+3.16	11736	-18.89	15638	+33.25	14471	-7.46
Pune	23013	31855	+38.42	31287	-1.78	14392	-54.00	16263	+13.00
Aurangabad	3687	9695	+162.95	9341	-3.65	12046	+28.96	12089	+0.36
Latur	10524	11495	+9.23	7930	-31.01	12475	+57.31	16140	+29.38
Amravati	26081	20056	-23.10	18854	-5.99	17799	-5.60	18887	+6.11
Nagpur	52611	52879	+0.51	62227	+17.68	123940	+99.17	46710	-62.31
Total	135221	144479	+6.85	145570	+0.76	200166	+37.50	131020	-34.54

***Source*:** Fish Production Report 2017-18, Department of Fisheries, Government of Maharashtra, India

Table 2: Inland Fishery Resources of Marathwada Region

Name of the District	0-500 ha	500-1000 ha	1000-2000 ha	Above 2000 ha	Total tanks and reservoirs	Total area (ha)
Aurangabad	115	1	0	0	116	8808.40
Jalna	67	0	0	1	68	11051.06
Beed	26	1	0	1	28	8253.73
Parbhani	152	1	0	2	155	18493.47
Aurangabad Region	360	3	0	4	367	46606.66
Nanded	153	2	0	1	156	11714.19
Hingoli	235	0	0	1	236	15187.97
Latur	84	1	1	0	86	6699.70
Osmanabad	26	0	0	1	27	3746.89

Latur Region	498	3	1	3	505	37348.75
Marathwada Region	858	6	1	7	872	83955.41

Table 3: District-wise Fish production (tonnes) trends of Marathwada region

Sr. No.	Name of the District	2013-14	2014-15	2015-16	2016-17	2017-18
1.	Aurangabad	1854	3175	3025	2496	2857
2.	Jalna	131	2615	3361	3369	3688
3.	Beed	634	2805	2355	2125	4331
4.	Parbhani	1068	1100	600	4056	1213
Aurangabad Region		3687	9695	9341	12046	12089
1.	Nanded	6509	6600	4830	6855	6290
2.	Hingoli	960	810	665	650	960
3.	Latur	1455	2185	1120	3000	6420
4.	Osmanabad	1600	1900	1315	1970	2470
Latur Region		10524	11495	7930	12475	16140
Marathwada Region		14211	21190	17271	24521	28229

Marathwada has vast potential for fish production from tanks and reservoirs, the total area estimated to be around 83955 ha. The fish production trends showed highest production of 28229 tonnes from Marathwada region during the year 2017-18. The contribution of Marathwada region was 21.54% to the total fish production of Maharashtra state. Fish production of Marathwada region has shown rising trends from 2013-14 to 2017-18.

