Studies on the Impact of Fingerlings Stocking on the Production of Major Carps in A Minor Reservoir

Mane A.M
Associate Professor, ACS College, Shankarnagar, Tq. Biloli, Dist. Nanded, Maharashtra, India

Abstract

Present study deals with impact of fingerlings stocking on the major carp production in a minor reservoir Manar, Nanded district. The water spread area is 15.2/ha and water is useful for Agriculture and fisheries activities. Fingerlings with 75-80mm size were stocked@2000/ha. Catla, rohu, mrigal, common carp and grass carp fingerlings were stocked @500/ha, 500/ha, 400/ha, 400/ha and 200/ha respectively. The fishes were harvested after one year. Survival rate was found to be 39.2%, 36.5%, 30.5%, 39.5%, and 31 % in catla, rohu, mrigal, common carp and grass carp respectively. Major carps yield was found to be 662kg/halyr, which is more than Indian average reservoir fish production (29.07kg/ha/yr).Catla attained maximum growth, followed by common carp, grass carp, rohu and mrigal and all the carps attained more than 1 kg in one year and catla (29.25%) yield was maximum, followed by rohu(24.24%), common carp(23)3.04%), mrigal(14.59%)and grass carp(09.09%).

KEYWORDS: Fingerlings, Stocking density, Minor reservoirs, Major carps, Fish yield.

INTRODUCTION

Reservoir constitutes the single largest inland fishery resource, both in terms of size and production potential. These manmade ecosystems offer enough scope for stock manipulation through ecological adoption, increasing production with relatively low capital investment. Reservoir fisheries development is labor productive and ensure employment for weaker section of our society. These water bodies, especially small and minor reservoirs, have immense potential for fish husbandry through extensive aquaculture technologies stocking cum capture.

The total surface area or reservoir in India is 3.1 Sm.ha and Indian average reservoir fish production is 29.7kg/halyr, which is very low. Seed is prerequisite for fish culture. Major carp seed can be procured either from natural resources like rivers, or from hatcheries. Major carp seed is in the form of hatchling spawn, fry and fingerlings. Both fry and fingerlings are useful for stocking natural water bodies like reservoirs, lakes and ponds etc. Seed stocking is one of the important management measures in the rearing systems, including extensive systems like reservoirs. Not only stocking densities but also stocking sizes play a pivotal role in fish rearing. Stocking of either fry or fingerlings play an important role in fish growth, survival rates and production. The present study was undertaken to observe the impact of stocking of fingerlings of ;major carp.

MATERIAL AND METHODS

The present study was conducted in a minor reservoir Manar in Nanded district, Maharashtra. The water spread area is 13 hectares and water is useful for agriculture and fisheries. The study was carried for one year period during 2011-12.

Various parameters were studied during the present work like stocking

densities, growth, survival rates and fish yield. The major carps such as catla *(Catla catla),* rohu *(Labeo rohita), mrigal (Cirrhina mrigala),* common carp *(Cyprinus carpio)* and grass carp *(Ctenopharyngodon idella)* fingerlings (75-80mm) were stocked in the reservoir. These carp fingerlings were stocked in July 2009 and harvested in may 2012. Fingerlings were introduced in the reservoir @2000 /ha. Yearly carp production was analyzed.

RESULTS AND DISCUSSION

Stocking Density :In the present study the stocking density was maintained has 2000 fingerlings / ha. Catla 500 /ha(25%), Rohu 500 /ha(25%), Mrigal 400 /ha(20%), Common carp 400 /ha (20%) and Grass carp 200 /ha(10%) fingerlings were stocked in the reservoir.

