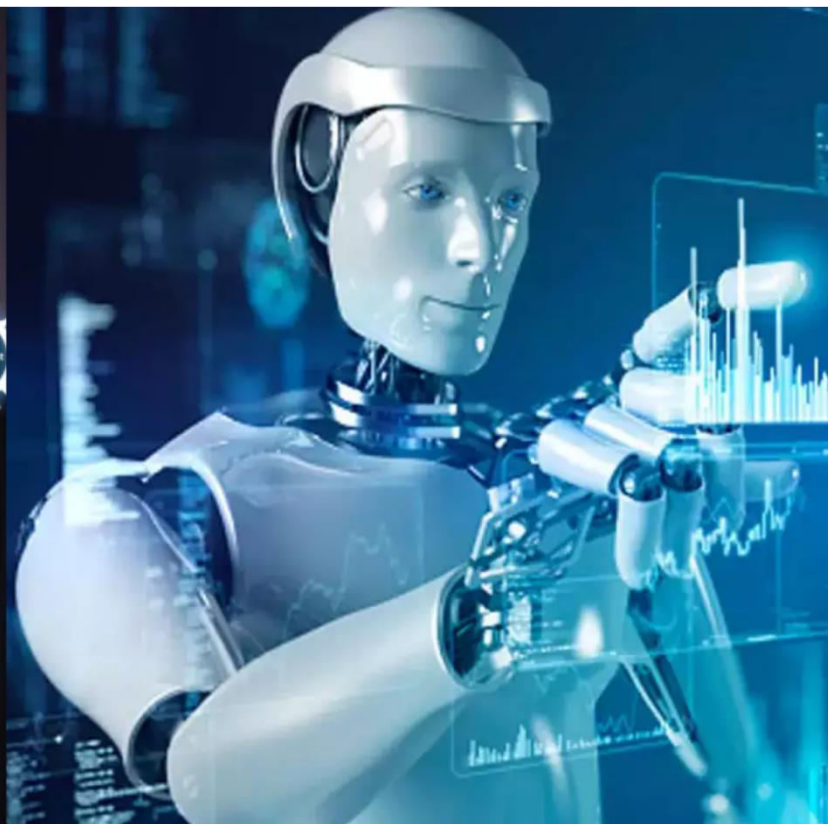




International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 11, November 2025

Prospects of Freshwater Prawn Aquaculture in Bihar

Dr. Ashok Kumar Singh

Assistant Professor (G), Department of Zoology, R.K.College, Madhubani, Bihar, India

E-Mail: ashokkumarsingh7075@gmail.com

ABSTRACT: The demand of fish production in Bihar is nearly 8.89 lakh metric tones whereas the total production is 8.73 lakh metric tones. Rivers, ponds, irrigation canals, reservoirs etc. are the main fisheries resources. Despite having sufficient resources for freshwater aquaculture, they are not utilized enough and have enormous scope to improve food security of Bihar. Tanks and ponds are one of the major resources for fisheries having total length of 93218km and rivers and canals 3200 Km. The livelihood of fisherman in the vicinity of rivers are dependent on fisheries resources of the ponds. There are total 125 reservoirs in Bihar encompassing total area of 64,889.87 hectares (Department of Fisheries, Bihar 2020). Despite having suitable conditions for prawn aquaculture in Bihar, it is not being utilized for commercial purposes (Janaki Ram & Pandey, 2003;). Besides giant freshwater prawn smaller prawns may also serve as a potential animal for freshwater aquaculture. Smaller freshwater prawn, *M. nipponense* is being cultured in China for commercial purpose (Kutty, 2003). *M. amazonicum*, *M. acantharus* & *M. carcinus* are being used for freshwater aquaculture in African countries (Pandey *et al.*, 2009). Smaller prawns like *M. lamarrei* & *M. dayanum* being a good source of nutrient rich food may be used for freshwater aquaculture in Bihar (Shukla & Sharma, 2010). Prawns, shrimps, crabs, lobsters etc are included in human diet. It has free amino acids, vitamins, proteins lesser in fat and carbohydrate therefore advised to diabetic people (Singh, 1977).