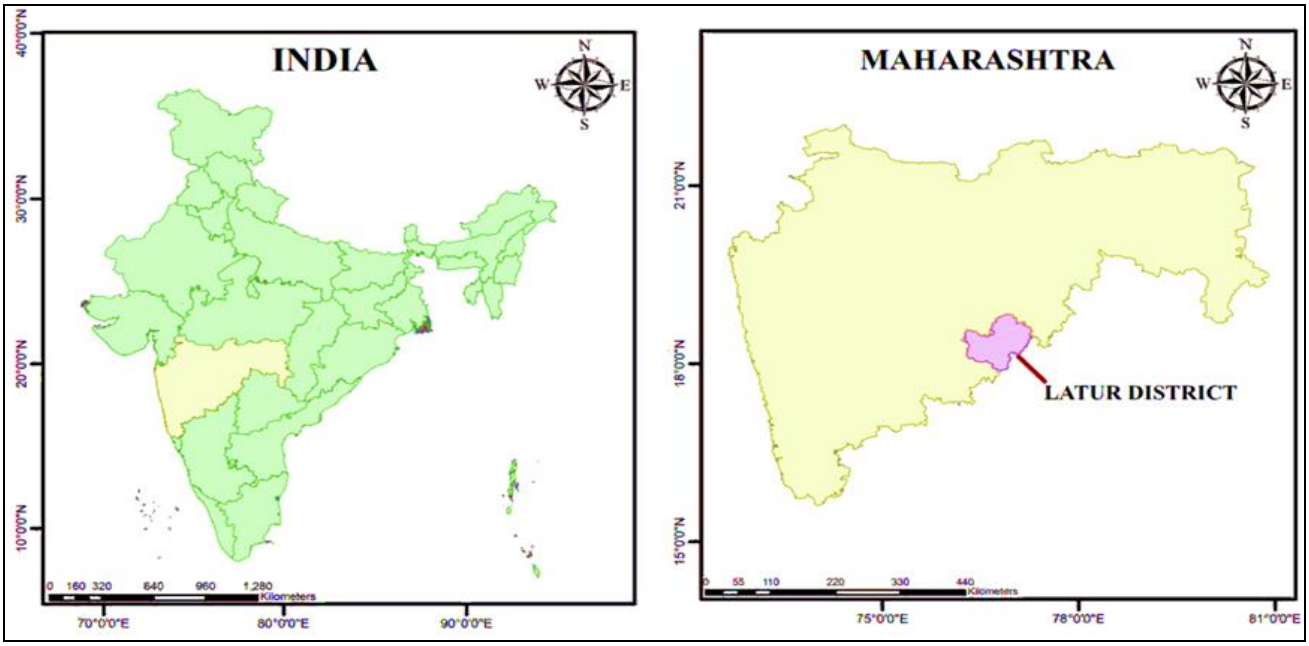
The primary causes of reservoirs' poor fish productivity are random fish stocking and a lack of commitment to good stock management. Low fish output from reservoirs is often caused by overstocking, understocking, stocking at tiny sizes, capturing fish at small sizes, poor management, and insufficient harvesting. To boost the fish output from this abundant resource, it is necessary to pay greater attention to scientifically oriented, capture-based fisheries in reservoirs. Fish diversity in various freshwater bodies have been studied by large number of researchers (Rao *et al*., 1998; Sharma and Nayak, 2001; Khedkar, 2005; Soni *et al*., 2008; Srivastava *et al*., 2008; Pawar and Pandarkar, 2010; Pawar *et al*., 2011) [21, 24, 13, 25, 26, 18, 19]. The present study has been undertaken to access the fish productivity of the Tiru reservoir located in the Udgir Tahsil of Latur District, Maharashtra.

Materials and Methods

Study Area

Tiru reservoir is located in the Udgir Tahsil of Latur District between 18º 33′ 18″ and 18º 34′ 16″ N and 77º 07′ 27″ and 77º 01′ 37″ E (Fig. 03). It is an earth fill dam build on the Tiru river during 1976. Tiru river has a course of about 56 kilometers in Latur district. Tiru river originates at eastern edge of the plateau near Chakur and flows eastwards to join Lendi river (Tributary of Manjara river) at Kharaka in Nanded district. These all rivers merges in to Godavari river basin. Agricultural lands surround the Tiru reservoir and water from the reservoir is mostly utilised for both agriculture and residential purposes in the adjacent villages. Many traditional fisherman in this area rely heavily on fishing for their livelihood. The reservoir has a potential fish yield of roughly 154 MT, according to estimates.

Watershed area of the Tiru is about 270 km^2 and average water spread area of 489 ha. All the morphometric features are depicted in the Table 04. The watershed to lake area ratio of Tiru reservoir is just 39.13, which indicates higher production levels.



