**Overview and interrelationship of fish seed and fish production in Rajasthan (India)**

**Abstract**

The water resources of the Rajasthan in the form of reservoirs, lakes, rivers, canals etc. which are used for fisheries purposes and contributing huge amounts of fish production. The potential of these water bodies could be exploited by application of appropriate farming practices and justified inputs. In this paper, the relationship between fish farming input i.e. fish seed production and fish production of the state for the last 25 years 2000-2001 to 2024-25 is evaluated. The result indicated that in the initial years 2000-2001 fish production (12,141 metric ton) and fish seed production (231.00 million fry) was relatively low while in 2024-2025 these were subsequently high 1, 01,108 metric tons and 14, 50.00 million fry. The relationship in the variables (fish seed production and fish production) shows linear straight line and the correlation coefficient (R2) was 0.910 thus showed a significant positive relationship. The linear equation (Y = 57.685 X - 645.370) and the regression coefficient (b) showed that one million fry can increase of 57.685 metric tons of fish production. The data analysis and results also revealed that produced fish seed quantity neither fulfills the demand of the fish farmers nor sufficient enough to adequately stock the water bodies of the state. Therefore, it is advised to establish more functional hatcheries or strengthen the existing hatcheries (government sector or private sectors) which may help to increase the seed production for the optimum utilization of the water bodies and encourage the fish farming in the state.

**Keywords:** Fish production, fish seed production, growth rate and Rajasthan waters

**1.0 INTRODUCTION**

Fish seed is the primary requirement for the modern aquaculture which was developed by the research and entrepreneurial inputs over the years. Demand for quality fish seed is never fulfilled by the suppliers because farmers always require good quality seed for that fish seed production sector which is expected to expand enormously. The fish seed requirement for fish farming ensures the better utilization and fully utilizes growth potential of water resources (Roy and Upadhyay, 2014 and Maurya *et al*., 2018). Stocking is the powerful tool to manage the water body and fish seed stocking a practice carried out by most of the countries to enhance the fish production. However, the stocking of the fish seed is either not in sufficient quantity or not following the scientific method for stocking. Hence, there is a need to quantify the fish seed that is required to be stocked in these water bodies Welcomme (1977).

The fishery resources of the state being with 15,838 numbers of water bodies including reservoirs, ponds and tanks covering an area of 4.24 lakh ha excluding rivers and canals  with 0.30 lakh ha and water logged area of 0.80 lakh ha respectively (Jhajhria, 2017; Ujjania et al., 2025). These existing water resources in the state play an important role to become a distinguished fish producer state of the country. Better utilization of resources for fisheries development, optimum fish production and productivity from available aquatic resources, employment generation, availability of protein rich food, appropriate planning for conservation and management strategies are of utmost importance (Miller, 2009, Lakra, 2010 and Gogoi, 2015).

The scientific records on management practices of fish culture in the state are elusive and inadequate which influence the proper utilization of water resources and fish production in the state. The water quality of resources with other scientific inputs including fish seed helps to increase the fish production and productivity (Rose et al., 2009, Yadav, 2017 and Ujjania et al., 2019). The fish farming activities face impending constraints of land, water, feed, seed and energy inputs which may limit its growth potential (Richard *et al*., 2014). The produced fish seed is not sufficient to stock in the water resources of the state (Anon, 2018) and fish production of the state is adversely affected (Ananthan et al., 2010 and Ujjania et al. 2019).

In view of the importance of water resources for fisheries development in the state, analysis of available data pertaining to fish seed production in relation to the fish production have been assessed in this manuscript.

**2.0 MATERIALS AND METHODS**

**2.1 Available Fisheries Resources:**

Rajasthan is the largest state of the country constituting 10.4 per cent of total geographical area and 5.67 per cent of total population. It is the landlocked state and blessed with various water resources covering (3.36 lakh ha area is covered by the large and medium reservoirs and 0.94 lakh ha area is covered by the small reservoirs). The rivers and canals (5,290 km) cover a combined water spread of 30,000 ha. Beside these water logged areas (80,000 hectare) and Salt affected area (1.80 Lakh hectare) also exist in the state for fisheries related activities.

**2.2 Data collection and analysis**

The secondary data for the present study was collected from various sources including Annual report (2025) published by Directorate of Fisheries (Government of Rajasthan) and Handbook on Fisheries Statistics (2024) published by Department of Fisheries (Government of India).  The data of fish seed production and fish production were compiled for the period of 2000-2001 to 2024-2025. The statistical data analysis for overview and interrelation with graphical presentation were computed by MS Excel (2013).