KEYWORDS: Freshwater, Prawn, Improve, Food, Security and Livelihood.

I. INTRODUCTION

Aquaculture is one of the most significant fisheries sectors in India having growth rate of over 7% per year. Today, India holds fourth position in culture fisheries production (FAO, 2018). Aquaculture provides dietary supplements for human food as well as creates enormous opportunities for employment, particularly in rural areas. Freshwater aquaculture in India has shown a rapid growth over the last 2 decades and contributes over 95% of the total aquaculture production. The inland fisheries have demonstrated rapid growth over the last few decades and has been increased to about 80% over the last few years (FAO, 2018). According to the FAO, in 2020, prawn farming contributed approximately 234.4 thousand tonnes, 2.5% of the total major crustacean species cultivated worldwide. On the other hand, white-leg shrimp (*Penaeus vannamei*) contributed 52.9% of total crustacean production. The FAO estimates that world aquaculture production will increase by 32.2% by 2030, and prawn farming significantly boosts this growth.

Early attempts of prawn culture by stocking ponds with juvenile prawns had disappointing results. Also experiments carried out by several Asian countries on prawn culture under controlled environment were unfruitful. In 1961, a breakthrough was made by Marine fisheries Research institute, Malaysia. They discovered that certain amount of salinity was important and basic requirement for the survival and development of the early stages of *Macrobrachium rosenbergii* larvae. Currently, *Macrobrachium rosenbergii* is the favorite species of Indian prawn culture. In India, Prawn Breeding unit of Central Inland Fisheries Research institutes developed indigenous technology for prawn culture in the year 1975. Prawn farming in India faces challenges like disease outbreaks (especially white spot disease), lack of quality seed and feed, increasing production costs, and inconsistent management practices. However, its prospects are positive due to a large potential area for brackish water farming, growing international demand, and the recent introduction of promising species like *Litopenaeus vannamei*, which could lead to increased production if diseases are managed and sustainable practices are adopted.

Indian freshwater prawn farming is not only substantial but is also distributed extensively throughout the country from moderate heights in Himalayan range through the plains and peninsula down to south and the Bay Islands. On a

worldwide basis. 49 species of *Macrobrachium* are of interest to the fisheries and at least 15 species are being considered for aquaculture. Over 30 species of this genus have been reported from Indian waters out of which 3 species are favoured for aquaculture. Freshwater prawn culture in India is now undergoing a moderate transformation from traditional level to highly productive semi-intensive culture through intensive Research and Development efforts by Indian Council of Agricultural Research. The traditional method is to introduce and hold the young prawns into ponds, tanks, ricefields etc. and, allowed to grow till market size. This is practised in many South Eastern countries including Indian subcontinent. Improve cultivation methods by collecting the wild seeds of prawns and stocking them in impot coupled with moderate feeding till they attain marketable size, is resulting in higher yields. In India it has been recorded from Hoogly estuarine system (West Bengal), Mahanadi system (Orissa). Cauvery system (Tamil Nadu), Krishna Godavari system (Andhra Pradesh). Cochin backwaters (Kerala), Thana creek and others rivers of West Coast of Maharashtra and Narmada and Tapi system in Gujarat. It has been estimated that the total production from this group of prawns is estimated at 20,000 tonnes per annum mainly from the Hoogly estuarine system, Vembanad lake and associated backwater of Kerala, Krishna Godavari, Kolleru aquatic system and Nannada river. The present freshwater prawn production from different aquatic systems in India indicates a decline in the yield except in Narmada river system.

