

ON CONTINUED CULTURE TRIALS OF *LATES CALCARIFER*
(BLOCH) AND *OREOCHROMIS MOSSAMBICUS* IN THE PONDS OF
KHARLAND RESEARCH STATION, PANVEL, MAHARASHTRA.

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ABSTRACT

Pond culture trials of *Lates calcarifer* (Bloch) were initiated in the ponds of Kharland Research Station, Panvel, from 1985 upto 1989 by adopting varying methods of inputs of commonly available organic substaces comprising deoiled cake of groundnut, rice bran and raw cattle dung. Although provision of zooplankton generated under phased fertilisation technique resulted in considerable yield level, subsequent trials in combination with direct feed methods gave higher yield.

Trials during 1990-91 adopting similar feed input techniques were continued but by stocking the seed of both *Lates* and *Oreochromis mossambicus* with yield percentage around 72.23 for *Lates* and 27.73 for *Oreochromis*. Trials were further continued during next three years. In relation to the organic input levels the yields rate for seven months period was in the range of 119.4 kg/ha to 250.4 kg/ha for *Lates*. In case of *Oreochromis* the yield rate varied between 28.5 to 153.32 kg/ha indicating the influence of differential stocking rates and size of the seed of two species.

INTRODUCTION

Seed of *Lates calcarifer* (Sea bass) popularly known as Jitada or Khajari in Konkan region of Maharashtra State are collected by local fishermen along the creeks during the months of July-September period, either for stocking in the ponds or in the monsoon paddy plots. The aqua-farmers particularly in the Thane and Raigad Districts of Maharashtra have been undertaking traditional polyculture by stocking the seed of this fish alongwith Tilapia and

Indian Major Carps (IMC) of similar size (Shirgur, 1990a; Belsare *et al.*, 1987). In view of commercial importance of *Lates calcarifer*, we undertook various research projects for survey of its seed resources with reference to Dharamtar Creek in Raigad Dist. and pond culture trials in the surface dug-out leaching ponds located in the Agricultural Farms of Kharland Research Station, Panvel. The detailed results of pond culture trials starting from 1985-86 upto 1989-90, are already reported (Shirgur, 1990b; Shirgur *et al.*, 1993). These trials have

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revealed that extensive polyculture comprising *Lates calcarifer*, Tilapia and IMC is highly profitable with an yield of 1500-3000 kg/ha by proportionately using commonly available organic substances such as de-oiled cake of ground nut (DOCG) and rice bran (RB) as direct feeds besides applying raw cattle dung (RCD) as liquid phased manure to generate zooplankton as complementary feed.

The pond culture trials were further continued starting from 1990-91 upto 1993-94 period by adopting the methodology of Shirgur *et al.* (1993).

MATERIAL AND METHODS

All the particulars of seed size, specieswise numbers stocked per pond are shown in Table 1. Trials were undertaken in five different ponds. The ponds ARS I and II are located in the Agricultural Research Station Farm at Panvel. The other three ponds such as KLRS-I, II and III are located at Kharland Farm, Pargaon under Khar Land Research Station, Panvel. Among these ponds, pond No. ARS-II was newly excavated and it was ready for trial only during 1993-94 period. Unlike ARS-I pond, all the four years' culture trials could not be undertaken in other ponds as these were under culture for freshwater prawns etc.

Seed stocking was done during July-September period depending upon availability of seed of *L. calcarifer*. Total seed input was usually in the range of 3500 - 5000 / ha with certain variations.

The seed input was usually in the ratio of 30 : 70 respectively for *Lates* and *Oreochromis*. When IMC were introduced, the ratio was 20 : 55 : 25 respectively for *Lates*, *Oreochromis* and IMC. In KLRS Pond-I of very small dimension, being connected to a small Nallah, extending from nearby Pargaon Creek, large number of live feed organisms were entering at the time of tidal influx. Hence, artificial feeds were not introduced in this pond.

Details of input of organic substances and harvesting are shown in Table 2.

RESULTS DISCUSSION

ARS - I :

During the previous three years, only *Lates* and *Oreochromis* seed were stocked. However, during 1993-94, besides these two species, IMC seed was also stocked, as per the traditional pond culture practices undertaken by the local fishermen. Culture duration has been around 7 months. During first three years, the input rate of organic substances was ranging from 195-401 kg/ha for 9 months with total biomass production in the range of 351-385 kg/ha. This trend indicated a very high rate of fish biomass production in relation to feed inputs, with conversion ratio of fish biomass to feed in the range of 0.51-1.14.