Table 1: Stocking densities, Growth rate, Survival Rates and Production of major carps in the minor reservoir

Major carps	Stocking density		Maximum growth rate (g)	Survival Rate		Production	
	No.	%		No	%	Kg/ha/yr	%
Catla catla (catla)	500	25	1380	194 /ha	39.20	193.65	29.25
Labeo rohita (rohu)	500	25	1240	182 /ha	36.50	160.52	24.24
Cirrhina mrigala (Mrigal)	400	20	1020	122 /ha	30.50	96.62	14.59
Cyprinus carpio (common carp)	400	20	1310	156 /ha	39.50	152.57	23.04
Ctenopharyngodon idella (Grass carp)	200	10	1280	62 'ha	31	60.02	09.09

Total major carp production: 662kg/ha/yr

Indian Institute of Management (IIM,Ahmedabad) conducted survey during 1983 and recommended the stocking rates of 1000 fingerlings/ha in minor reservoirs (Srivastava,1985). Government of India suggested that on an average all the reservoirs in India were under - stocking range of 2-150 fingerlings per hectare as against the required density of 500 fingerlings per hectare. In China, the stocking was very high varying from 1200-3000 fish seed per hectare per year (Mohanty,1984). Mohanty (1984) suggested 1000 seed/ha in reservoirs of Orissa. Das et al, (1984) reported the stocking rate of 200 fingerlings/ha in few reservoirs like Mandira, Hadgarh, Talsara etc. In most of the reservoirs the stocking rate was low when com;,a, ed to the proposed stocking rate. In the present study the stocking rate was higher than that of the abu%/e studies.

Piska (2003) suggested the stocking density of 2000 seed in reservoirs and tanks and 5000 seed ha in the ponds in Andhra Pradesh. He also stated that the stocking density of 2000/ha is slightly high, which in due to compensate the mortality of sensitive fingerlings in the open waters. He also stated that 3 1, 09, 580 fingerlings are required to stock the reservoirs and 72, 49, 540 are required to stock the tanks in Andhra Pradesh. Mathew and Mohan (1990) reported the stocking rate was 841 fingerlings/ha in Kerala and they never considered the stocking rate was

low. They also stated that a stocking density of 1000-5000 advanced fry/ha was planned for the reservoirs in Kerala. They stated that the major carp stocking of 250/ha was desired for reservoirs without predatory fishes and 600/ha for reservoirs with abundance of cat fishes.

In the present study, 75-80mm size fingerlings were introduced into the reservoir. Different authors tried with fingerlings (Srinivastava,1985; Mathew and Mohan,1990) or advanced fingerlings (Ahmed and Singh, 1992). Piska and Rao (2005) conducted an experiment with the same stocking sizes of major carp seed in a minor reservoir, Bibinagar. Some of the reservoirs also stocked with fingerlings (Mathew and Mohan, 1990). Srivastava (1985) recommended 12.5 cm fingerlings for stocking in reservoirs.

Many authors reported that the reservoirs were stocked with fry, and found low fish production (Devi,l997; Chary,2003; Srinivas,2005; and Ansar,2010) . This was due to delicate nature of fry which were perished due to the environmental changes and predation. The predators which were found in the reservoir attack easily on fry and kill them. Due to the above reasons, fingerlings were used has the stocking material in the present study. The mortality due to the rate was more in case of fry when compared to fingerlings. Mathew and Mohan (1990) reported that the fish seed mortality was also due to predatory fishes in the reservoir. They also suggested high stocking of fish seed in the reservoirs with more predators.

Growth: All carps except mrigal crossed 100 gm during monsoon period. Catla and grass carp grew to maximum to 120gr. During post monsoon period catla (840gr), grass carp (820gr) and common carp (800gr) reached 800gr. All carps crossed 1 kg at the end of the year catla grew to maximum (1380gr), followed by common carp (1310gr), grass carp (1280gr), ro;_ '1240gr) and mrigal (1020gr).

Ansar (2010) reported that all major carps crossed 1 kg mark in the first year in Jamulamma reservoir, Gadwal. Venugopal et al (1998) reported the growth of common carp was more than 600gr and catla - 400gr and rohu - 300gr in seven months rearing in a seasons rain-fed tank. Piska (2000) reported that rohu grew to 401.35gms, catla to 407.32gms and common carp to 653.46gms in six months in a seasonal rain-fed tank without supplementary feeds and inorganic fertilizers. The growth rates in present study were less when compared to above studies. The less growth in the present study due to the presence of high population ofTilapia and pollution load in the tank.