Freshwater aquaculture in Bihar:

Total production of shrimps has seen an increase of 5% and reached to 5 million tons in 2021 (FAO, 2019). The area available for shrimp farming in India is around 160,000 hectares. In 2018, India has reached the highest level ever recorded at 700,000 MT but estimated production to fall 600,000 MT by 2021. Bihar shares about only 6% of the total fish biodiversity in India. It is most populated state of India having rich freshwater fish diversity (Pathak *et al.*, 2019). The demand of fish production in Bihar is nearly 8.89 lakh metric tonnes whereas the total production is 8.73 lakh metric tonnes. Rivers, ponds, irrigation canals, reservoirs etc. are the main fisheries resources. Despite having sufficient resources for freshwater aquaculture, they are not utilized enough and have enormous scope to improve food security of Bihar. Tanks and ponds are one of the major resources for fisheries having total length of 93218 km and rivers and canals 3200 Km (Department of Fisheries Bihar., 2020). The livelihood of fisherman in the vicinity of rivers are dependent on fisheries resources of the ponds. Apart from riverine system, reservoirs are one of the most important fisheries resources in India. There are total 125 reservoirs in Bihar encompassing total area of 64,889.87 hectares (Department of Fisheries, Bihar 2020). North Bihar have maximum number of small ponds (Department of Fisheries Bihar., 2020). Revers and Chaur are also considered as one of the most important sites for aquaculture. In Bihar, revenue ponds encompass an area of 80000 hectares. The total water area across all categories of water bodies in the state stands at around 3.52 lakh hectares (352,000 hectares). (Department of Fisheries, Bihar., 2020). The ponds may be used as a potential source for freshwater aquaculture.

In order to fulfill the requirement of quality fish seeds in Bihar, there are 10 functional, 5 are under installation, 14 are yet to be operationalized, and one is not functional, according to the National Fisheries Development Board (NFDB). The Directorate of Fisheries, Bihar also mentions a plan to establish 18 new hatcheries to increase fry production. (Department of Fisheries Bihar., 2020). Apart from this, there are 72 feed mills in the state (Department of Fisheries Bihar., 2020).

II. REVIEW OF LITERATURE

Review of related literature provides an opportunity of gaining insight into the method, measures, subject and approaches employed by the other researchers.

Lalrinsanga, P.L., et al. (2012) Prawn farming has superior cultivable characteristics such as fast growth, high market demand, hardiness, euryhaline nature, and compatibility with cultivable finfish such as Indian major carps, tilapia, and catfishes, making it incredibly valuable. From the mid-1990's until 2005, *M. rosenbergii* production in India increased dramatically from 178 to 42,870 tonnes. Monoculture of *M. rosenbergii* has achieved yields of 1.0–1.5 tonnes/ha in a cycle lasting 7–8 months.

Manush, S.M., et al. (2006) Prawns require specific knowledge to manage appropriately. Mishandling of shrimp can cause increased stress and disease development. Sex segregation of *M. rosenbergii* using manual labor in Nellore resulted in the development of stress among the individuals, according to Saurabh S and Sahoo PK. This highlights the need for proper training for workers in the industry.

Lodhi, H.S, Shukla, Sanjive.(2020) Inland (freshwater) fisheries contributed almost 51.3% in 2018, while *M. rosenbergii* contributed only 2.5%. Despite this, scampi farming can be sustainable if proper farming procedures are followed to increase production. To achieve sustainable production, it is crucial to have a thorough understanding of the nutritional requirements, growth phase, and water quality parameters of scampi.

III. METHOD OF THE STUDY

The method used in this paper is descriptive-evaluative method. The study is mainly review based. It is purely supported by secondary source of data. The secondary data for the present study was collected from several sources which mainly include FAO (2018) and Handbook of fisheries statistics, 2020, published by Department of Fisheries, Government of India and Bihar.

FRESHWATER PRAWN CULTURE IN BIHAR:

Freshwater prawns are potential candidate for aquaculture and they are good source for vitamin A & D, free amino acids and proteins. Owing to their high nutritional value, their demand is high in national and International market (Sankar *et al.*, 2011, Ahmed *et al.*, 2021). India holds second position in export of freshwater prawn in the world market (Balamurgan *et al.*, 2004). The total production of freshwater prawn in India amounts 30,450mt and encompasses an area about 34,630 ha (Sakthivel 2003; Balamurgan *et al.*, 2004). India contributes about 42% of the total aquaculture production of prawn worth 579 US \$ million (Sakthivel 2003; Nair *et al.*, 2007). India has rich resources for the aquaculture of freshwater prawns that may be utilized for commercial farming of marine and freshwater prawns both (Pandey *et al.*, 2009). There are almost 200 species of freshwater prawns, out of which *M. rosenbergii* is widely cultured species commonly called as “Scampi”. It is a giant prawn, suitable for aquaculture owing to its resistance to diseases, rapid growth rate and high demand in national and international markets (Pandey *et al.*, 2009). Being a commercially important species, giant freshwater prawn, *M. rosenbergii* are being cultured in several states such as Kerala, West Bengal, Andhra Pradesh, Orissa, Haryana, Punjab, Maharashtra (Sakthivel, 2003; Singh, 2003).