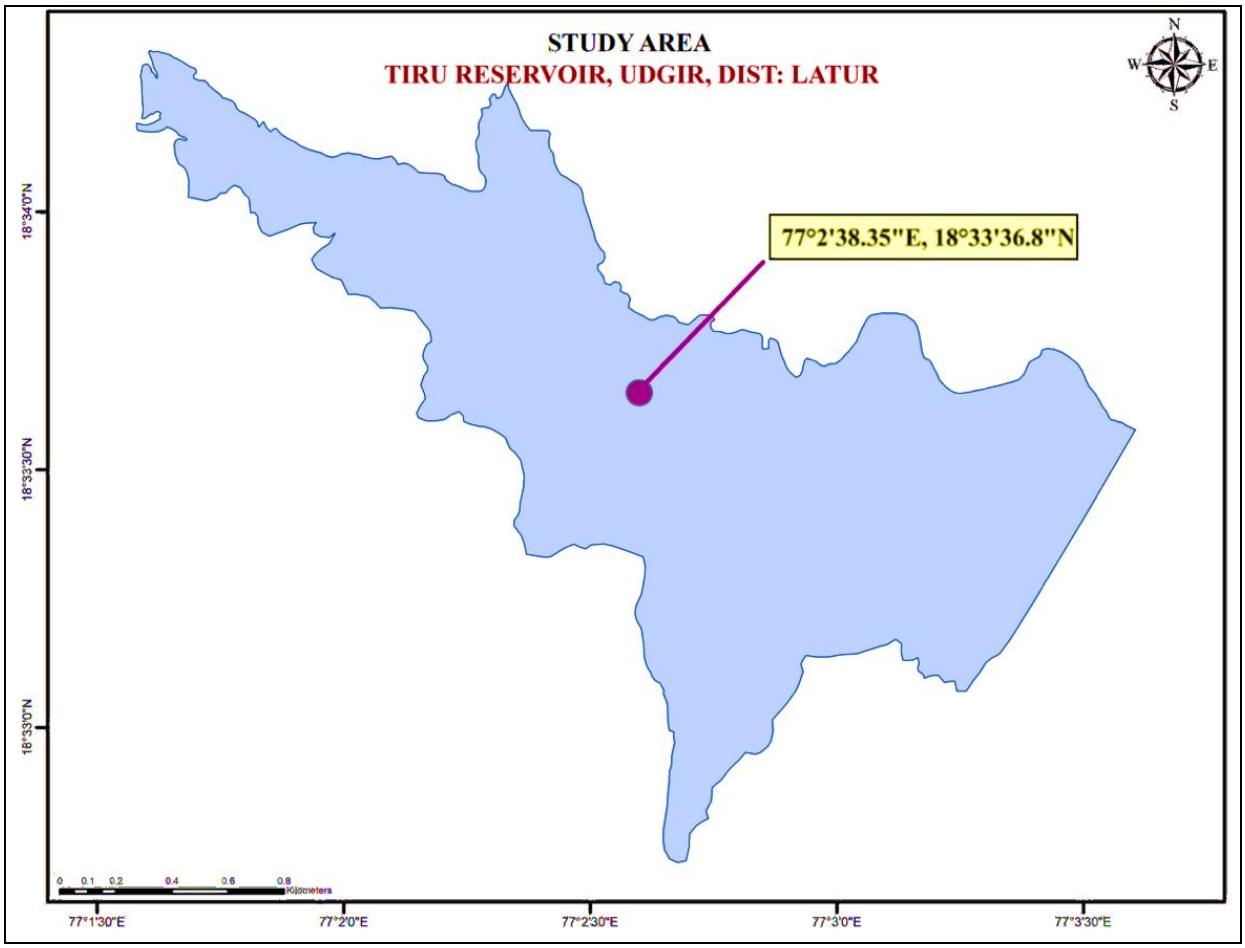


Fig 3: Location map of the Tiru reservoir

Table 4: Morphometric features of Tiru reservoir, Udgir, Dist.: Latur

No.	Item	Units	Value
1.	Submergence area	km^2	6.9
2.	Average water spread area	km^2	4.8
3.	Watershed Area	km^2	270
4.	Command area	ha	2654
5.	Maximum Length	km	3.15
6.	Maximum Width	m	930
7.	Maximum Depth	m	7.31
8.	Mean Depth	m	3.98
9.	Volume	km^3	311
10.	Watershed to lake surface area	km^2	39.13

Data collection

Fishing in the Tiru reservoir is conducted by fishermen from two different co-operative societies. Daily catch data from August 2017 to July 2018 has been gathered from the local fish merchants that buy the fish from these fishermen in the reservoir itself in order to evaluate the productivity of the reservoir. The species identification was carried out by referring standard literature of Duttamunshi and Srivastava (1988) [5], Talwar and Jhingran (1991) [27], Day (1994) [2], Jayaram (1994) [8], Menon (1999) [14] and Jayaram (1999) [9].