During 1993-94, however, rate of total feed input was around 1047 kg/ha for 9 months. In relation to this level of input, fish biomass production around 645 kg/ha was obtained. The conversion

Table 1 : Particulars of specieswise seed size and number of stocking in various ponds of Khar Land Research Station for polyculture of *Lates calcarifer*, *Oreochromis mossambicus* and Indian Major Carps.

Pondwise particulars	ARS-I		ARS-II		KLRS-I (Natural feed)			KLRS-II		KLRS-III	
	1990-91	1991-92	1992-93	1993-94	1993-94	1990-91	1991-92	1992-93	1990-91	1991-92	1990-91
Surface area with mean depth around 1.0 m (m ²)			7370		2000.0		9.0		365.0		342.0
Area (ha)			0.0737		0.2		0.0009		0.0365		0.0342
Species under polyculture	L+T	L+T	L+T	L+T+IMC	L+T	L	L	L	L+T	L+T	L+T
Source of seed											
a) <i>Lates</i>	Natural Collection from Panvel creek				Same as ARS-I	Same as in case of ARS-I			Same as in case of ARS-I		Same as in case of ARS-I
b) Tilapia	Natural collection from local ponds				As above	-	-	-	As above		As above
c) IMC	Govt. Fish seed Farm, Goregaon,				-	-	-	-	-		-
					Bombay						
Date of stocking											
a) <i>Lates</i>	16.7.90	2.8.91	23.9.92	16.8.93	21.8.93	16.7.90	28.3.91	30.9.92	16.7.90	7.8.91	16.7.90
b) Tilapi	10.7.90	13.7.91	20.8.92	15.7.93	July 93	-	-	-	8.7.90	7.8.91	6.7.90
c) IMC	-	-	-	16.8.93	-	-	-	-	-	-	-
Specieswise numbers stocked											
a) <i>Lates</i>	75	75	75	70	10	10	10	35	37	39	
b) Tilepia	185	450	225	192	350	-	-	-	86	86	91
c) TMC	-	-	-	88	-	-	-	-	-	-	-
Total number of seed per pond	260	525	300	350	500	10	10	10	121	123	128
Total number of seed hectaragewise	3528	7123	4070	4749	2500	11111	11111	11111	3315	3370	3743
Numerical percentage proporation among species.											
a) <i>Lates</i>	28.85	14.28	25.0	20.0	30.0	100.0	100.0	100.0	28.92	30.08	28.91
b) Tilapia	71.15	85.72	75.0	54.86	70.0	-	-	-	71.08	69.92	71.09
c) IMC	-	-	-	25.14	-	-	-	-	-	-	-
Average length (cm)											
a) <i>Lates</i>	6.2	6.5	6.0	7.4	7.5	6.2	6.5	6.0	6.2	6.5	6.2
b) Tilapia	6.2	6.8	-	-	-	-	-	-	6.2	6.2	6.2
c) IMC	-	-	-	3.45	-	-	-	-	-	-	-
Average weight (g)											
a) <i>Lates</i>	-	7.5	7.2	7.5	7.5	-	7.5	7.2	-	7.5	-
b) Tilapia	-	-	-	-	-	-	-	-	-	-	-
c) IMC	-	-	-	0.547	-	-	-	-	-	-	-

Table 2 : Results of extensive polyculture trials of *Lates calcarifer*, *Orochromis mossambicus* and Indian Major Carps from the ponds of Khar and Research Station

Pondwise particulars	ARS-I				ARS-II	KLRS-I (Natural feed)			KLRS-II		KLRS-III
	1990-91	1991-92	1992-93	1993-94	1993-94	1990-91	1991-92	1992-93	1990-91	1991-92	1990-91
Date of harvesting	27.12.90	Feb.1992	23.2.93 & 19.3.93	April/May 1994	May 94	27.12.90	Dec.90		Jan. 1991		Jan. 1991
Culture duration (months)	7	7	7	7	7	5	3	Poaching reported	7	Poaching reported	7
Specieswise numbers of harvested fish.											
a) <i>Lates</i>	47	48	74	70	118	3	3		13		11
b) <i>Tilapia</i>	74	185	93	76	1	-	-		34		41
c) IMC	-	-	-	16	-	-	-		-		-
Total number of harvested fish	121	233	167	162	119	3	3		47		52
Specieswise percentage											
a) <i>Lates</i>	16.7	64.0	99.0	43.21	79.0	30.0	30.0		37.0		29.8
b) <i>Tilapia</i>	40.0	42.0	41.0	46.91	0.28	-	-		-		-
c) IMC	-	-	-	9.38	-	-	-		-		-
Total percentage survival	46.54	44.36	55.67	46.28	23.80	30.0	30.0		38.34		40.62
Nength range with average length in brackets (cm)											
a) <i>Lates</i>	21-38	21-41	21-49	23-40	22-42	23-30	18-20		27-40		24-39
b) <i>Tilapia</i>	-	-	-	17-29	30.0	-	-		-		-
c) TMC	-	-	-	31-42	-	-	-		-		-
Weight range with average weight in brackets (g)											
a) <i>Lates</i>	150-1020 (402)	110-1070 (260)	100-1450 (122)	150780 (325.25)	100-75	195-400 (310)	100-150		300-950 (570)		200-800 (395)
b) <i>Tilapia</i>	28.39	51.89	121.50	100-325 (117.5)	-	-	-		29.41		12.19
c) IMC	-	-	-	350-950 (618.23)	-	-	-		-		-

