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International Journal of Current Research
Vol. 8, Issue, 01, pp. 24863-24869, January, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

IMPACT OF TILAPIA-DOMINANCE ON THE GROWTH AND PRODUCTION OF MAJOR CARPS IN MINOR RESERVOIRS

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ARTICLE INFO

Article History:
Received 26th October, 2015
Received in revised form
20th November, 2015
Accepted 16th December, 2015
Published online 31st January, 2016

Key words:

Minor reservoirs,
Fish production,
Major carps,
Mesotrophic reservoirs,
Tilapia-Dominance.

ABSTRACT

The present study deals with the effect of dominance of Tilapia on fisheries of minor reservoir. In the present study two reservoirs were selected with almost equal water speared area and analyzed for three years. Julur was selected as experimental reservoir due to the dominance of Tilapia (61.23%), where as Bibinagar (17028'48.6N, 78047'34.7"E) was selected as control reservoir, where Tilapia population was negligible (0.27%). The physico-chemical parameters indicated the mesotrophic nature of water in both the reservoirs. The Ichthyofuna diversity in both reservoirs was almost similar. Five major carp's fry were stocked with similar quantities in three years in both reservoirs. The production of major carps was significantly (t 22.98, $P<0.05$) effected in Julur due to the dominance of Tilapia when compared to Bibinagar. Tilapia production was also differed significantly (t 5.73, $P<0.05$) which was more in Julur. Tilapia was responsible for requirement of more major carp fry for production of 1kg major carps. Tilapia also affected the growth rate of major carps; 1kg of major carps was attained in the early part of the third year in Tilapia dominated reservoir when compared to that of Bibinagar, where major carp attained 1kg in 1year. Tilapia consumed more amount of Zooplankton which effected the significant reduction in the growth and production of major carps. The present study indicated that Tilapia population plays a negative role in the growth and production of desirable fishes.

Citation: **Sreenu Noothi, Sunil Kumar Ausula, Venkateswar Chinna and Maruthiram Ganagaraju, 2016.** "Impact of Tilapia-Dominance on the Growth and Production of major Carps in Minor Reservoirs", *International Journal of Current Research,* 8, (01), 24863-24869.

INTRODUCTION

Reservoirs constitute the single largest inland fishery resource, both in terms of size and fish production potential. These manmade ecosystems offer enough scope for stock manipulation through ecological maneuvering, paving the way for production hikes at relatively low capital investment. Experience has revealed that these water bodies have imminence potential for fish husbandry through extensive aquaculture techniques. Reservoirs are considered as the growing resource with economic potential for fish production augmentation through capture fisheries and extensive aquaculture. Reservoir fishery is stocking-cum capture system. India has 19,370 reservoirs containing a total surface water area of 3.15 m ha-1 and 2.85 mha-1 of pond for fisheries and aquaculture in addition to numerous rivers and canals. Reservoirs are classified into Major (> 1000 ha), medium (100-1000ha) and minor (10-100 ha) habitats based on their surface water area (Agarwal, 1990; Piska 2000; Piska and Rao, 2005). The fish faunistic spectrum of India is very rich. More than 400 species of freshwater fish, many of which are economically important, have been identified in Indian rivers. The Gangetic system alone harbors at least 265 species of fish. Despite the faunistic changes associated with impoundments, Indian reservoirs harbor a rich variety of fish species. On the basis of studies conducted so far, large reservoirs, on average, harbor 60 species of fish, of which at least 40 contribute to commercial fisheries; whereas minor reservoirs harbor around 30 fish species. The fast growing Indo-Gangetic carps are among the most commercially important fish. More recently, a number of exotic species have contributed substantially to commercial fisheries. The tilapia (Oreochromis mossambicus) was first introduced into the country in 1952 and it was shortly thereafter stocked in the reservoirs of south India and it is common fish in Indian waters. By the end of the 1960s, most of the reservoirs in Tamil Nadu and Kerala were regularly stocked with tilapia.