Result and Discussion

Due to the lack of natural recruitment or breeding of Indian Major Carps, and the fact that fish production was entirely dependent upon seed stocking, Tiru Reservoir is a classic example of culture-based fisheries. Fish enter the Tiru reservoir during floods when reservoirs in the upper riches overflow. However, the amount of rain throughout this investigation was quite mild. As a result, reservoir fishing is practised year round.

Fish Production status of the Tiru Reservoir

Tiru reservoir is stocked with 50 Lakh spawns of Catla, Rohu and Mrigal in the year 2017 and 3 lakh seed of freshwater prawn *M. rosenbergii* was stocked in the same year. Species-wise and month-wise fish production from Tiru reservoir during 2017-18 is given in the Table 04 as well as Fig. 03. Total fish production of 61,367 kg was recorded from the Tiru reservoir during the year 2017-18.

Table 4: Species-wise and month-wise fish production from Tiru reservoir during 2017-18

Sr. No.	Name of the species	Aug 17	Sep 17	Oct 17	Nov 17	Dec 17	Jan 18	Feb 18	Mar 18	Apr 18	May 18	Jun 18	Jul 18
1.	*Catla Catla*	957	749	362	450	827	588	512	621	648	1962	1217	560
2.	Labeo rohita	1103	794	758	791	948	998	467	717	521	1860	1812	734
3.	Cirrhinus mrigala	1046	777	842	1037	809	512	725	1191	632	1784	1322	614
4.	*Channa striatus*	213	101	129	101	140	84	143	78	153	215	302	209
5.	*Cyprinus carpio*	735	287	375	162	437	245	474	611	422	1454	1997	732
6.	Mastacembelus armatus	180	93	117	104	113	116	144	137	152	335	323	195

7.	*M. rosenbergii*	144	135	90	108	47	83	185	302	240	140	225	86
8.	*Ompok pabda*	213	131	50	42	41	119	242	140	140	323	479	312
9.	*Mystus seenghala*	189	198	302	240	150	105	213	248	104	416	302	275
10.	*Wallago attu*	620	132	423	374	219	173	582	383	146	864	827	423
11.	*Channa striatus*	321	153	47	192	128	155	122	186	152	219	212	200
12.	Miscellaneous	632	398	294	353	219	203	267	251	206	441	00	36
Total		6353	3948	3789	3954	4078	3381	4076	4865	3516	10013	9018	4376
Total fish production from Tiru reservoir during 2017-18 = 61367 kg.													

Month-wise fish catch trends

Highest fish production of 10013 kg was recorded during the May 2018 month. Water level in the reservoir is at lowest level during the May month which might be the cause of getting highest catch in the net during this month. Lowest fish catch was observed during January 2018 due to winter season. The catch trends showed average 3000 kg-4000 kg of fish catch in most of the month and higher catch of 9000 kg-10000 kg when the water level was lowest in the reservoir.

