



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2021; 9(3): 170-174

© 2021 JEZS

Received: 01-03-2021

Accepted: 03-04-2021

Manoj Kumar

College of Fisheries, Dau Shri
Vasudev Chandrakar Kamdhenu
Vishwavidyalaya, Kawardha,
Dist. Kabirdham, Chhattisgarh,
India

Rajan Kujur

College of Fisheries, Dau Shri
Vasudev Chandrakar Kamdhenu
Vishwavidyalaya, Kawardha,
Dist. Kabirdham, Chhattisgarh,
India

Honnananda BR

College of Fisheries, Dau Shri
Vasudev Chandrakar Kamdhenu
Vishwavidyalaya, Kawardha,
Dist. Kabirdham, Chhattisgarh,
India

Corresponding Author:**Manoj Kumar**

College of Fisheries, Dau Shri
Vasudev Chandrakar Kamdhenu
Vishwavidyalaya, Kawardha,
Dist. Kabirdham, Chhattisgarh,
India

Cage culture practices in Kabirdham district of Chhattisgarh: A case study

Manoj Kumar, Rajan Kujur and Honnananda BR

Abstract

Chhattisgarh state has 1,770 number of irrigation reservoirs having 0.826 lack hectare areas throughout the state, 912 cage units in 12 reservoirs are constructed for fish culture. Sarodha sagar and Chhirpani reservoir are small reservoir having the catchment area 194 km² and 163 km², respectively. There are total 99 cages in Sarodha sagar and 96 cages in Chhirpani reservoir were formed having 24 battery. *Pangasianodon hypophthalmus* (90-110 mm size) and Monosex Tilapia (30 gm weight) were used as a candidate species for stocking (5000 number per cage) in both cages. Fishes are fed with pelleted feed containing 32 % CP at 3–5 % body weight twice-a-day for 6-8 months. In 6-8 month of culture period, they attain the weight of about 1 kg. The average fish yield from per cage in both reservoirs is 4500 kg. A total of Rs. 32,422 was earned as net income from one cage in one batch. Cage culture has great opportunity to utilize large water bodies with great production potential to increase production from reservoirs and posed as an answer to fulfil the demand for animal protein in the country.

Keywords: Chhattisgarh, cage culture, Sarodha, Chhirpani, *Pangasianodon* sp

Introduction

India is one of the largest fish producing countries in the world. India is also a major producer of fish through aquaculture and rank second in the World after China^[3]. The fish production in India has registered an average annual growth of 7.53% from 2014-15 to 2018-19 and stood at an all-time high of 13.75 million metric tonnes tons^[3]. India has 3.15 million ha. of reservoirs and more than 5.0 lakh ha. of floodplain wetlands (beels, jheels, mauns, pats, etc.) spread across the various river basins in the country^[8]. The present fish yield from reservoirs is low, to the tune of about 82 kg/ha^[6], in spite of their high production potential (500 kg/ha, 250 kg/ha and 100 kg/ha from small, medium and large reservoirs, respectively).

Chhattisgarh one of the thirty five constituents of the country, occupies 1, 35, 194 square km which is 4.14% of the geographical area of India^[2]. The State is playing an important role by generating self-employment through fisheries in rural areas which in turn provides nutritious food to rural folks. The state has about 1.909 lakh ha water area available for fish culture. The state has reservoir with an area of 0.826 lakh ha. In the state, reservoirs constitute 45.3 percent of the total available water area. The fish production in the state during 2019-20 recorded 5.37 lakh tons. Annual fish production has recorded an average growth of 283 % during 2007-08 to year 2019-20 Plan^[2]. Average productivity in rural tanks and irrigation reservoirs is 3287 and 222 kg/ha/year, respectively. The fish production from irrigation reservoirs of the state was recorded 19,857 metric tons which share 3.70 % in the year 2019-20 of total fish production of the state. Chhattisgarh ranks sixth in the country in the area of fish seed production as well as inland fish production. States fisheries are mostly culture based in which Major carp fish group play a leading role. Availability of 88,671 ponds covering 1.083 lakhs hectare water area is the main asset on which culture fisheries rest. So far 92% of the area has been covered. Present demand of fish seed is placed at 140 crores stocking fry against of which 273 crore have been produced in 2019-20^[2]. Some progressive farmers in the state who are successfully harvesting 8000 to 12000 kg/ha major carp fish production and upto 70 tons Pungasius fish production.