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The performance of tilapia in south Indian ponds has been discouraging mainly because of early maturity, continuous breeding, and overpopulation and dwarfing of the species. It matures at an age of 75 days when it is 6 cm in length, and breeds at monthly intervals under tropical conditions. The warm waters of the tropical reservoirs in India provide an ideal habitat for tilapia and it has secured a niche in a number of south Indian reservoirs. Concerns regarding its stunted growth have been allayed as the average size of tilapia did not decline as much as it did in ponds (Piska, 2000). It is uneconomical and has less demand in Indian markets it is dominated in some of the water bodies and effecting fisherman economy. Neil (1966) studied the behavior of Tilapia mossambica, Bruton and Allanson (1974) studied the growth of Tilapia mossambica in Lake Sibaya in South Africa. Bruton and Boltt (1975) observed the biological aspects of Tilapia mossambica in a natural fresh water lake in lake Sibaya in South Africa. The main objective of present work is to observe the impact of Tilapia-dominance on fish growth and production in a minor reservoir.

MATERIALS AND METHODS

The present work carried out in two minor reservoirs in Nalgonda district, Telangana, India for 3 years from July 2010 to June 2013. These are perennial water bodies and water is used for agriculture and fisheries. The water surface area of Bibinagar reservoir equaled 25 ha which is used as control, where Tilapia dominance was not found and Julur reservoir equaled 22 ha which is used as experimental, where Tilapia dominance was observed. The physico-chemical parameters were estimated bi-monthly for 3 years according to methods published in APHA (2012) and calculated per year.

Ichthyofuna were identified and abundance was estimated in both reservoirs. The fishes were grouped into Major carps, Minor carps, Cat fishes, Murrells, Tilapia and Other fishes. Only major carp seed was stocked every year in the month of July and remaining fishes depend on auto-stocking. Equal percentage of juveniles (major carps in fry stage) was stocked with same species composition in both reservoirs. The fishes were harvested every month with the help of the cast net, drag net and gill net. The fish landing were estimated species-wise in every month and calculated per year. The fish productivity was estimated. The growth rates of all major carps were estimated monthly and calculated for year. The impact of Tilapia on growth and production of major carps was analyzed. Student "t" test was employed to find out the difference in fish production and standard deviation was analyzed based on the methods from Bailey (1959)

RESULTS

Water quality

The physico-chemical parameters of water were almost similar in both reservoirs (Table 1). Water is alkaline in nature the nutrients like nitrates and phosphates were in moderate level in both the reservoirs Nitrates were found to be 2.8 in Bibinagar and 3.42 in Julur and Phosphates were 0.82 in Bibinagar and 0.98 in Julur. The difference of the above both nutrients in both reservoirs were found to be insignificant (P>0.05). This indicates that both the reservoirs in mesotrophic nature.

Table 1. The mean Physico-Chemical Parameters of Water in minor reservoirs during 2010 to 2013

Parameter	Bibinagar Reservoir	Julur Reservoir
	Mean	Mean
pH	7.88 ±0.8	7.92±0.9
Dissolved oxygen (mg/lit)	6.54±0.9	6.34±0.7
Total alkalinity (mg/lit)	184.23±18.4	193.46±17.3
Total hardness (mg/lit)	196.34±16.3	205.62±17.8
Calcium (mg/lit)	98.36±6.8	110.32±7.2
Magnesium (mg/lit)	16.5±1.6	21.9±2.4
Chloride (mg/lit)	145.36±12.4	158.52±12.1
Nitrates (mg/lit)	2.8±0.2	3.42±0.3
Phosphates (mg/lit)	0.82±0.1	0.98±0.1
Turbidity (NTU)	5	5

mg= Milligram, lit=Liter, NTU=Nephelometric Turbidity Units

Ichthyofuna diversity

25 species were found in Bibinagar reservoir, whereas 23 species in Julur reservoir. Major carps were dominated in Bibinagar reservoir where as Tilapia in Julur reservoir.

Table 2. The Icthyofaunal abundance in minor reservoirs during 2010 to 2013

S.No	Group/Fish Name	Bibinagar Reservoir	Julur Reservoir
	Major carps		
1	*Labeo rohita*	+++	+++
2	*Catla catla*	+++	+++
3	*Cirahina mrigala*	+++	+++
4	*Cyprinus carpio*	+++	+++
5	*Ctenopharyngodon idella*	+++	+++
	Minor carps		
6	*Labeo calbasu*	+	+
7	*Puntius sarana*	+	+
	Murrells		
8	*Channa striatus*	++	++
9	*Channa punctatus*	++	++
10	*Channa gachua*	+	+
	Cat fishes		
11	*Clarias batrachus*	++	++
12	*Heteropneustes fossilis*	++	++
13	*Mystus bleekeri*	+	+
14	*Aurichthys aor*	+	+
15	*Ompok bimaclatus*	+	+
	Tilapia		
16	*Oreochromis mosambicus*	+	+++
	Other fishes		
17	*Salmostoma clupeoides*	++	++
18	*Salmostoma bacaila*	+	-
19	*Amblypharyngodon mola*	++	++
20	*Puntius ticto*	+	+
21	*Ambasis nama*	+	+
22	*Etropus suratensis*	+	+
23	*Glossogabius guiris*	+	+
24	*Mastacembelus armatus*	+	-
25	*Gambusia affinis*	++	++