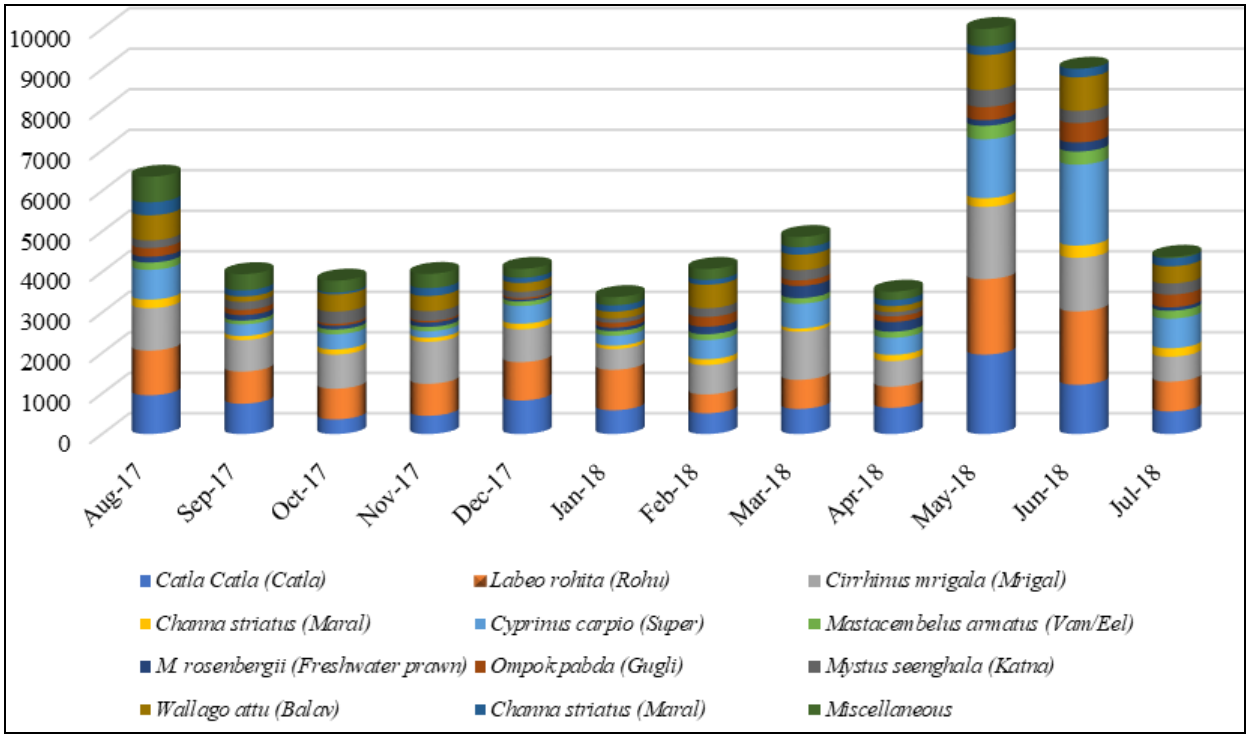


Fig 4: Month-wise fish catch trends in the Tiru reservoir

Species-wise fish catch trends

Alltogether 15 species of fishes has been reported from the Tiru reservoir. *Labeo rohita* contributed highest (19%) in the total fish catch followed by *Cirrhinus mrigala* (18%), *Catla catla* (15%), *Cyprinus carpio* (13%), *Wallago attu* (9%), *Mastacembelus armatus* (3%), *Channa striatus* (5%) and remaining species contributed negligible percentage. Out of the stocked species Catla, Rohu and Mrigal has contributed nearly half of the total fish production.

Niraj Kumar (2012) [15] reported 40 species from Turkaulia Lake, East-Champaran, Bihar with major abundance of IMC species. Yousuf *et al*. (2012) [31] documented 29 species from Halali Reservoir, Vidisha, Madhya Pradesh showing 41% abundance of Cyprinidae family. Pawar *et al*. (2014) [20] reported 23 species Jawalgaon reservoir in Solapur district and they further pointed out the 52% dominance of Cyprinidae family in Maharashtra. Ravinder *et al*. (2016) [23] reported 14 species from Dharmasagar reservoir in Warangal district of Telangana State and they also reported abundance of Indian Major Carps (IMC) from the reservoir. Tiwari (2016) [29] reported 23 species from Dalsagar Lake, Seoni, Madhya Pradesh. Ingole (2017) [7] reported 7 species from Majalgaon dam from Beed district. Telkhade and Jambhule (2017) [28] reported 30 species of fishes from Lohara Lake, Lohara, Chandrapur District with dominance of the order Cypriniformes. Kale *et al*. (2018) [11] reported 11 fish species from Lonimavla reservoir in Ahmednagar District with dominance of *Catla catla, Cirrhinus mrigala, Cirrhinus reba, Labeo rohita, Labeo bata* and *Garra mullya.* Raveendar *et al*. (2018) [22] reported abundance of 30 species from Nanaksagar reservoir in Uttarakhand with important contribution of *Catla catla, Labeo rohita, Cirrhinus mrigala, Labeo calbasu, Ctenopharyngodon idella, Cyprinus carpio, Labeo gonius, Notopterus notopterus, Mystus* spp., *Channa* spp. and *Wallago attu.* Venkateshwarlu and Ahmed (2018) [30] reported 10 species with major contribution of fishes belonging to order Cypriniformes from Durgadahalli Lake in Karnataka.