Table Contd.

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Pondwise particulars	ARS-I				ARS-II	KLRS-I (Natural feed)			KLRS-II		KLRS-III
	1990-91	1991-92	1992-93	1993-94	1993-94	1990-91	1991-92	1992-93	1990-91	1991-92	1990-91
Quantities of organic substances/pondwise (Kg)											
a) DOCG	12.66	5.6	9.0	24.0	65.13	-	-	-	6.33	-	11.76
b) RS	5.42	5.6	9.0	24.0	65.13	-	-	-	2.71	-	5.036
c) RCD	-	-	25.0 (wet)	60.0 (wet)	162.32 (wet)	-	-	-	-	-	-
			5.0 (Dry)	12.0 (Dry)	32.564 (Dry)	-	-	-	-	-	-
d) Single Super Phosphate	-	-	2.0	1.470	-	-	-	-	-	-	-
e) Urea	-	-	1.0	-	-	-	-	-	-	-	-
Total quantities of organic substances/pond on dry basis (Kg)											
	18.08	11.2	23.0	60.0	162.924	-	-	-	9.04	-	16.796
Mode of input. (phased fertilisation-PF, Direct feed-DF)											
	PF+DF	PF+DF	PF+DF	PF+DF	PF+DF	-	-	-	PF+DF	-	PF+DF
Percentage composition of feed											
a) DOCG	70.02	50.0	39.13	40.0	40.0	-	-	-	70.02	-	70.02
b) RB	29.98	50.0	39.13	40.0	40.0	-	-	-	29.98	-	29.98
c) RCD	-	-	21.74	20.0	20.0	-	-	-	-	-	-
Total input of organic substances/ha (Kg)											
a) For culture duration	245.320	151.970	312.070	814.120	814.120	-	-	-	247.670	-	491.110
b) For 9 months	315.410	195.390	401.230	1046.70	915.885	-	-	-	318.43	-	613.420
Specieswise weight upon harvesting per pond (Kg)											
a) Lates	18.900	12.469	8.8	16.620	23.120	0.930	0.400	-	7.410	-	4.350
b) Tilapia	2.100	9.6	11.3	10.100	0.400	-	-	-	1.00	-	0.500
c) IMC	-	-	-	10.250	-	-	-	-	-	-	-
Total weight of fish upon harvesting/pond (kg)	21.00	22.069	30.100	36.970	23.530	0.930	0.400	-	8.410	-	4.850
Conversion ration (Fish feed)	1:0.86	1:0.51	1:1.14	1:1.62	1:6.92	-	-	-	1:1.07	-	1:3.46
Total specieswise production/ha for culture duration pondwise (Kg).											
a) Lates	256.445	169.186	119.403	225.509	115.650	1033.333	444.444	-	203.013	-	127.193
b) Tilapia	28.494	130.258	158.324	137.042	2.000	-	-	-	27.397	-	14.619
c) IMC	-	-	-	139.077	-	-	-	-	-	-	-

Table Contd.

Table Contd.