+++ = *Most abundant,* ++ = *Abundant,* + = *Less abundant* - = *Absent*

5 species of major carps, 2 species of minor carps, 5 species of cat fishes, 3 species of Murrells, one species of Tilapia and 9 species of other fishes were found in Bibinagar reservoir. Only Mastacembelus armatus and Salmostoma bacaila were absent and remaining species of Bibinagar reservoir were present in Julur reservoir (Table 2). All major cards were most abundantly

found (Table 2) and Tilapia population was less abundant in Bibinagar reservoir, where as in Julur reservoirs Tilapia along with all major carps were most abundant.

Fish Landing

In Bibinagar reservoir, the major carps were dominated in fish landing during three years with 95.63%. The remaining groups of fishes were found in less number, major carps were followed by cat fish (1.87%), Murrells (1.63%), other fishes (0.31%), Tilapia (0.27%) and minor carps (0.25%) (Table 3). In Bibinagar reservoir, the major carp landings were found 94.94%, 95.85% and 96.02% during 2010-11, 2011-12 and 2012-13 respectively (Table 3). The major carp landings increased gradually from 2010-11 to 2011-12 ($p<0.5$). Tilapia population was negligible with 0.31% (43 kg), 0.27% (40.27 kg) and 0.23% (37.51 kg) during 2010-11, 2011-12 and 2012-13 respectively. The Tilapia population was decreased gradually from first year to last year (Table 3).

Table 3. The Fish production in both reservoirs during 2010 to 2013

Bibinagar reservoir				
Fish	2010-11	2011-12	2012-13	Total No.
	kg	kg	Kg	kg
Major carps	13091	14295	15660.5	43046.5
	(94.94)	(95.85)	(96.02)	(95.63)
Cat fishes	291	266.96	282.16	840.12
	(2.11)	(1.79)	(1.73)	(1.87)
Murrels	278	219.33	238.12	735.45
	(2.01)	(1.47)	(1.46)	(1.63)
Tilapia	43	40.27	37.51	120.78
	(0.31)	(0.27)	(0.23)	(0.27)
Minor carps	41	34.3	39.14	114.44
	(0.3)	(0.23)	(0.24)	(0.25)
Other fishes	44	44.74	52.11	140.85
	(0.33)	(0.3)	(0.32)	(0.31)
Total (kg)	13788	14900.6	16309.54	44998.14
kg/ha/yr	551.52	596.56	652.38	1800.46
Julur reservoir				
Major carps	4521.44	5375.7	6408.28	16305.42
	(25.13)	(31.37)	(42.38)	(32.45)
Cat fishes	429.94	356.35	302.44	1088.73
	(2.39)	(2.08)	(2)	(2.17)
Murrels	404.75	347.78	296.39	1048.92
	(2.25)	(2.03)	(1.96)	(2.09)
Tilapia	12227.86	10720.57	7816.32	30764.75
	(67.97)	(66.58)	(51.69)	(61.23)
Minor carps	275.23	190.17	161.81	627.21
	(1.53)	(1.11)	(1.07)	(1.25)
Other fishes	130.58	141.12	136.29	407.99
	(0.75)	(0.86)	(0.9)	(0.81)
Total (kg)	17989.8	17131.69	15121.53	50243.02
kg/ha/yr	817.72	778.73	687.36	2283.81

Kg= kilogram, ha = Hector, yr =Year

In Julur reservoir, the Tilapia was dominated in fish landing with 61.23%. Maximum dominance of Tilapia was found during 2010-11 with 67.97% (12, 227.86 kg) and its landing decreased gradually in next year to 62.58% (10,720.57 kg) and further decreased to 51.69% (7,816.32 kg). The landing size of Tilapia was mostly ranged between 100-200 gr. The Tilapia production between Bibinagar reservoir (0.27%) and Julur reservoir (61.23%) was found to be differed significantly (t 5.7348, df 4, $p<0.05$) (Table 3).