Harvesting is a main problem in most of the reservoirs and lakes in the country as most of them are either weed-choked or having obstructions in the form of boulders or tree stumps which affect operation of fishing gear. Presence of predators causes high natural mortality of stocked fishes, results low productivity^[9]. This is mainly responsible for low fish yield from these ecosystems. Therefore, it is prudent to search alternate production tools to enhance fish yield.

Thus, cage culture systems play important role in augmenting fish inland open waters in India especially in reservoirs and floodplains [1].

Cage culture is a promising technology in which fishes are reared from fry to fingerling, fingerling to table size or table size to marketable size while captive in an enclosed space that maintains the free exchange of water with the surrounding water body [7]. A cage is covered on all sides with mesh netting made from synthetic material that can resist decomposition in water for a long period of time. Cages are generally small, ranging in freshwater reservoirs from square meter (m) to 500 m. Several small cages combined in a battery, are suited for even intensive culture [4].

The present study was conducted to collect the information on Cage Culture in Chhattisgarh based on the primary and secondary data collected from stakeholders and Assistant Fisheries Officer of Kawardha district, department of fisheries, Chhattisgarh.

Cage Culture in Chhattisgarh

Under the Blue Revolution Scheme, the department of fisheries, Govt. of Chhattisgarh installed 115 new cages in the

year 2019-20. Under the schemes of National Mission for Protein Supplement, Rashtriya Krishi Vikas Yojana, Blue Revolution and National Fisheries Development Board (NFDB), the Chhattisgarh state has established 912 cage units in 12 reservoirs of the state [2]. Under these schemes, 48 cages of 6×4×4 meters are made per unit. In these cages, fast growing fishes like pangasius (*Pangasianodon hypophthalmus*) and tilapia are cultivated. About 4000 fingerlings are stocked in each cage and 3000-5000 kg fish production is obtained from each cages. The production cost is 65 to 70 rupees per kg and 48 cage units generate Rs. 70,000 per annum annual income per cage. Under above schemes, to set up cage units in the lease reservoirs, 40 to 50 percent subsidy is being provided at Rs. 3.00 lakh unit cost. A report from the Department of Fisheries indicates that in Sarodha sagar and Chhirpani reservoirs of Kabirdham district have 99 and 96 fish rearing cages respectively, Bilaspur district, Gonga reservoir 48 cages, Jhumka reservoir in Korea district 96 cages, Tauranga reservoir in Gariyaband district with 48 cages, Korba district Bango reservoir 48 cages and Ambikapur district Gunghuta reservoir with 48 fish rearing cages [2].

Table 1: District wise cage culture units in Chhattisgarh

Sl. No.	Reservoirs	Districts
1.	Saroda Sagar	Kabirdham
2.	Chhirpani	Kabirdham
3.	Ghongha	Bilaspur
4.	Torenga	Raipur
5.	Jhumka	Koriya
6.	Gondli	Balod
7.	Ghughutta	Sarguja
8.	Bango	Korba
9.	Dudhawa	Dhamtari
10.	Buka	Korba
11.	Khutaghat	Bilaspur
12.	Mongra	Raj Nandgaon

(Source: Dept. of Fisheries, Govt. of CG, 2020) [2]

Sarodha Sagar Reservoirs

Sarodha sagar reservoir is small reservoir situated in Bodla block, district – Kabirdham, Chhattisgarh. It was established in the year 1963 [5]. Its catchment area is 194 km² [5]. This reservoir is constructed under the *Uttari River* [5]. For irrigation purpose water supply was made by main canal from

139 km length and by small canal of about 82 km [5]. In this reservoir mostly Indian major carp are abundant and some of the other species are also available such as Common carp, *Mystus sp.*, *Notopterus sp.*, *Channa sp.* etc. For harvesting the fish in this reservoir mostly monofilament gillnet used.