Survival rates: In the present study, out of 2000/ha 718/ha (35.90%) fishes were recovered during harvesting. Maximum survival rate was observed in catla (194/ha, 39.20%), and followed by rohu(182/ha, 36.40%), mrigal(122/ha, 30.50%), common carp(l 56/ha, 30.50%) and grass carp(62/ ha, 31 %). Piska and Rao (2005) reported the range of survival rates as 9.85-51.10% in Bibinagar.

Piska and Rao (2005) reported, 684 with 75-80 mm, in Bibinagar, Nalgonda. The catla was dominated with 193.65kg/ha/yr or 2943.45kg with the percentage of 29.25%, catla was followed by rohu with 160.52kg/ha/yr or 2439.96kg xvith the percentage of 24.25%, Mrigal with 96.62kg/halyr or 1468.68kg with the percentage of 14.60% ,common carp with 152.57kg/ha/yr or 2319.03kg with percentage of 23.05%. and grass carp with 60.02kg/ha/yr or 912.24kg with the percentage of 9.09%.

Major Carp Production: The total major carp production was found to be 662 kg/ha/yr (92.30%). Among different major carps, catla production was maximum with 193.65 kg/ha/yr(29.25),followed by Rohu 160.52 kg/ha/yr(24.24%), Mrigal

96.62 kg/ha/yr(14.59%), Common carp 152.57 kg/ha/ yr(23.04%) and grass carp 60.02 kg/ha/yr(9.09%).

Piska and Rao (2005) opined that the major carp production increased with increase of stocking sizes of carp seed. They reported that the major carp production was 632.91 with the stocking size of 75-80 in Bibinagar. The production levels in the present study were more when compared to that of Piska and Rao (2005) study. This indicates that the productivity of the present study was more due to nutrient-rich waters. Most of the authors tried with fry to produce major carps with different stocking densities. Devi (1997), Chary (2003) and Rao (2004) used fry to improve the major carp production in the reservoirs of in and around Hyderabad. Srinivas (2005) tried with advanced fry in Edulabad reservoir.

Das *et al*, (1984) reported the dominance of catla (84%), followed by mrigal (14%) and rohu (2%) in Pitamahal reservoir. They reported the total dominance of catla, around 98% and followed by common carp (1 %) and rohu (0.50%) and calabasu (0.50%) in Sanamachkandana reservoir. The percentage of catla, rohu and mrigal was estimated 21, 33 and 46 respectively. They also reported that in Hadgarh reservoir catla constitute about 80% of the catch followed by mrigal and calabasu. Rohu was scarce in the catch. This was no common carp in the catches.

Jhingran and Sugunan (1990) reported that the major carps contributed 90.54 - 94.76% in Tillaiya and 57.44 - 76.61% in Konar reservoirs. Catla showed a reduction only in Tillaiya. In Konar, a general stock reduction was noted particularly that of mrigal. He also observed the dominance of mrigal (21.1-71.4%) among overall catches of Indian major carps in Ranapratapsagar reservoir in Rajasthan.

Selvaraj and Murugeshan (1990) reported that the contribution of major carps was 93.09% in Aliyar reservoir, Tamilnadu. Devi (1997) reported that the contribution of major carps was 91.42% in Ibrahimbagh and 96.40% in Shathamraj reservoirs of Andhra Pradesh during 1993-1995. The major carp composition was 31.30-33.29% catla, 24.65%-27.24%. Rohu, 18.37%-20.68% mrigal, 21.65%-15.18% common carp and grass carp was 4.03%-3.60% in Ibrahimbagh during 1993-95. In Shathamrai reservoir 41.62-33.06% catla, 20.70-26.30% rohu, 16.50-19.20% mrigal, 19.6220.44% common carp and 1.56-1.0% grass carp was reported during 1993-95.

L.calbasu too used to have a significant presence (3tonnes) in the 1997-98 catches (Singh, 2001). In the Markonahalli reservoir, Karnataka fish yield which was low of 5.6kg/ha in 1990-91 enhanced nearly 13 folds to 74.8kg/ha in 1993-94 due to stocking of major carps and increased fishing efforts. Major carps consisting rohu (41.5%) and catla (16.1%) accounted for more than 50% of the catch (Rao *et al* 2002). According to Patel *et al* (2002) the fish production in Ukai reservoir was 159.Okg/ha and is capable of producing 220 kg/ha on the basis of primary productiv ity. This production is to be rated as high, considering the average natural production of 11.43kg/ha and potential production of 49.99kg/ha from the category of large reservoirs.