Major carps dominated after Tilapia in Julur reservoir with 32.45%. Their percentages were gradually increased from 25.13% (4521.44 kg) to 31.37% (5375.70 kg) to 42.38% (6408.28 kg) during 2010-11, 2011-12 and 2012-13 respectively. Remaining fish landings were negligible in Julur reservoir. Tilapia and major carps domination was followed by cat fishes (2.17%), murrels (2.09%), minor carps (1.25%), and other fishes (0.81%) (Table 3).

Among major carp landings catla was dominated in Bibinagar with 35.94%, which was followed by rohu (27.14%), common carp (18.37%), mrigal (17.99%) and grass carp (1.73%). In Julur reservoir also catla was dominated among major carps landings with 26.91%, which was followed by rohu (23.84%), common carp (21.20%), mrigal (17.84%) and grass carp (10.21%). But catla production was reduced. The overall major carps landing were gradually increased in Julur reservoir. The overall landings of major carps were high in Bibinagar reservoir (43,046.50 kg) when compared to Julur reservoir (16,305.42 kg) and were found significantly differed, (t 22.9813, df 4, $p<0.05$) (Table 4).

Table 4. The Major carp production in both reservoirs during 2010 to 2013

Bibinagar reservoir				
Fish	2010-11	2011-12	2012-13	Total
	Kg	kg	Kg	kg
Catla	5448	4726	4795.24	14969.24
	(41.62)	(36.56)	(30.62)	(34.77)
Rohu	2710	4760	4211.1	11681.1
	(20.7)	(29.8)	(26.89)	(27.14)
Mrigal	2160	2744	2840.81	7744.81
	(16.5)	(19.2)	(18.14)	(17.99)
Common Carp	2568	1922	3417.12	7907.12
	(19.62)	(20.44)	(21.82)	(18.37)
Grass Carp	205	143	396.23	744.23
	(1.56)	(1)	(2.53)	(1.73)
Total (kg)	13091	14295	15660.5	43046.5
kg/ha/yr	523.64	571.8	646.42	1721.86
Julur reservoir				
Catla	1183.71	1468.64	1735.4	4387.75
	(26.18)	(27.32)	(27.08)	(26.91)
Rohu	1099.16	1335.86	1452.18	3887.2
	(24.31)	(24.85)	(22.66)	(23.84)
Mrigal	839.17	961.71	1107.73	2908.61
	(18.56)	(17.89)	(17.29)	(17.84)
Common Carp	919.68	1160.08	1377.73	3457.49
	(20.34)	(21.58)	(21.5)	(21.2)
Grass Carp	479.72	449.41	735.24	1664.37
	(10.61)	(8.36)	(11.47)	(10.21)
Total (kg)	4521.44	5375.7	6408.28	16305.42
kg/ha/yr	205.52	244.35	291.29	741.15

Kg= kilogram, ha = Hector, yr =Year

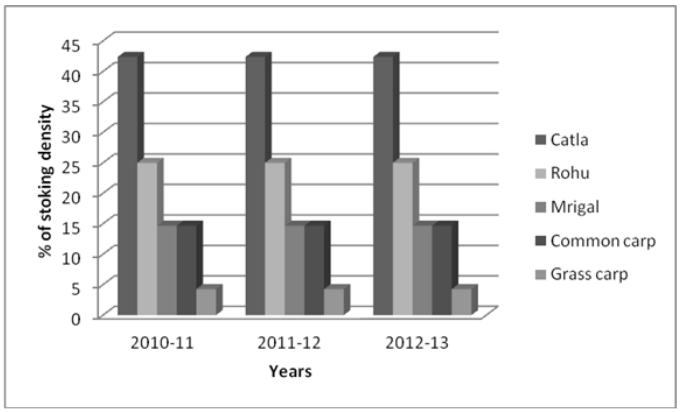
Fish Productivity

The major carp fish production was 523.64 kg/ha/yr, 571.8 kg/ha/yr and 626.42 kg/ha/yr, Tilapia productions was 1.72 kg/ha/yr, 1.61 kg/ha/yr and 1.5 kg/ha/yr, and other fishes productions was 26.16 kg/ha/yr , 22.61 kg/ha/yr and 24.46 kg/ha/yr during 2010-11 , 2011-12 and 2012-13 respectively in Bibinagar reservoir where as in Julur reservoir the major carp fish production was 205.52 kg/ha/yr, 244.35 kg/ha/yr and 291.29 kg/ha/yr, Tilapia productions was 560.36 kg/ha/yr, 491.84 kg/ha/yr and 364.38 kg/ha/yr, and other fishes

productions was 51.84 kg/ha/yr , 42.52 kg/ha/yr and 36.22 kg/ha/yr during 2010-11 , 2011-12 and 2012-13 respectively (Fig no.2).