**3.0 RESULTS AND DISCUSSION**

**3.1 Overview on fish and fish seed production**

The fish production data were compiled for the last 25 years 2000-2001 to 2024-25 and results clearly reveal the increasing growth trends of fish and fish seed production in the state. The result shows that during 2000-2001, fish production and fish seed production were relatively low at 12,141 metric ton and 231.00 million fry respectively, whereas subsequently in 2024-2025 it was attained maxima of 1,01,108 metric ton and 14,50.00 million fry with an average of 40,714 metric ton and 716 million fry respectively (Fig. 1).

**3.2 Interrelationship of fish and fish seed production**

The data on fish and fish seed production of the state were further used to establish the relationship in the variables namely fish production and fish seed production. The linear regression showed a straight line and correlation coefficient (R2=0.910) was indicating close, strong and positive relationship among these variables (Fig. 2). In the linear equation (Y = 57.685 X - 645.370) the regression coefficient (b) depicted that stocking one million fry can increase of 57.685 metric ton of fish production (Fig. 2).

In the present scenario of fish production 101108 metric tons and fish seed production of 1450.00 million fry against fish production potential of 1.35 lakh metric tons Ananthan et al. (2010). Similar findings regarding fish and fish seed production of the state were described by Ujjania et al (2025), Ujjania and Ujjania (2025) and Ujjania et al. (2025a). Although the state is endowed with massive water resources but trailing in fish production which may be attributed to the unavailability of quality fish seeds in desired quantity, quality feeds, extensive fish farming practices and culture of only few selected species (Ujjania et al., 2019). Saini (2017) reported that non-availability of fish seed at required time and quality of seed affects the fish production. The fish productivity 283 kg/ha/yr reported from Srilanka and 250 kg/ha/yr in small reservoirs of Thailand (Sreenivasan, 2001) while as compared to these reports the average fish productivity of the state is 56 kg/ha in large reservoir, 176 kg/ha in the small and medium reservoir of Rajasthan is reported by Yadav et al. (2020). The state facing a huge deficit of fish seed and only 25 % of present seed supply is met within the state whereas 75 % seed supply is met by imports from other states (Ananthan et al., 2010 and Yadav et al., 2020). The total fish seed demand in the state is estimated to be 1216 million fry every year while average seed supply is only 40 % of the estimated seed requirement. Roy and Upadhyay (2014) reported that seed production is one of the important factor to determine the level of fish production in different states of NE region. Similarly, the present findings also indicated that the seed production is one of the important factors for increasing fish production. This is well evident from analysis of the data for last twenty five years. Singh and Ahmad (2003) also described that availability of poor quality fish seed creates problems for the development of freshwater fish farming.

The findings regarding importance of fish seed and the relationship between fish seed production and fish production revealed that fish seed produced or stocked in the water bodies of the state is not sufficient. The similar findings were reported from Uttar Pradesh by Maurya et al. (2018) and from Rajasthan by Ujjania et al. (2019) and Yadav et al. (2020). The strong significant relation (R=0.97) between two variables i.e. fish seed production and fish production (Roy et al., 2015). The requirement of quantity of quality fish seed could be fulfilled by the development of fish hatcheries by state government or by promoting the established private hatcheries. It is also suggested to develop the appropriate supply chain for fish seed for better utilization of water resources in the state as well as for enhancing the fish production and productivity of available fisheries resources.

**4.0 CONCLUSION**

The water resources of Rajasthan are very productive and have potential for good fish production but it is limited by the necessary fish farming inputs specially fish seed. The fish seed produced by the state is neither sufficient to stock the water body nor fulfil the demand of fish farmers. It can be concluded that there is fish seed production and fish production are certainly interrelated. Moreover, relationship between fish seed production and fish production is linear and significant to conclude that fish production of the state can be increased by the supply of good quality and quantity of fish seed. The fulfilment of seed requirement is only possible by establishing the hatcheries in government as well as private sectors or strengthening the existing hatcheries. Furthermore, it is experienced that advanced fish farming practices with desirable quality and quantity of seed could be helpful to enhance the fish production in multiple folds and double the income of fish farmers in the state.

**REFERENCES**

Ananthan P.S., Tiwari V.K., Reddy A.K., & Munil Kumar (2010). Perspective Plan and Strategies for Fisheries Development in Rajasthan, Report of the UNDP-Rajasthan Mission on Skill and Livelihoods (RMOL) funded Consultancy Project. ICAR-Central Institute of Fisheries Education, Mumbai

Annual Report, Department of Fisheries (2025). Annual Report, Department of Fisheries published by Directorate of Fisheries (Government of Rajasthan), Jaipur.