There is high demand for larger freshwater prawns such as *M. rosenbergii* in national and international markets (Upadhyay *et al.*, 2006). Yet the culture of these prawns is difficult in non-coastal areas such as Bihar, M.P., Punjab, U.P and Haryana despite having rich resources for freshwater aquaculture (Shukla and Sharma, 2010). The larger species of prawns require brackish water for their larval development hence it is costly to transport them. Apart from this, these prawns have long larval period. Therefore, the environmental stress may lead to less success rate upto post larval period (Shukla and Sharma, 2010). Despite high demand of *M. rosenbergii* “scampi” there are certain disadvantages in culture of larger prawn species like, they need brackish water for larval development, hatcheries are set at sea coast therefore seed transport make it expensive, long larval period makes them more vulnerable to environmental stress and success rate upto post larva is very less; prawns processing unit are not set throughout India; Culture cannot successfully performed in natural water reservoirs therefore productive land is used which is not ecofriendly ; Due to high price they do not cope up nutritional demands of common and poor people of India.

IV. RESULTS

Despite having suitable conditions for prawn aquaculture in Bihar, it is not being utilized for commercial purposes (Janaki Ram & Pandey, 2003;). Besides giant freshwater prawn smaller prawns may also serve as a potential animal for freshwater aquaculture. Smaller freshwater prawn, *M. nipponense* is being cultured in China for commercial purpose (Kutty, 2003). *M. amazonicum*, *M. acantharus* & *M. carcinus* are being used for freshwater aquaculture in African countries (Pandey *et al.*, 2009). Smaller prawns like *M. lamarrei* & *M. dayanum* being a good source of nutrient rich food may be used for freshwater aquaculture in Bihar (Shukla & Sharma, 2010). Prawns, shrimps, crabs, lobsters etc are included in human diet. It has free amino acids, vitamins, proteins lesser in fat and carbohydrate therefore advised to diabetic people (Singh, 1977).

It supports the livelihood of 10-12% of world population (FAO, 2016). Currently, aquaculture is responsible for nearly half of the global food fish consumption (Subhasinghe *et al.*, 2009). Freshwater aquaculture is an important sector of fisheries research. Jayasankar (2018) has documented a review on the status of freshwater aquaculture in India. However, no comprehensive review has been documented on the status of freshwater aquaculture in Bihar. Nowadays

demand has increased towards freshwater prawns in local and global markets which shifted attention towards freshwater prawn aquaculture. Therefore, in the present paper an attempt has been made to review the current status of freshwater aquaculture in Bihar.

Possibilities of smaller freshwater prawns:

Other alternatives must be utilized in order to provide better nutrition and economic growth. Smaller freshwater prawns may be used as a better candidate which are readily consumed by the local population and still not promoted the way they should be (Shukla and Sharma, 2010)

Attempts in India:

Indian rivers and water reservoirs are enriched with small freshwater prawn species having high aquaculture potential (Kurian & Sebastian, 1993). The species of smaller prawns which are commonly found in India are *M. lanchesteri*, *M. equidens*, *M. nobilli*, *M. mirabile*, *M. idella*, *M. lanchesteri*, *M. scrobiculum*, *M. rude*, *M. lamarrei* and *M. dayanum* etc. Being smaller size, having abbreviated development and resistant to diseases than larger prawn species, these prawns are better option than larger freshwater prawn species.