The total fish production equaled 1800.46 kg/ha/yr (45,011.55 kg total 25 hectares yield per year) in Bibinagar reservoir, where as 2283.81 kg/ha/yr (50,243.80 kg total 22 hectares yield per year) Julur reservoir (t 7.4519, df 4 $p<0.05$). The fish production in Bibinagar reservoir increased gradually from 551.52 kg/ha/yr in 2010-11 to 596.56 kg/ha/yr in 2011-12 to 652.38 kg/ha/yr in 2012-13 where as in Julur reservoir the fish production was decreased gradually from 817.72 kg/ha/yr in 2010-11 to 778.73 kg/ha/yr in 2011-12 to 687.36 kg/ha/yr in 2012-13. The major carps production was found to be 1721.86 kg/ha/yr in Bibinagar reservoir and 741.16 kg/ha/yr in Julur reservoir. The difference was found to be significant (t 22.9813, dt 4, $p<0.05$). The ratio between major carps (MC) and Tilapia (T) was found to be 1:356.49 (T:MC), Tilapia and other fishes (OF) was 1:15.16 (T:OF) and other fishes and major carps was 1:23.51 (OF:MC) in Bibinagar reservoir where as in Julur reservoir the ratio between Tilapia and major carps was 1:1.91(T:MC), between other fishes and Tilapia was 1:10.85 (T:OF) and between other fishes and major carps was 1:5.68(OF:MC) (Table 5).

25-33 mm. The major carps production equaled 523.64 kg/ha/yr with the stocking density of 4880/ha during 2010-11.



Kg= kilogram, ha = Hector, yr =Year

Fig. 1. The Stocking densities of major carps in the both reservoirs during 2010-2013

The fish production was increased to 571.80 kg/ha/yr with increased stocking density of 5680/ha during 2011-12 and further increased to 626.42 kg/ha/yr with further increase of stocking of 6748/ha during 2012-13 in Bibinagar reservoir

Table 5. The Fishes production and their ratio in minor reservoirs during 2010 to 2013

Year	Major carp production (kg/ha/yr)	Tilapia production (kg/ha/yr)	Other fishes production (kg/ha/yr)	Total production (kg/ha/yr)	Ratio		
					T: MC	T:OF	OF: MC
Bibinagar reservoir							
2010-11	523.64	1.72	26.16	551.52	1:304.44	1:15.21	1:20.02
2011-12	571.8	1.61	22.61	596.56	1:355.15	1:14.04	1:25.29
2012-13	626.42	1.5	24.46	652.38	1:417.61	1:16.31	1:25.41
Total	1721.86	4.83	73.23	1800.46	1:356.49	1:15.16	1:23.51
Julur reservoir							
2010-11	205.52	560.36	51.84	817.72	1:2.73	1:10.81	1:3.96
2011-12	244.35	491.84	42.52	778.72	1:2.01	1:11.57	1:5.75
2012-13	291.29	364.38	36.22	687.36	1:1.27	1:10.6	1:5.75
Total	741.16	1416.58	130.58	2283.8	1:1.91	1:10.85	1:5.68

T= Tilapia, MC=Major carp, OF= Other fishes
Kg= kilogram, ha = Hector, yr =Year

Table 6. The Stocking densities and fish productions of major carps in both reservoirs during 2010 to 2013

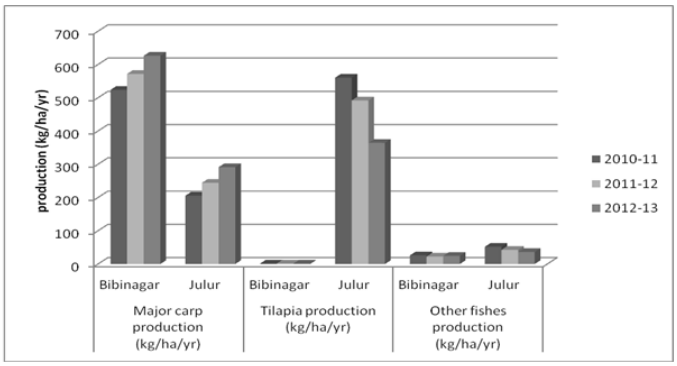
Year	Stocking density (No/ha)	Bibinagar reservoir		Julur reservoir	
		Fish production (kg/ha/yr)	No. of fry for production of 1 kg fish	Fish production (kg/ha/yr)	No. of fry for production of 1 kg fish
2010-11	4880	523.64	9.32	205.52	23.74
2011-12	5680	571.8	9.93	244.35	23.25
2012-13	6748	626.42	10.77	291.29	23.17
Total	17308	1721.86	30.02	741.16	70.16
Average	5768	573.95	10.01	247.05	23.39

