DOI: 10.54083/BRT/7.6.2025/168-172

Bio. Res. Today 2025, 7(6):168-172

Biotica Research Today

e-ISSN: 2582-6654

June, 2025

Article ID: RT1812 **Success Story**

Cage Culture in Umiam Reservoir, Meghalaya through Women Participation: A Success Story

Pronob Das[1*], Basanta Kumar Das[2], Birendra Kumar Bhattacharjya[1], Sanjay Kumar Das[3], Tasso Tayung[3], Simanku Borah[1], Dharmendra Kumar Meena[2], Sona Yengkokpam[1], Alakesh Das[3], Prasanta Mahanta[3], Amulya Kakati[1] and Sullip Kumar Majhi[1]

[1]ICAR-Central Inland Fisheries Research Institute, Regional Centre, Guwahati, Assam (781 006), India

[2]ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, West Bengal (700 120), India

[3]ICAR-Research Complex for NEH Region, Umiam, Ri-Bhoi, Meghalaya (793 103), India

Open Access

Corresponding Author

Pronob Das

✉: pronobjaan80@gmail.com

Conflict of interests: The author has declared that no conflict of interest exists.

How to cite this article?

Das, P., Das, B.K., Bhattacharjya, B.K., *et al.*, 2025. Cage Culture in Umiam Reservoir, Meghalaya through Women Participation: A Success Story. *Biotica Research Today* 7(6), 168-172. DOI: 10.54083/BRT/7.6.2025/168-172.

Crop/ Variety/ Enterprise: Cage culture

Name of the Farmer(s) and Address: Ri-Bhoi Farmers' Union, Meghalaya, India

Abstract

Umiam Reservoir, a small waterbody of approximately 500 ha, is located in mid-altitude region of Northeast (NE) India. Feasibility of cage culture in the reservoir through participatory approach was successfully assessed. Management of cages with participation of local fisherwomen group apparently led to good results and sustainability. Rearing of common carp, *Cyprinus carpio* along with silver barb, *Barbonymous gonionotus* appears to be a successful model for cage culture in reservoirs of mid-altitude region in NE India during the summer season for production enhancement. Adoption of stock enhancement module by stocking fishes reared in cages in small reservoirs can be a viable option for sustainable enhancement of fish production.

Keywords: Cage culture, Participatory approach, Umiam reservoir, Women participation

Background Information

Umiam Reservoir (25°39'30'' N, 91°43'51'' E) located in Umiam, Ri-Bhoi district of Meghalaya (Figure 1). It is a small reservoir (500 ha) in mid-altitude region (900 m MSL) with tremendous scope for development of fisheries and eco-tourism beside generation of electricity. There are no organized fisheries in this reservoir. It is utilized as capture fisheries (open-access) and fishing in the reservoir is limited to artisanal and subsistence fishing by the riparian population. Local tribal fishers (khasi) practice small-scale fishing both for their family consumption and commercial purpose.

The technological support for management of reservoir fisheries of India provided by CIFRI resulted in significant rise in average fish production of the reservoirs of the country (Das *et al*., 2018, Sarkar *et al*., 2018, Das *et al*. 2022a). However, average fish yield level of reservoirs of Northeast India is still below its potential. Das *et al*. (2022a) suggested for adoption of stock enhancement module in reservoirs of Meghalaya to sustainably increasing the fish output through the supplementary stocking of carp fingerlings @ 2,000 no. ha^{-1} for small reservoirs. Stock enhancement is increasing the population of targeted fish species through artificial stocking or promoting natural recruitment (Das *et al*., 2022a). Stock enhancement may involve establishing culture-based fisheries primarily reliant on the recapture of supplied fish or augmenting self-recruiting populations (Borah *et al*., 2022; Das *et al*., 2022a). Cage culture in mid-altitude reservoirs of Meghalaya with proper technical backstopping of ICAR-CIFRI can be a viable option for additional income of reservoir fishers (Das *et al*., 2022a).

ICAR-CIFRI conducted a successful cage culture experiment

Article History

RECEIVED on 02nd June 2025 RECEIVED in revised form 12th June 2025 ACCEPTED in final form 13th June 2025

in Umiam reservoir during 2019-20, marking the inaugural instance of such an endeavour, with the involvement of local fishers under the auspices of the Ri-Bhoi Farmers' Union (Das *et al*., 2022a,b). The final harvests from the cages directly benefited the local fishing families including fisherwomen (Das *et al*., 2022b). It proved the feasibility of carrying out cage culture in the reservoir located in mid-altitude zone through community based management with fishers' participation (Das *et al*., 2022a,b). After success of cage culture trial through community participation, we initiated cage culture in the reservoir with participation of fisherwomen (exclusively), which is first of its kind in the region.