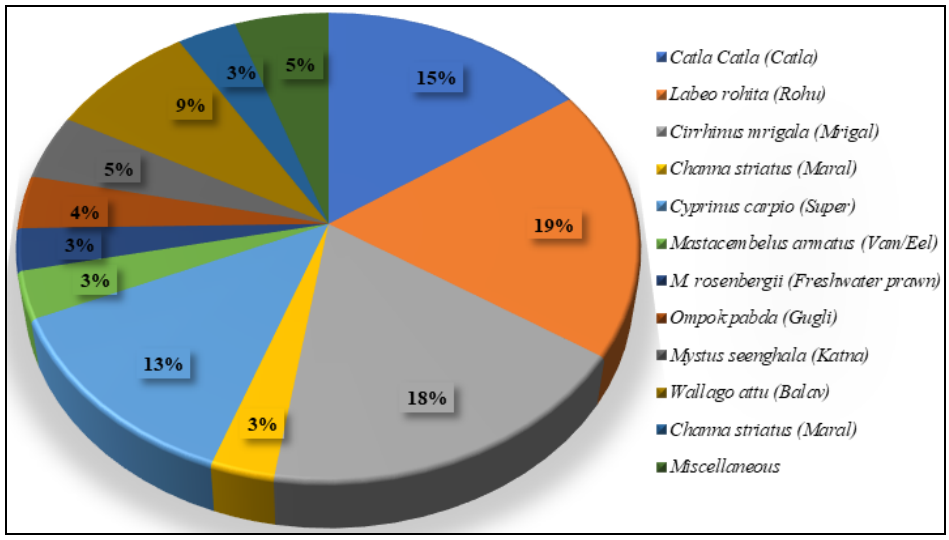


Fig 5: Month-wise fish catch trends in the Tiru reservoir

Productivity of the reservoir

Average water spread area of the Tiru reservoir is about 489 ha. and the potential yield of the Tiru reservoir mentioned by the department of Fisheries, Government of Maharashtra is 154.35 ton. The total fish production of the Tiru reservoir was 61367 kg. Hence the reservoir has given 125 kg/ha/year of fish production. The productivity of the reservoir was quite good as compared to the average fish production of 50 kg/ha/year (Karnataka and Kumar, 2014).

Agarwal (1990) [1] reported the fish productivity in many small and minor reservoirs from Haryana, He recorded 355.7 kg/ha/year of fish production from Suraj Kund, 227.8 kg/ha/year fish productivity from Hallipark, 17 kg/ha/year from Karnal, 160 kg/ha/year from Dhoz, and 138 kg/ha/yr from Tillyar, 63.95 kg/ha/yr from Damdara, 138 kg/ha/year in Mornital. Devi (1997) [3] reported the productivity of 445 kg/ha/year and 528 kg/ha/yr during 1993-95 in Ibrahimbagh and Shanthamraj reservoirs of Rangareddy district, Andhra Pradesh.

Conclusions

The good fish production in the Tiru reservoir is mainly attributed to the better productivity level of the reservoir. Tiru reservoir is surrounded by the agriculture fields and the area is famous for soyabean cultivation. For getting good soyabean production farmers are using heavy fertilizers in the reservoirs. These fertilizers are entering in the reservoir during rainy season and enhance the plankton productivity of the reservoir. Further, the domestic animal and sewage waste is entered in the reservoir increases the productivity. Fish stocking was done by the fishermen every year also supports increase in the fish production.

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