Table 2: Details of fish culture in Sarodha cage

Sl. No.	Salient features	Unit
1.	Total catchment area reservoir	194 km ²
2.	Total area of cage	2376 m ² (24 m ² /cage)
3.	Total no. of cages	99 no.
4.	Volume of cage	6 m x 4 m x 4 m = 96 m ³
5.	Depth of cage installed	24 feet
6.	Fish stock	<i>Pangasiodon sp.</i> and Monosex tilapia
7.	Stocking density	5000 fingerling/ cage
8.	Avg. weight of fingerling	30 – 50 g
9.	Avg. size of fingerling	90-110 mm
10.	Avg. Production of 1 cage	3500-4000 kg

Chhirpani Reservoir

Chhirpani reservoir is small reservoir located in Bodla block, district - Kabirdham, Chhattisgarh. It was established in the year 1993 [5]. This reservoir is constructed in the Phonk River (latitude: 22.20210.81°N and longitude: 81.19828.48°N) a

tributary of the river Mahanadi system [5]. In this reservoir mostly Indian major carp are abundant and some other species such as Common carp, *Mystus Sp.*, *Wallago attu*, etc are also available. In this reservoir, mostly monofilament gillnet are used for harvesting of these fishes.

Table 3: Details of fish culture in Chhirpani cage

Sl. No.	Salient features	Measurement (Unit)
1.	Total catchment area reservoir	163 km ²
2.	Total area of cage	2304 m ² (24 m ² /cage)
3.	Total no. of cages	96
4.	Volume of cage	6 m x 4 m x 4 m = 96 m ³
5.	Depth of cage installed	30-40 feet
6.	Fish stock	<i>Pangasiodon sp.</i> , and <i>monosex tilapia</i>
7.	Stocking density	5000 fingerling cage
8.	Avg. weight of fingerling	30-50 g
9.	Avg. size of fingerling	90-110 mm
10.	Production from each cage	3000-4000 kg

Construction of Cage Frames

Cage frames in Sarodha and Chhirpani reservoir is made from galvanized iron (GI) and to make a battery holding 4 cages, each 24 m², and the battery were 24 m long and 16 m wide. To make such a frame, 24 bamboo lengths are required for the top frame and 24 for the lower frame. High-density polyethylene (HDPE) drums are placed between the two frames of GI, mostly in the corners and near joints to provide the frame with balanced flotation. Catwalks were made locally with bamboo crisscrossed with wooden bars or with

plywood to provide ease and comfort to cage workers. Catwalks were bolted to a GI frame, with a bamboo frame at the top that was tightened with GI wire. Once the frame is anchored at the cage culture site, net cages of nylon material (6 m × 4 m × 4 m) were attached to the frame, thus forming a battery of 4 cages. There are total 99 cages in Sarodha and 96 cages in Chhirpani were formed having 24 battery. On top, silk ropes are used to tie nets to the bamboo frame firmly to reduce sagging. The lower bottom corners and the sides of the net cages were tied with sinkers for taut vertical hanging.

**Fig 1:** Installed cage in Sarodha Sagar

Cage culture operations

Species Selection and Stocking

Pangasiodon sp. and monosex tilapia fingerlings were used to grow because of their good market demand in C.G. They are generally requires 6-8 month to harvest 1 kg table size fish. It also depends on the natural productivity of water body and the quality of supplementary feed. The stocking density per cage is 5000 fingerling (30 g weight each) with seed sources from M.M fish hatchery, Mana, Raipur.

Supplementary feeding

Supplementary feeding is essential for growing fingerlings to

table size fish in captivity because natural food in many Indian reservoirs may be insufficient for growth even to only fingerlings. Extruded feed of Abis Company with 32 percent protein were used for growing table-fish of *Pangasianodon hypophthalmus* and monosex tilapia. The feeding were done at the rate of 5% of body weight (pellet size 2 mm) for initial 2 months, then it reduced 4%, 3% and 2% of body weight as the size increases. Size of pellets increased as the size of fish increases. Feeding was done twice in a day. Initially, 5-6 kg of feed is applied per cage per day. This is reduced as time passes.

**Fig 2:** Feeding of Fishes in

Maintenance of Cage

Cleaning of cages

Cages should be cleaned with soft brush fortnightly to remove algae, sponges and other organisms. Floating macrophytes that waves sometimes push against cages should also be

removed. Any dead fish should be removed from cages immediately and disposed of in a pit. Covering dead fish with lime helps contain any disease. Deaths should be recorded to facilitate later analysis of disease outbreaks.



Fig 3: Fish stock monitoring

Routine checks of fish health help prevent massive fry loss. Fish health can be easily checked by monitoring fry response when feed is applied. Signs of ill health include surfacing, lesions, rashes, spots, lumps, excessive mucus formation,

woolly mat formation, bulging eyes, and fin and tail erosion. Appropriate prophylactic measures should be applied as necessary and at least fortnightly. Disease in these both cages was not observed.