Anon (2018). Rajasthan Economic Review 2017- 18, published by [www.rajras.in](http://www.rajras.in)

Gogoi Budhin, Akash Kachari, Rashmi Dutta, A. Darshan, & Debangshu Narayan Das (2015). Fishery based livelihood approaches and management of fishery resources in Assam, India. *International Journal of Fisheries and Aquatic Studies*, 2(4): 327-330

Hand book of Fisheries Statistics (2024). Hand book of Fisheries Statistics published by Department of Fisheries, Ministry of Fisheries and Animal Husbandry and Dairying, Gov. of India, New Delhi.

Jhajhria, A. (2017). Conservation of Freshwater Fish Biodiversity: A Challenge for Rajasthan.. *International Journal of Scientific Research and Management*, 5(06):5445-5447

Lakra, W. S. (2010). Fish Biodiversity of Uttar Pradesh: Issues of Livelihood Security, Threats and Conservation. National Conference on Biodiversity, Development and Poverty Alleviation.

Maurya Ashish Kumar, Upadhyay A D, Laxmi Prasad & Khan Shakila (2018). Trend analysis of fish production in Uttar Pradesh, India. *Journal of Entomology and Zoology Studies*, 6(4): 180-184

Miller, J.W. (2009). Farm ponds for water, fish and livelihoods. FAO Diversification Buklet-13 Rural Infrastructure and Agro-Industries Division, Food and Agriculture Organization of the United Nations, Rome, 74

Richard W, Malcolm B, Randall B, Sarah C, Nuttapon C, & Sadasivam K. (2014). Improving productivity and environmental performance of aquaculture improving productivity and environmental performance of aquaculture. World Resources Institute, Washington Working Paper, 60

Rose Sanchita, Sharma L.L. & Ujjania N.C. (2009). Aquatic resource management and fish and fisheries of Ajmer district of Rajasthan (India). National Congress of Zoology, Central Institute of Fisheries Education, Mumbai. Organized by Central Institute of Fisheries Education, Mumbai, Dated 29 to 31 December, 2009

Roy A K & Upadhyay A D. (2014). Fisheries Resources and Production Statistics of NE States of India-An analytical and value added presentation. Narendra Publishing House, Delhi, 328

Roy, A.K., Upadhyay, A.D. & Verma, N.K. (2015). Outlook on Fish Seed and Fish Production and their Interrelationship at Uttar Pradesh. *Journal of Environment and Sociobiology*, 12 (1): 15-21

Saini, V.P. (2017). Fisheries Development: Knowledge Paper. A Technical report for Doubling Farmers Income, submitted in GRAM Udaipur, Rajasthan, 2017.

Singh, A. K. & Ahmad S H. (2003). Present status and future plans of fisheries development in residual Bihar. *Fishing Chimes.* 23(1):99-106.

Sreenivasan, A. (2001). Influence of stocking on fish production in reservoirs in India. In: report of the second session of the IPFC working party on inland fisheries. FAO (UNO), Rome pp

Ujjania N.C., L.L. Sharma, C.P. Juyal& V.K. Ujjania (2025). Assessment of training programmes for the fish farmers and its impact on fish production, fish seed production and revenue generation. *Asian Journal of Agriculture Extension Education*, 43 (3): 170-177

Ujjania N.C., L.L. Sharma, C.P. Juyal& V.K. Ujjania (2025a). A 25-year retrospective growth of fish production, fish seed production and revenue generation from aquatic resources of Rajasthan (India).

Ujjania N.C., Sharma L.L. & Juyal C.P. (2019). Fish seed procurement and fish production trends in Rajasthan. *Journal of Indian Fisheries Association*, 46 (2): 40-45

Ujjania V.K. & Ujjania N.C. (2025). Trends in fish and fish seed production of Rajasthan. *Archives of Current Research International*, 25 (4): 463-467

Welcomme, R.L., 1977 Inland fisheries in arid zones. In Arid land irrigation in developing countries: environmental problems and effects. Based on the International symposium 16–21 February 1976, Alexandria, Egypt, edited by E.B. Worthington. Oxford, Pergamon Press, pp. 303–6

Yadav R. (2017). Factors Affecting Opinion Leadership in Capture Fisheries of Jaisamand Lake in Udaipur District, Rajasthan. M.F.Sc Dissertation, ICAR-Central Institute of Fisheries Education, Mumbai

Yadav Rajpal, Yadav Rohitash, Keer Naresh Raj, Ojha Shekhar Nath & Ananthan P.S. (2020). An assessment of factors affecting fish production and its potential in Rajasthan. *Journal of Entomology and Zoology Studies*, 8(2): 1032-1035

Figure 1. Fish and fish seed production in Rajasthan

Figure 2. Interrelationship between fish production and fish seed production