Kg= kilogram, ha = Hector, yr =Year, No= Number

Stocking densities and fish production

Equal amount of major carps juveniles were stocked (5768 fry/ha/yr) in both reservoirs (Fig. 1). 4880 No./ha, 5680 No/ha and 6748 No/ha seed were stocked during 2010-11, 2011-12 and 2012-13 respectively. In both the cases, more catla juveniles were stocked (41.37%), followed by rohu, mrigal, common carp and grass carp. Mrigal and common carp juveniles were stocked equally (14.68%). The stocking of juveniles were gradually increased from first year to third year. The juveniles were stocked in fry stage with the length of

(Table 6), where as in Julur reservoir, the fish production was 205.52; 244.35 and 291.29 kg/ha/yr during 2010-11, 2011-12 and 2012-13 respectively with the above stocking densities. The overall stocking density of 5768/ha, the fish production equaled 573.95 kg/ha/yr in Bibinagar reservoir and 247.05 kg/ha/yr in Julur reservoir. The average number of fry for production of one kg fish equaled 10.01 in Bibinagar reservoir and 23.39 in Julur reservoir (Table 6). The number of fry for production of one kg fish were gradually increased from 9.32 to 10.77 in Bibinagar reservoir and is gradually decreased from 23.74 to 23.17 in Julur reservoir.



Kg= kilogram, ha = Hector, yr =Year

Fig. 2. The Fish production in minor reservoirs during 2010 - 2013

Growth rates of major carps

The growth rates of major carps in both the reservoirs and the growth rate was observed very slow in Julur reservoir when compare to Bibinagar. In Bibinagar reservoir rohu, catla and mrigal attain one kg in one year, whereas exotic carps in ten months. Rohu and mrigal grow to 2 kg in 2 years, catla and exotic carps in 21 months whereas in Julur reservoir all fishes grow to 3 kg in the early part of the third year. The growth rate of major carps differed significantly ($P<0.05$) from Bibinagar reservoir to Julur reservoir.

DISCUSSION

The results of physico-chemical parameters of water indicated that the study reservoirs were mesotrophic in nature. The water is alkaline in nature. In mesotrophic water, the fish production is usually high due to the abundance of plankton Chary, (2003). Piska and Chary (2000) reported that the fecundity of fishes was high in mesotrophic waters when compared to oligotrophic and eutrophic waters. Carney and Elser (1990), Elser and Goldman (1991), Kasprzak *et al*. (2000) and Pratt and Smokorowski (2003) reported that the mesotrophic lakes are beneficial for the better growth of phytoplankton, zooplankton and fish production.

Ichthyofaunal diversity indicates that major carps were most abundant in reservoirs. Many authors reported that most abundance of major carps in Indian reservoirs (Jhingran and Sugunan, 1990; Selvaraj and Murugeshan, 1990; Devi 1997; Piska, 2000; Piska, 2001 and Singh, 2004, Ansar 2010 and Piska *et al*., 2011). Tilapia was found most abundantly in Julur reservoir and rarely found in Bibinagar reservoir. The abundance of Tilapia was reported by Rao and Shakuntala (1998), Piska and Rao (2002) and Piska *et al*. (2002). The Ichthyofauna was almost similar in the study reservoirs except M.armatus and S.bacaila which were rarely found in Bibinagar reservoir. This indicated that the Ichthyofunal diversity of both reservoirs was almost similar. The major difference in between two reservoirs was Tilapia population which was dominated in Julur reservoir (61.23%) and negligible in Bibinagar reservoir (0.27%). This helps to study influence of Tilapia dominance on the fish production. In the present study the major carps dominance was mainly due to their seed stocking. Jhingran and Sugunan (1990) reported that major carps contributed 90.54-94.76% in Tillaiya and 57.44 to 76.61% in Konar reservoirs. Selvaraj and Murugeshan (1990) reported the contribution of major carps as 93.09% in Aliyar reservoir. Devi (1997) and Piska (2000) reported that the contribution of major carps was 91.42% in Ibrahimbagh and 96.40% in Sathamraj reservoirs, Hyderabad. In the present study, major carps production was high when Tilapia population was less. In contrary, major carp production was reduced when Tilapia was dominated. This indicates that the inverse relationship was found between the above fishes. Similar relationship between major carps and Tilapia was reported by Piska and Rao (2002), Piska *et al*. (2002), and Rao (2004). Tilapia population was decreased along with other fishes. This indicates that direct relationship is found between Tilapia and other fishes. Tilapia population was decreased due to the repeated netting to reduce its population. The juveniles were also removed by netting. Tilapia was a prolific breeder and voracious feeder. Due to these characters their population was increased with greater speed and sufficient natural food may not be available to other fishes. Tilapia competes with major carps for natural food and space which reflects on growth rate and production of major carps. Similar reports are made by Rao (2004).