The productivity of the reservoir was much higher when compared to other minor reservoirs of India, medium and large reservoirs of India. The present figures were much higher than small reservoirs of India-49.9kg/ha/yr (Piska, 2000). Devi (1997) and Piska (2000) recorded the productivity of 445kg/ha/yr and 528kg/ha/yr during 1993-95 in Ibrahimbagh and Shanthamrai reservoirs of Rangareddy district, Andhra Pradesh. The present productivities were higher than other minor reservoirs like Baghla-106kg/ha/yr, Bachra - 139kg/ha/yr and

Gularia- 100kg/ha/yr which were managed by scientific methods as described by Jhingran and Sugunan (1990).

The present productivity of fish was much higher than average Indian large reservoirs, which were observed by Srivastava (1985)- Pong dam 4.1 to 25.08kg/ha/yr, Rihand - 3.7 to 14.24kg/ha/ yr, Tenughat - 0.53 to 1.471 kg/ha/yr, Kangsabati - 0.55 to 1. l Okg/ha/yr, Kodana 6kg/ha/yr. Gandhisagar 0.52 to 13.3kg/halyr, Hirakud-10.5kg/ha/yr, Sathanur 3.5 to l lkg/ha/yr, Tungabhadra 5.54kg/ha/yr. Pilit 08-35.30kg/ha/yr and Shardarsagar 42 to 56kg/ha/yr. The fish production of 7kg/ha/yr in Nizamsagar, 107kg/ha/yr in Kolleru, 8kg/ha/yr in Bhadha and 6kg/ha/yr in Panam reservoirs. According to Srivastava, (1985) the average reservoir annual fish yield was estimated to increase about 60kg/ha/yr.

The present production was many times more than the average fish production in Indian reservoirs, 29.70kg/ha/yr (Dehadrai, 2001). Mahapatra (2003) recorded only 15.6kg/ha/yr in Hirakud reservoirs and 5-1 0kg/ha/yr in other major reservoirs in Orissa and concluded that there was scope for increase the yield rate to 100 kg/ha/yr by proper management. Sreenivasan (2001) estimated the production potential of Indian reservoirs at I 00kg/ha/yr. Even according to a conservative administrative estimate the potential yield of Indian reservoirs is around 50kg/ha/yr. Bihar holds the record for the lowest fish yield from reservoirs, 0.54kg/ha/yr. In 1997-98, the TNFDC operated 11,088 ha of reservoirs, producing 426.73mt of fish (38.Skg/ha) (Sreenivasan, 2001). According to Dwivedi *et al* (2000) fish production of 133.5kg/ha/yr was achieved against an average potential fish yield of 166.5kg/ha/yr was harvested (80.5%) from the Naktara reservoir Madhya Pradesh, major carps dominated the catch, particularly due to continuous stocking and due to absence of large predatory fish.

The number of fingerlings required for the production of 1 kg fish was 3.02. Among major carps, catla required less number of seed to produce 1 kg, catla with 5.16 seed followed by common carp with 6.21 seed, rohu with 7.10 seed, grass carp with 7.61 seed and mrigal 14.07 seed to produce 1 kg of fish, 2.58, 3.12, 4.14, 2.62 and 3.33 fingerlings required to produce 1 kg of catla, rohu, mrigal, common carp and grass carp respectively.

Piska and Rao (2005) also reported that the number of seed required to produce 1 kg of major carp was decreased gradually from fry to advanced fingerlings in Bibinagar. The total number of fry required to produce 1 kg of carps were 13.89, whereas advanced fry 8.64, fingerlings 3.16 and advanced fingerlings 1.99 with overall figure of 3.97 in Bibinagar. They also reported more number of fry required and less number of advanced fingerlings required to produce 1 kg carps.