Pondwise particulars	ARS-I			ARS-II			KLRS-I (Natural feed)			KLRS-II		KLRS-III
	1990-91	1991-92	1992-93	1993-94	1993-94	1990-91	1991-92	1992-93	1990-91	1991-92	1990-91	
Total production/ha per pond for culture duration (kg)	284.939	299.444	272.727	501.628	117.650	1033.333	444.444		230.410		141.813	
Rate of Total production per pond maximum for 9 months (kg)	27.0	28.374	25.843	47.533	26.471	1.674	1.200		10.813		6.236	
Rate of total production/ha maximum for 9 months (kg)	366.350	384.999	350.649	614.950	132.356	1860.0	1333.333		296.243		182.331	
Range and average of production/ha for 9 months for all ponds (Kg)												
Range		132.356-1860.0										
Average		616.801										
Hydrobiological parameters												
a) Temperature (oC)	25.1-28.9	-	-	20-32	-	-	-		25.5-29.0		25.0-28.6	
b) pH	7.28-7.3	-	-	8.10	9.5-9.8	-	-		7.1-7.4		7.1-7.4	
c) Salinity (ppt)	FW	-	-	-	18.2	-	-		FW		15-35	
d) Water transparency (cm)	Nil-20.C	-	-	21-43	25-46	-	-		Nil-20		Nil-15	
e) Dissolved oxygen (ppm)	7.8-8.4	-	-	4.5-7.0	-	-	-		8.0-8.8		8.0-8.8	
f) Range of zooplankton percentage												
i) Copepods	28-70	-	-	21.5-46.0	very	-	-		10-70		35-70	
ii) Cladocerans	5-20	-	-	21.54-35.75	poor	-	-		Nil-20		Nil-10	
iii) Rotifers	20-67	-	-	25.5-50.2	plankton	-	-		20-90		20-60	

ratio of fish to feed was 1 : 1.62 which is comparable to three previous years' trials.

Although initial rate of seed stocking was generally 30 : 70, upon final harvesting productivity of *Lates* ranged between 44 - 90% and *Oreochromis* 10 - 56%.

Water temperature ranged between 25.1 and 28.9°C and 20 - 32°C respectively for 1990-91 and 1992-93 period. pH was in the range of 7.2 - 7.3 and 8 - 10 respectively. Water transparency was nil - 20 and 21 - 43 cm respectively. DO level was in the range of 7.8 - 8.4 and 4.5 - 7.0 ppm for respective years. During both the years copepods and rotifers were dominant.

ARS - II :

In relation to rate of total organic input around 915 - 885 kg/ha, production rate was around only 132.0 kg/ha for 9 months' duration. Conversion ratio for fish to feed was very high around 1 : 6.92. The poor yield appears to be due to pond being excavated a few months before the onset of monsoon. pH was very high, around 9.5 - 9.8, salinity around 13.2 ppt and transparency in the range of 25 - 46 cm.

KLRS - I :

For 1990-91 and 1991-92 period, rate of production of *Lates* was respectively 1860 and 1333 kg/ha for 9 months' duration. This pond was thus highly productive due to influx of the natural

feed organisms for forage by *Lates*. During 1992-93 poaching occurred and hence it was not possible to assess the productivity.

KLRS-II :

This was a surface dugout pond, with a gradual rise in low salinity by time of harvesting.

In relation to input of 318 kg/ha for 9 months, total production was around 230 kg/ha with conversion ratio around 1 : 1.07. These results are comparable with ARS-I pond.

During 1991-92 period, productivity could not be assessed due to poaching throughout the culture period. Temperature varied between 25.5 and 29°C. pH was almost neutral. Salinity was almost nil. Transparency varied from nil to 20 cm. DO was high, in the range of 8.0 - 8.8 ppm. Rotifers were dominant among zooplankton.

KLRS-III :

This is a deeper pond for leaching out the soil salinity during monsoon period in the adjoining area. During the culture trial of 1990-91, the rate of input of organic substances was 631 kg/ha for 9 months. However, rate of total production was only around 182 kg/ha. This pond, being remote, was also subjected to poaching. The conversion ratio works out to be 1 : 3.46.

Temperatures varied between 25.0 and 28.8°C. pH was neutral. Salinity

ranged between 15 and 35 ppt. Transparency was nil to 15 cm. Dissolved oxygen was rich in the range of 8.0 - 8.8 ppm. Rotifers were the dominant group.

On the basis of above results, following conclusions can be drawn.

1. Very high conversion ratio of fish biomass to feed in case of ARS-1 pond appears to be due to *Oreochromis* exploiting all the feed resources in the pond to the maximum extent and providing the fry for the forage of *Lates calcarifer* by intensive breeding.

2. The overall productivity is linked with the input of organic substances in direct proportion.

3. It seems, for enhancing overall productivity, *Oreochromis* seed may be stocked in 1 : 4 ratio against *Lates*.

4. Under polyculture, IMC seed of similar size as that of *Lates* can be stocked besides *Oreochromis*.

5. Within the short culture duration of 7 months, *Lates* had grown upto maximum of 1.45 kg. Under 1993-94 trial in ARS-I pond, *Oreochromis* had grown to maximum weight of 325 g and IMC upto 1 kg.

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