

A road map for scaling up of freshwater prawn (Scampi) farming in India

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This article discusses the current status, challenges, and potential for the revival of scampi farming in India, focusing on the states of Andhra Pradesh, West Bengal, and Odisha. It highlights the decline in scampi production over the years due to various factors such as poor seed quality, disease outbreaks, and increased farming costs. However, recent initiatives, including the development of a genetically improved scampi breed and promotion of polyculture, show promise for revitalizing the industry. The article proposes an action plan to achieve a target production of 50,000 tonnes of scampi annually by promoting polyculture and establishing new hatcheries. It emphasizes the need for collaborative efforts among policymakers, research institutions, hatchery operators, and farmers to realize the potential of scampi farming in India.

Keywords: Freshwater, Hatcheries, Polyculture, Prawn, Road Map, Scampi

THE giant freshwater prawn (*Macrobrachium rosenbergii*), also widely known as 'scampi', is an indigenous freshwater prawn species of India, inhabiting rivers, canals, estuaries, and coastal waters. It is one of the most important cultivable species in freshwater systems due to its high price, large size, faster growth, good taste, and high export demand. It can be cultured either in freshwater or slightly brackish water (<7 ppt) and both in monoculture or polyculture systems. The natural stocks of this species from Indian rivers and estuaries have significantly reduced due to various anthropogenic activities, such as dam construction, pollution, and destructive fishing in natural waters.

Present status of scampi farming in India

According to the production data of scampi by the Marine Products Export Development Authority of India, the total production of farmed scampi in 2021-22 was 21,317 tonnes (MPEDA 2023), which is nearly 50% less than the highest production of 42,800 tonnes reported in 2005. Now,

the major scampi farming states are Andhra Pradesh and West Bengal. The production reported from Maharashtra and Gujarat are from reservoir stocking. Other than these states, only Odisha and Tamil Nadu reported some production in 2021-22 (Table 1). Andhra Pradesh is the top scampi producer in India followed

by West Bengal and Odisha. In Andhra Pradesh (AP), most of the farmers practice monoculture of scampi at lower stocking density of 30,000/ha. Most of the production from other states comes from village ponds and reservoirs or small-scale polyculture practiced by marginal and small farmers in these states.



A haul of prawns

Table 1. State-wise production and area under culture of *M. rosenbergii* from 2014-15 to 2021-22 (Source: MPEDA).

State		2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
West Bengal	AUC	4773	6305	4628	#	#	#	7745	7745
	EP	3448	3780	2421	5024	2784	3307	3373	3037
Odisha	AUC	1565	1787	921	#	#	#	1675	1637
	EP	598	1504	769	1619	1118	1235	1074	976
Andhra Pradesh	AUC	695	25	17	#	#	#	427	1772
	EP	688	1207	14	167	329	1580	335	13,399
Tamil Nadu	AUC	125	239	540	#	#	#	76	220
	EP	24.5	86	144	90	111	38	41	70
Kerala	AUC	2149	4294	45	-	0	#	2	0
	EP	185	263	29	-	0	1.08	0.22	0
Maharashtra	AUC	-	54	-	-	#	#	179650	1,79,650
	EP	1835	2002	-	1463	1350	1469	1497.87	2415
Gujarat	AUC	-	-	-	-	#	#	#	0
	EP	1210	1310	-	1620	1530	1890	1982	1420
Total	AUC	9,307	12,704	6151	#	#	#	9924	11,379
	EP	7,989	10,152	3377	9983	7222	9540	8303	21,317

*AUC - Area under culture; EP - Estimated production; #Area under village farms and reservoirs