Institutional Intervention

Cage culture trial in Umiam reservoir (Figure 2) was carried out by ICAR-Central Inland Fisheries Research Institute (CIFRI), Regional Centre (RC), Guwahati, Assam. The Fisheries Division/Section of ICAR-Research Complex for NEH (ICAR-RC-NEH) Region, Umiam, Ri-Bhoi district, Meghalaya and the Department of Fisheries (DoF), Government of Meghalaya acted as local collaborator in the trial. The project was executed through participation of fisherwomen of Umniuh Khwan village under Ri-Bhoi Farmers' Union (RFU), Meghalaya.

Figure 1: Umiam reservoir, Ri-Bhoi district, Meghalaya

Figure 2: Cage culture in Umiam reservoir

A series of CIFRI GI cages (6 cage) covering a total area of 600 m^3 (5×5×4 m^3 $cage^{-1}$) with cage water volume of 90 m^3 $cage^{-1}$ (5×5×3.6 m^3 $cage^{-1}$) erected at a suitable site near the Umniuh Khwan village in Umiam reservoir. Fingerlings of rohu, *Labeo rohita* (20%), common carp, *Cyprinus carpio* (60%) and silver barb, *Barbonymous gonionotus* (20%) were stocked in the cages @ 10, 15 and 20 no. m^{-3} in duplicate. Fish fingerlings were brought from fish farm of ICAR-RC-NEHR, Umiam. Fishes were reared in the cages for a period 6 month through fisherwomen participation.

CIFRI CAGEGROW (28% Crude protein), a floating fish feed commercialized by ICAR-CIFRI was fed to the fishes reared in the cages. They were fed twice daily @ 2-5% of body weight. Regular monitoring of fish growth, health, survival and water quality was carried out by the scientific team of ICAR-CIFRI and ICAR-RC-NEHR Region (Figure 3). Daily feeding of fishes, watch and ward, cleaning and monitoring of cages was the responsibility of the local fisherwomen under the Union (Figure 4).

Figure 3: Monitoring of fish growth in cages

Figure 4: Feeding by fisherwomen in cages

C. carpio and *B. gonionotus* was successfully reared in the cages, reaching marketable size in 6 months culture period (Figure 5). The average fish production of 5-6 kg m^{-3} was attained after 6 month of rearing. The growth performance of *C. carpio* and *B. gonionotus* in cages was significantly higher as compared to *L. rohita*. *C. carpio* exhibits the highest growth pattern among the stocked species. *B. gonionotus* acted as a cleaner of cages by removing accumulated algae and bio-fouling organism in the cage nets which is clearly visible from the cleaned cage net (Figure 6). This behaviour contributed to maintain better cage environment for higher growth and survival of the cage reared fishes. It also helps to reduce efforts of manual cleaning of the fisherwomen as observed during our trial. *B. gonionotus* is suitable for usage exclusively in the summer season, as our observations indicate the species' sensitivity to low temperatures during cage culture trials.

Figure 5: A portion harvested fish from cages for sale

Figure 6: Cleaned net due to Silver barb in cages

On successful completion of cage culture in the reservoir, ICAR-CIFRI, RC Guwahati jointly conducted a Field Day on "Cage culture in reservoirs of Meghalaya" along with ICAR-RC-NEHR, Umiam; DoF, Meghalaya and RFU, Meghalaya at Umniuh Khwan village, Umiam (Figure 7). Field Day was attended by 80 people including 25 women beneficiaries of the trial. The sale of cage reared fishes on the bank of the reservoir was inaugurated by the Deputy Director, DoF, Meghalaya (Figure 8). The sale directly benefited 25 fisherwomen families of the Union.

Figure 7: Field day at Umiam reservoir on the occasion of successful harvest of cage reared fishes

Figure 8: Sale proceed of cage reared fishes received by the fisherwomen group

A major portion of carps reared in the cage (mainly *L. rohita*) were stocked to the reservoir for development of sustainable fisheries through stock enhancement. The stakeholder including fisheries officials, scientific personnel and fishers participated in the fish release programme with an objective to develop sustainable reservoir fisheries (Figure 9-10).