The fish productivity was high in both reservoirs when compared to Indian average reservoir fish production of 29.70 kg/ha/yr Dehadrai, (2001) and Indian minor reservoir fish average production of 49.5 kg/ha/yr Piska, (1999, 2000a). The total fish production was very high in Julur reservoir due to the dominance of Tilapia which contributed 50-62% of total landings. Total fish production was decline from first to third year in Julur reservoir due to the removal of Tilapia where as in Bibinagar reservoir total fish production was increased from 2007-08 to 2009-10 due to the increase of stocking rates of major carps. But in Julur reservoir the stocking rates were increased even though the fish production was not improved. This was mainly due to the presence of thick population of Tilapia. The results clearly show that Tilapia has great influence on the fish production. The ratios of Tilapia and major carps production levels were completely reverse in these reservoirs.

The number of fry for production of 1kg fish was high in Julur reservoir (23.39) when compared to Bibinagar reservoir (10.01). The results shows that the more fry were required to produce 1kg of fish in Julur reservoir. This is due to two aspects, firstly the growth rate of fishes was less due to the dominance of Tilapia. Secondly, the mortality of sensitive fry or subsequent stage due to the presence of carnivores in the reservoir. Here the first cause has more chance, which is evidenced by the growth rates of major carps in Julur reservoir. The major carp production has increased in both reservoirs from 2010-11, to 2012-13. This is mainly due to the increase of stocking densities. This indicated that the stocking densities play a pivotal role in the enhancement of fish production. Similar reports are given by Devi (1997), Velayudhan and Siddarthan (1998), Piska (2000), Chary (2003) and Rao (2004). The growth rate of major carps was more in Bibinagar reservoir when compared to Julur reservoir. The carps grow to 1kg mark during first year in Bibinagar reservoir where as in Julur reservoir only during early part of third year. This indicates that the growth rate was very slow in Julur reservoir due to the

dominance of Tilapia. Where Tilapia was negligible, the growth rate of carps was excellent. The results clearly show that Tilapia influence is very much on the growth of major carps. Similar reports were given by Rao (2004).

In the present study the water spread area, water quality, Ichthyofuna and their abundance stocking densities and species composition were equal in both the reservoirs. The only difference between them was the Tilapia population. Whatever changes observed in growth rates and production of major carps were clearly due to dominance of Tilapia. Narayanan and Kohli (2004) reported that Tilapia was responsible to devour spawn of major carps besides competing for food and has completely replaced the endemic fauna owing to its early maturity, stunted growth and has finally assumed the dimension of pest. Mitra, Naik & Sarkar (1989) was also shown district signs of causing deterioration in the economic returns due to presence of Tilapia. In the present study catla production was significantly ($p<0.05$) decreased in Julur reservoir when compared to other major carps. This was due to the depletion of zooplankton, catla prefers only zooplankton, which is found in surface water Piska (1999, 2000). Tilapia prefers more zooplankton as food Narayanan and Kohli, (2004) and Piska, (2004). Due to the scarcity of zooplankton Piska, (2004) catla growth rate and production were severely affected in Julur reservoir. Narayanan and Kohli (2004) stated that Tilapia competes for zooplankton with other fishes and responsible for reduction of its population Narayanan and Kohli, (2004).

Acknowledgements

We are thankful to primary fishermen cooperative society members for their help during the progress of work.

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