Scampi farming rose to prominence in AP during the late nineties when shrimp farmers who were incurring losses due to white spot disease were looking for an alternate species. During 1999-2000, the scampi cultivation area in the state was 6,510 ha, and the productivity was below 700 kg/ha. By 2002-03, the farming area increased to 21,580 ha and the production rose to 27,020 tonnes, taking the productivity to 1,250 kg/ha. Scampi farming was mainly concentrated in the coastal districts of AP i.e. east and west Godavari, Krishna, Guntur, Prakasam and Nellore. Nellore, the southernmost coastal district of AP produced the bulk of production till 2005. However, the production started to decline from 2006 onwards. Poor quality of seed was a major problem faced by farmers, which led to slow growth and poor survival thereby decreasing production. This led to a decline in the profit margin of scampi farmers. Outbreaks of diseases also caused low survival and poor scampi production. In addition, increase in the cost of farming (cost of feed, labour, and energy) and the static nature of farm gate prices led to a reduction in profit from farming and forced farmers to shift to other

fish species such as carp, pangasius, and shrimp (vannamei) thereby drastically reducing the area under scampi culture and production. However, from 2020 onwards, the scampi production showed signs of revival in AP, the production increasing to 13,399 tonnes in 2021-22. The availability of fast-growing genetically improved scampi breed 'CIFA-GI Scampi®' through the multiplier scampi hatcheries in AP has a major role in this increase in scampi production in AP.

In West Bengal (WB), the scampi production is going on in two districts viz. East Medinipur and North 24 Parganas. Tentulia in Bilbally areas of North 24 Parganas is the major hub of scampi farming in WB. Bilbally is a low-lying area of more than 20,000 ha fed by River Sonai. In this area, nearly 600 ha is presently under scampi culture. A team of scientists from CIFA visited some of the farms in Tentulia and interacted with the farmers in December 2017. Culture was going on during the time and the prawn size was around 50 g. Polyculture of scampi and Indian major carps (IMC) is practiced in this area. Nearly 5000 small farmers are involved in scampi farming in the

area. Culture is based on the wild seed as the farmers are not happy with the quality of hatchery seed. They informed that hatchery seed was showing a poor growth rate, so they shifted to wild seed. The farmers stock 20,000 to 30,000 post larvae (10 mm size) per acre. Seeds are collected from nearby rivers during April and culture continues up to March next year. As there is no scampi feed available in the market, the farmers use vannamei feed at ₹100/kg. Harvest starts from October onwards and continues till March. In six month (October), the harvest size is 40 to 50 g and by end of 8th month (December), it would be 80 g. There is a dedicated market for scampi in Tentulia, where every day from October till March, scampi is sold by local farmers by auctioning. The rate they receive for 30 g is ₹400/kg and for 80 to 100 g, they receive ₹500/kg (2017 price). Farmers report net revenue ranging from ₹ 2.0 to 4.0 lakhs/acre. They get a production of 900 to 1000 kg per acre. Larger fish seeds (yearling of 150-200 g) are stocked at a very low density of 500/acre. Farmers experience some diseases like black gill, rostral deformity, and antennae cut. As they are earning good profits, they are planning to continue the scampi culture.

In Odisha, the polyculture of scampi is practiced by small-scale carp farmers mainly in the coastal districts of Balasore, Kendrapara, Bhadrak, Jagatsinghpur, Puri, and Khordha. In addition, farming is also practiced in non-coastal districts on a small scale. Around four backyard-type hatcheries are producing 1-2 million seeds per annum and one medium-scale hatchery with a production capacity of 30 million seeds are catering to the local seed demand. Many farmers still depend on wild seeds. Besides these, an innovative and low-cost technique of seed production of scampi in small brackish water ponds is going on in West Bengal and Odisha for the last few years. This is practiced mostly in East Medinipur district in West Bengal and Balasore district in Odisha. This is a seasonal operation and is practiced from February

to June when the salinity is high in the brackish water canals. The seeds obtained through this method are larger in size compared to the hatchery seed and are healthy as they are produced in the pond itself and, therefore, have good demand. The normal production of scampi from polyculture ranges from 200 to 400 kg/ha and the usual farm gate price is ₹350/kg for 50 g size (20 count). The price may go up to ₹600/kg in non-coastal states due to the high demand. The scampi seed is now selling at ₹1 to 1.50/pc. There is a good demand for scampi seed in Odisha at present and a good scope for expansion.