CONCLUSION

The present study indicate the stocking of fingerlings yielded better result, hence recommend the fingerlings as stoking material in reservoirs to get maximum fish production instead of fry, which were stocked most commonly in Indian reservoirs.

REFERENCES

Ansar. 2010. Studies on fisheries of Jamulamma reservior, Gadwal, Mahaboobnagar dist, Andhra Pradesh. Ph.D. thesis, Osmania University

Chary. K. D.2003.Present status, Management and Economics of Fisheries of a minor Reservoir, Durgamcheruvu of Rangareddy District, Ph.D. thesis, Osmania University,Hyderabad. Das,R. K., Misra, D.C,Murthy,T.S.,Pradhan, N.K. and Mitra, S. 1984. Managing reservoir fisher

ies, certain case studies. Proc. Fresh water Fish - rural Devel Sec. 1, 57 - 63.

Dehadrai, 2001. Reservoir fisheries in India. Proc. Nat. sem. Riverine and Reservoir Fisher. 97-104.

Devi. B. S, 1997 Present status, Potentialities, Management and Economics of Fisheries of two minor Reservoir of Hyderabad. Ph.D. thesis, Osmania University, Hyderabad.

Dwivedi, R.K., Khan, M.A., Singh., H.P., Singh, D.N. and Tyagi,R.K. 2000. Production dynamics and fisheries development in Naktara reservoir, Madhya Pradesh, India. *J. Inland Fish soc. India,* 32 (2):81- 86.

Jhingran, A. G. and Sugunan, V.V. 1990. General guidelines and planning criteria for small reservoir fisheries management. Proc. Nat. Workshop Reservoir Fish, 1-8.

Mahapatra, D.K. 2003. Present status of Fisheries of Hirakud reservoirs, Orissa. *Fishing Chimes.* 22 (10 & 11):76-79.

Mathew, P.M. and Mohan, M.U. 1990. Reservoir Fisheries in Kerala - status and scope for development. Proc. Net. Workshop Reservoir. Fish. 111 - 1 l7.

Mohanty, S.K. 1984. An approach for the development of reservoir fisheries in Orissa. Proc. Fresh water fish. Rural devel. Sec.1. 40-46.

Patel, M.1, Thaker, D.B. and Shukla, N.M. 2002. Fisheries of Val labhasagar reservoir Ukai, Gujarat. *Fishing Chimes.* 22(6):27-31.

Piska, R.S. 2000. Concepts ofAquaculture. Lahari Publications, Hyderabad.

Piska, R.S. and Rao,A.M.2005 Impact of juvenile stocking size on the major carp production in a minor reservoir, Bibinagar, India. *Rev. Fish Biol. Fish.* 15:167-173.

Rao, A M 2004. Studies on Limnology and fisheries in a Tilap] a- Dominated Perenial Tank, Julur,

Nalgonda District, Andhra Pradesh, Ph.D. Thesis, Osmania University,Hyderabad. Rao,D.S.K; Ramakrishnaiah, M; Karthikeyan, M. and Sukumaran, P.K.2002. Limnology and Fish

Yield enhancement through stocking in Markonahalli reservoir. Nat. Symp. Fish. Enhanc.Inland Waters, IFSI, 17.

Selvaraj, C. and Murugesan, V.K. 1990. Management techniques adopted for achieving a record

fish yield from Aliyar reservoir, Tamilnadu. Proc. Nat. Workshop. Reservoir Fish. 86 - 96. Sreenivasan, A. 2001. Stagnating reservoir fish production of India. Fishing Chimes. 2I(1):39 - 43. Srinivas, Ch. 2005 Impact of river Musi pollution on the fisheries of Edulabad reservoir, Ranga

Reddy District, Andhra Pradesh, India. Ph.D. Thesis, Osmania University, Hyderabad. Srivastava, A. 1985. Inland Fish Marketing in India. Indian Institute of Management, Ahmedabad. Venugopal. G.,Hingorani,H.G.,Venkateshwaran,K. and George,J.P.1998.Culture of carps in a sea sonal tank. *Comp.Physiol.* Eco.13(1):20-23.