Figure 9: Stock enhancement of cage reared fishes in Umiam reservoir

Figure 10: Release of carps (mainly Rohu) reared in the cage in Umiam reservoir

Success Points

Cage culture was carried out using 'CIFRI GI cage' and 'CIFRI CAGEGROW floating feed' in Umiam reservoir, Meghalaya through fisherwomen participation. Following 6 months of rearing in cages, average fish yield of 5-6 kg m^{-3} was obtained. Growth and survival was the highest in *C. carpio* followed by *B. gonionotus* in the cages. *B. gonionotus* also observed to function as a cleaner in net cages. *B. gonionotus* along with *C. carpio* may be used for cage culture in reservoirs mid-altitude of region in summer season. Final fish harvest from the cages benefited twenty five fisherwomen families of the locality under RFU (Figure 11-12). Further, stocking of fishes (especially rohu) reared in cages to the reservoir is likely to result in enhanced fish production in the reservoir and increased income for the reservoir-dependent fishers. By seeing the success of the trial, state fisheries officials of Government of Meghalaya were convinced about suitability of cage culture as an option for increasing fish production from the reservoirs of Meghalaya.

Figure 11: Fisherwomen working in cages

Figure 12: Successful harvest of fishes from cages in Umiam reservoir

Outcome

C. carpio along with *B. gonionotus* emerged as a model for cage culture during the summer season in reservoirs of NE India located mid-altitude region. Management of cage culture in reservoir through involvement of fisherwomen group was the key for successful results. Carps reared in cages and released to the reservoir would result in enhancement of fish stock and fishers' income. The success of the present trial is expected to lead to similar efforts in reservoirs and lakes of mid-altitude region NE and other such region.

Conclusion

Cage culture proved to be an option to obtain additional production of fish, income enhancement and livelihood improvement to the fishers especially in the reservoirs of mid-altitude region, NE India. Further, supplementary stocking of cage reared fishes in the reservoir either to establish culture-based fisheries or to enhance the self-recruiting populations as expected to contribute to improve capture fisheries in the reservoirs of the region.

Acknowledgements

The authors express gratitude to Indian Council of Agricultural Research (ICAR) for providing financial support under NEH Component and TSP programme. We also acknowledge cooperation of Ri-Bhoi Farmers' Union, Meghalaya and the Department of Fisheries, Government of Meghalaya during the project period.

References

Borah, S., Sarkar, U.K., Das, P., Yadav, A.K., Puthiyottil, M., Pame, D., Bhattacharjya, B.K., Das, B.K., 2022. Managing floodplain wetlands through culture-based fisheries (CBF) for livelihood security and sustainable development: A study from biodiversity hotspot region of India. *Arabian Journal of Geosciences* 15(14), 1245. DOI: https://doi.org/10.1007/s12517-022-10524-5.

Das, P., Borah, S., Yadav, A.K., Bhattacharjya, B.K., Das, B.K., 2018. Openwater fisheries of Assam and strategies for its development. *Fishing Chimes* 38(1&2), 17-28.

Das, P., Bhattacharjya, B.K., Das, B.K., 2022a. Strategies for sustainable utilization of openwater fisheries resources of Meghalaya: A way forward. *Research*

Biotica 4(3), 124-131. DOI: https://doi.org/10.54083/ResBio/4.3.2022/124-131.

Das, P., Das, B.K., Das, S.K., Bhattacharjya, B.K., Hazarika, S., Borah, S., Das, A., Singh, S.G., Devi, P., Mahanta, P., Yengkokpam, S., Meena, D.K., Yadav, A.K., Parida, P.K., Tayung, T., Kakati, A., Mishra, V.K., Jena, J.K., 2022b. Assessment of feasibility of cage culture in Umiam reservoir at mid-altitude region, Meghalaya through participatory approach. In: *Book of Abstracts: 1st Indian Fisheries Outlook 2022 on "Priming Indian Fisheries in Attaining Sustainable Development Goals"*. (Eds.) Das B.K., Nayak, B.B., Behera, B.K., Bhkta, D., Devi, M.S., Bera, T., Nair, S.M., Swain, P.R., Sajina, A.M., Mishal, P., Swain, H.S., Parida, P.K. and Ramteke, M. ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, India. p. 17.

Sarkar, U.K., Sandhya, K.M., Mishal, P., Karnatak, G., Lianthuamluaia., Kumari, S., Panikkar, P., Palaniswamy, R., Karthikeyan, M., Mol, S.S., Paul, T.T., Ramya, V.L., Rao, D.S.K., Khan, M.F., Panda, D., Das, B.K., 2018. Status, prospects, threats and the way forward for sustainable management and enhancement of the tropical Indian reservoir fisheries: An overview. *Reviews in Fisheries Science & Aquaculture* 26(2), 155-175. DOI: https://doi.org/10.1080/23308249.2017.1373744.