Current market demand and price

Scampi has good demand in the domestic as well as export market and the price usually vary depending on the size. Larger-sized prawns (>100 g) fetches higher prices compared to smaller-sized prawns (<30 g). The rate for 50 g prawn (Head-on) ranges from ₹300 to ₹350 in most parts of the country. The price may go up to ₹600/kg during festive seasons. For the export market, the exporters require an assured minimum supply of 40 tonnes to load one container so farm clusters are essential to promote the export market.

Potential states for the Scampi farming

India has vast freshwater resources, including 2.38 million ha of ponds and tanks, and 0.798 million ha of *bheels* and oxbow lakes, that can be used for freshwater prawn culture. Besides, some of the 1.44 million ha of available brackish water area in the country can also be made available for freshwater prawn culture. With little concerted effort, freshwater prawns can be easily incorporated into the existing carp-based aquaculture system, as prawns are compatible with the major carp. Potentially all the earthen ponds and tanks available in states in southern (Kerala, Tamil Nadu, Karnataka, Telangana), eastern (Odisha, AP, WB), and western (Maharashtra, Gujarat, Rajasthan) parts of the country as well as inland states (Bihar,



Adult male

Jharkhand, Chhattisgarh, Uttar Pradesh) can be used for scampi farming. Only upland areas, like Himachal Pradesh, Uttarakhand, Jammu and Kashmir, etc., are not suitable for scampi farming due to low ambient water temperature.

Fish species compatible with the Scampi culture system

Scampi is a bottom-dwelling species and mainly feeds on small animals like worms, crustaceans, bottom detritus, and plant materials available on the pond bottom. In polyculture systems, surface feeders and column feeders, like rohu, catla, silver carp, and minor carp are recommended. The bottom feeders, like mrigal and common carp and carnivorous fish species, should be avoided in the scampi polyculture system. The carp-scampi polyculture system is most widely practiced in the country.

Measures for the revival of scampi farming

Development of a genetically improved fast-growing breed of scampi: Scampi, being an indigenous species, has several advantages as a cultured species. It is readily available in most of the major river systems in the country, has very good domestic as well as international market demand, and

fetches good prices. Besides these, technology for breeding and seed production is available. It can be cultured along with carp, integrated with rice cultivation and cultured in low-saline coastal sites also.

Considering the immense potential of scampi farming in increasing aquaculture production as well as the income of farmers, it is essential to work towards reviving the culture of scampi. One way to achieve this is by developing a fast-growing strain of scampi through selective breeding. Towards this goal, the ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA) in collaboration with the WorldFish (an international research organization headquartered in Malaysia) started a systematic selective breeding program for improving the growth rate of *M. rosenbergii* in 2007. A base population was formed with wide genetic base populations of scampi from three geographically distant locations in India (Gujarat, Kerala and Odisha) to start selective breeding. Selection for harvest body weight was carried out for 14 generations (from 2007 till now). The grow-out performance of the 9th and 10th generation of selectively bred scampi was evaluated in farmers' ponds in Odisha. The average daily growth of improved breed recorded in the

farmer's field ranged from 0.17 to 0.48 g which was significantly higher than that of the farmers' stocks. Dissemination of the improved breed to the scampi farmers through multiplication scampi hatcheries is one way to revive the scampi farming. The improved breed developed through selective breeding was registered as CIFA-GI Scampi® in 2020. To disseminate CIFA-GI Scampi® to farmers across India, ICAR-CIFA has selected five scampi hatcheries from AP and signed an MOU with them for the multiplication of CIFA-GI Scampi®. These selected hatcheries will act as multiplier hatcheries (MH) of CIFA-GI Scampi® and will raise the broodstock of CIFA-GI Scampi® as well as produce the seed and supply it to farmers. A total of 1.99 lakh and 1.83 lakh brood seeds of the latest generation of CIFA-GI Scampi® were supplied to the MHs in 2022 and 2023 respectively. It is hoped that in coming years, the MHs will be able to disseminate the CIFA-GI Scampi® to farmers across India and help in enhancing GP production in the country. ICAR-CIFA is also supplying improved scampi seed to the National Freshwater Fish Brood Bank (NFFBB) established by NFDB at Kausalyaganga in Bhubaneswar for broodstock raising. NFFBB is now supplying improved broodstock of scampi to interested scampi hatchery operators in Odisha and AP.