Advantages of smaller prawns over larger prawn species:

- They have abbreviated development, fully completing in freshwater therefore seed can be obtained locally and hatcheries can be set in all parts of country.
- Availability of seed in local rivers throughout year.
- Despite low fecundity, they have short larval period and high survival rate which makes them better suited for culture.
- Resistant to disease than larger prawn species.
- Culture can be performed in natural water reservoirs therefore ecofriendly.
- Due to smaller size they can be sun dried and stored for longer period.
- Polyculture of these prawns with common fishes is possible.

Prospects of freshwater prawn farming in Bihar:

- Most of them are fast growing hardy species having great market demand both nationally and internationally.
- They are highly nutritious.
- They can withstand wide fluctuation of water quality parameters.
- Compared to brackish water prawn they are less vulnerable to disease.
- They can be cultured both in inland region.
- They can be easily adopt themselves to artificial feeding and being omnivorous species can consume wide range of feed.
- As they are compatible to other fish species, polyculture can be done along with fishes.
- The culture method is easy and highly profitable.
- They can be cultured in sewage and waste water.
- As the seed production technology is already standardised the gap between demand and supply can be filled up by setting up more commercial hatcheries in our State
- **Market Demand:** There is a significant gap between global demand for shrimp and its supply, creating a strong international market for Indian shrimp products.
- **Untapped Potential:** India has a vast untapped area suitable for brackish water shrimp farming, presenting a significant opportunity for expansion.
- **Technological Advancement:** The development and introduction of new species like *Litopenaeus vannamei* offer opportunities for growth, though disease management remains crucial.
- **Employment:** Prawn farming is a major source of employment in many coastal areas of India.

Problems:

- **Disease:** Outbreaks of diseases like white spot disease and white muscle disease cause significant mortality.
- **Seed and Feed:** There is a lack of quality seed and dependable broodstock, and feed quality and availability are issues.
- **Cost:** The cost of production is rising due to expenses for feed, labor, and mandatory certificates.

- **Environmental and Management:** Poor management, such as selective stocking not being practiced, can lead to the overstocking or understocking of ponds. Environmental issues like water logging and salinity can also be a problem.
- **Pest:** Predatory organisms can enter ponds with tidal water and harm the shrimp.
- **Infrastructure:** India has an existing cold chain infrastructure for products like milk and ice cream, which can be leveraged for frozen shrimp exports,

Suggestions:

- Feed, particularly for freshwater prawn, should be formulated based on the amino acid profile of these prawns instead of using the feed prepared for the brackishwater shrimp.
- More R and D effort is to reduce the larval rearing period in order to reduce the cost of production.
- More and more training and extension programme from lab to land is required to increase the freshwater prawn production.
- To popularise the freshwater prawn culture more subsidy to the prawn farmers is needed.



V. CONCLUSION

Freshwater aquaculture of fishes is increasing rapidly and the current production is about 632 thousand metric tons. Based on the data collected in the present study, it may be concluded the ponds are mostly used resources for freshwater aquaculture in Bihar. Bihar is rich in resources such as reservoirs, rivers, ponds etc, which are majorly unutilized and need to be used for enhancing fish production in the state (Kumar *et al.*, 2020). Loss of natural habitats, exotic species over fishing has caused decline in fish production from rivers. This need to be curb down via enactment of strict rules and regulation for sustainable utilization of rivers (Maurya *et al.*, 2018) Prawn aquaculture is a recent and profit -making industry (Pandey *et al.*, 2009). Freshwater prawn culture in India is prevalent in about 34,630 ha with a total production of 30,450 mt (Balamurgan *et al.*, 2004). Though, Bihar is rich in freshwater resources and have ideal conditions for prawn aquaculture it is yet to be explored and utilized in the state (Sultan, 2003). Smaller prawns, *M. lamarrei* & *M. dayanum* “an untapped resource” can be future prospective along with the culture of larger prawn species.

REFERENCES

1. Lalrinsanga, P.L, Pillai, B.R, Patra, G, Mohanty, S, Naik, N.K, et al. (2012) Length-weight relationship and condition factor of giant freshwater prawn *Macrobrachium rosenbergii* (De Man, 1879) based on developmental stages, culture stages, and sex. Turk J Fish Aquat Sci 12:123-129.
2. Rungsin, W, Paankhao, N, Na-Nakorn, U (2006) Production of all-male stock by neofemale technology of the Thai strain of freshwater prawn, *Macrobrachium rosenbergii*. Aquac 259: 88-94.