Fig 4: Observation of fish health

Monitoring of growth rate

Samples should be taken at a regular interval to assess fry length and weight to monitor growth. This information is important for maintaining fish health and optimal feeding, as well as for scheduling the harvest.

Harvesting

Harvesting of table size fish was done after 6-8 months of stocking. For harvesting, detach the bottom frame from the cage and start lifting the cage from three corners, thereby leading the fishes to a corner near the opening of the cage.

Table 4: Economics of cage culture (culture period 8-10 months)

Sl. No.	Particular	Per unit cage	Sarodha Reservoir (99 Cages)	Chhirpani Reservoir (96 Cages)
	Number of cages used for stocking		72	96
1.	Fixed cost			
	Cage lease amount (in Rs.)	5078	365,616	487,488
	Cage size		(6x4x4 m)	(6x4x4 m)
2.	Operational cost			
	A. Stocking Density (in no.)	5000	3,60,000	4,80,000
	B. Mortality 10% (no.)	500	36,000	48,000
	C. Survival 90% (no.)	4500	3,24,000	4,32,000
	D. Price of fingerling stocked @ Rs. 5 Per fingerling (100 mm.)	25,000/-	18,00,000/-	2,40,000/-
	E. Total feed required @ 1.7 kg per fish per cycle	8,500 kg	6,12,000 kg	8,16,000 kg
	F. Feed cost @ Rs. 35 Per Kg.	2,97,500/-	21,420,000/-	28,560,000/-
	G. Wages @ 150 Rs. Per day	45,000/- per person per cycle	2,25,000/- for 5 no. of labour per cycle	90,000/- for 2 no. of labour per cycle
	H. Total operational cost (in Rs.)	3,72,578/-	23,810,616/-	31,537,488/-
3.	Total production (in kg)	4500	3,24,000	4,32,000
4.	Total output @ 90 Rs. per kg fish	405000/-	29,160,000/-	38,880,000/-
5.	Total profit (Total income- Total operational cost)	32,422/-	5349384/-	7342512/-

Conclusion

The article concludes that adoption of scientific management coupled with government support has made Chhattisgarh reservoir fisheries prominent in the country. Intervention of cage culture technology at large scale through public private partnership (PPP) mode in these reservoirs can boost and bridge the gap between the current production and expected production potential.

Acknowledgement

Authors are duly thankful to the Department of Fisheries, District Kabirdham, Government of Chhattisgarh for providing necessary data and information.

References

1. Das AK, Meena DK, Sharma AP. Cage Farming in an Indian Reservoir. World Aquaculture, 2014, 56.
2. Department of Fisheries, Government of Chhattisgarh, 2020. <http://agriportal.cg.nic.in/fisheries/FishHi/>.
3. Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Govt. of India. Annual Report. 2019-20, 124. http://dof.gov.in/sites/default/files/2020-10/Annual_Report.pdf.
4. Guideline for cage culture in inland open water bodies of India. Published by National Fisheries Development Board Hyderabad 2016, 14. <http://nfdb.gov.in/PDF/GUIDELINES/Guidelines%20for%20Cage%20Culture%20in%20Inland%20Open%20Water%20Bodies%20of%20India.pdf>.
5. http://india-wris.nrsc.gov.in/wrpinfo/index.php?title=Dams_in_Chhattisgarh.
6. Jha BC, Sharma AP, Das AK. Status, Scope and Potential of enclosure fish farming in reservoirs and floodplain wetlands. In: Sugunan VV, Sharma AP, Jha BC (eds.) recent advances in culture based fisheries in India 2013, 157-168.
7. Karnatak G, Kumar V. Potential of cage aquaculture in Indian reservoirs. Int. J Fish. Aquat. Stud 2014;1(6):108-112.
8. NFDB-Expression of interest document- For taking up fish culture in cages with an integrated approach in the Indira Sagar reservoir of Madhya Pradesh State, 2018; <http://nfdb.gov.in/PDF/EoI%20Cage%20Culture%20MP.pdf>.

pdf.

9. Sugunan VV. Ecology and fishery management of reservoirs in India. Hydrobiologia, 2000;430(1-3):121-147.