3. Lodhi, H.S, Shukla, Sanjive.(2020) Morphological and Histochemical characterization of haemocytes of freshwater prawn, *Macrobrachium dayanum* (Crustacea-Decapoda). Uttar Pradesh J. Zoology. 41(10):109-120.
4. Manush, S.M, Pal, A.K, Das, T, Mukherjee, S.C (2006) The influence of 25 to 36°C temperatures on developmental rates, morphometrics, and survival of freshwater prawn (*Macrobrachium rosenbergii*) embryos. Aquaculture 256: 529-536.
5. Ranjeet, K, Kurup, B.M (2011) We are standardizing stocking density for freshwater prawn *Macrobrachium rosenbergii* (De Man, 1879) farming in coconut garden channels. Asian Fish Sci 24: 354-366.
6. Singh S, Chauhan RS (2014) Study on Growth and Survival of Giant Freshwater Prawn, *Macrobrachium rosenbergii*, in Tarai Agroclimatic Regime of Uttarakhand. J Ecophysiol Occup Hlth 14: 165-170.
7. Janaki, Ram, K, Pandey, A.K(2003). Status and prospects of aquaculture development with special reference to Uttar Pradesh. In: Brain Storming Session on Production Status and Potential of Fisheries in U.P.: Uttar Pradesh Council of Agricultural Research. Lucknow, Constraints and Opportunities 24-38.
8. Jayasankar, P.(2018) Present status of freshwater aquaculture in India- A review. Indian Journal of Fisheries.;65(4):157-165.
9. Kanoujia, D.R.(2006) Freshwater prawn breeding and culture in: Handbook of Fisheries and Aquaculture (S. Ayyappan Ed.): Directorate of Information and Publication in Agriculture (ICAR), New Delhi, 293-306.
10. Nair, C.M, Nambudiri, D.D, Jose S, Sankaran, T.M, Jayachandran, K.V, Salin, K.R. (2016) Freshwater prawns: Advances in Biology, Aquaculture and Marketing. Allied Publishers, New Delhi & Mumbai. Newsletter of the National Fisheries Development Board. 7(5):1-64.
11. Pandey ,A.K, Upadhyay, A.S, Lakra, W.S.(2009) Diversity of Commercially Important Freshwater Prawns and their Aquaculture Potential in India. J. Exp. Zool. India.;13:121-128.
12. Pathak, A.K, Sarkar, U.K, Dayal, R, Singh, S.P.(2019) UPF Base—A freshwater fish diversity database of Uttar Pradesh, India. Indian J. Anim. Sci.;89(3):347-354.
13. Radheshyam.(2009) Farming the Freshwater prawn, *Macrobrachium malcolmsonii*. Aquacult. Asia. 13:29-32.
14. Sankar, G, Elavarasi, A, Sakkaravarthi, K, Ramamoorthy, K.(2011) Biochemical changes and growth performance of Black tiger Shrimp larvae after using *Ricinius communis* extracts as feed additive. Intl. J Pharm. Tech. Res. 3:201-208.
15. Sen, P, Tiwari, K.J, Shukla, S, Sharma, U.D. (2008) Pathomorphological changes in gills of fresh water prawn, *Macrobrachium dayanum* (Crustacea-Decapoda) exposed to Cadmium. National Conference on Recent Advances in Life Sciences held at Meerut College, Meerut ,95.
16. Shukla, S, Shukla, R, Sharma, U.D.(2021) Histopathological effects of detergent, Linear Alkyl benzene sulphonate on hepatopancreas of freshwater prawn, *Macrobrachium lamarrei* (Crustacea-Decapoda). International Journal of Fisheries and Aquatic Studies. 9(6):230-233.
17. Singh, H. Record growth and production of giant freshwater prawn, *Macrobrachium rosenbergii* in Haryana-new possibilities. In: International Symposium on Freshwater Prawns College of Fisheries, Kerala Agricultural University, Cochin, 2003,96.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details