Promotion of polyculture: Active promotion of the polyculture of scampi with Indian major carps (IMC) is another way of reviving scampi farming as we have nearly 0.80 million hectares of area under carp culture and scampi can be easily incorporated in this as a bottom feeder. If we can incorporate scampi as a bottom component in 10% of the present area under carp culture, then we can expect to have an additional production of 32,000 tonnes. In India, larger size scampi (>50 g) is preferred as it fetches good price and polyculture yields large size prawns. Farmers can get additional income with minimum effort. However, for this, we need to have a sufficient supply of good



Blue claw male

quality scampi seed. More concerted efforts are needed to bring more hatchery operators to scampi seed production. The government has brought a new ambitious scheme called *Pradhan Mantri Matsya Sampada Yojana* (PMMSY) in 2021 that has several schemes for both fish/prawn farmers and hatchery operators. Increased awareness of farmers on this and similar beneficial schemes of the state fisheries department would bring more farmers into scampi farming.

Development of dedicated nurseries for the supply of larger size juveniles:

For stocking in polyculture ponds, 40-60 days old juvenile prawns are preferred. Juvenile prawns (>2 g) are hardy compared to delicate post larvae (0.02 g) and can withstand environmental fluctuations, therefore, farmers get good survival during culture. Thus, juvenile stocking is essential to get good survival and yield from polyculture. State government agencies may consider demarcating nursery ponds for raising large-size prawn juveniles for supplying to polyculture ponds. Juveniles can fetch much higher prices compared to post-larvae (PL). As the survival during 40 to 60 days in nurseries can be 80% or more, the nursery growers can earn a good profit if a continuous supply of PL is ensured.

Establishment of a dedicated brood bank for scampi: During the peak production period of scampi in early 2000, the majority of the scampi hatchery owners were sourcing broodstock either from wild or

from grow-out ponds which led to the deterioration of the seed quality over time resulting in poor growth and survival during grow-out. This reduction in productivity is one of the reasons cited by many farmers for exiting scampi farming. The establishment of a dedicated brood bank near a commercial hatchery would ensure the supply of good quality brooders to the hatchery. However, a tie-up with one or two existing hatcheries before the establishment of a brood bank is essential. ICAR-CIFA established the first brood bank for scampi in Nellore in collaboration with the College of Fisheries, Muthukur, Nellore in 2012. However, the closure of many scampi hatcheries in the vicinity of the brood bank affected its functioning as there were no takers for the broodstock raised by the brood bank.

Cluster approach: In India, more than 90% of freshwater prawn farmers belong to the small or marginal category with operational holdings of less than two hectares per individual. Each of the farmer's production systems is independent and the culture operations are different from that of nearby farmers. Most of them practice traditional methods for operating their farms and do not have access to scientific farming techniques. The promotion of cluster farming has resulted in substantial benefits to shrimp farmers as demonstrated by MPEDA in Andhra Pradesh. The same cluster approach would be beneficial to scampi farmers also.

Cluster refers to interdependent aquaculture ponds often situated in a specified geographical locality and near each other where all members of the cluster have similar production systems, cultures same species and share resources or infrastructure. The cluster approach enables participating farmers to organize the schedule of farm operations, quality seed procurement, simultaneous stocking, water exchange, and harvesting regimes contributing to a substantial reduction in the cost of production. The unity gives them bargaining power to deal with the local government departments to get subsidies or other assistance. The members can reduce the production cost through efficient use of resources, avoiding unwanted chemicals and antibacterial agents, and sharing of expenses for culture operation.

Fisheries departments of state governments can play a major role in forming clusters for scampi farming. Clusters should be linked with a scampi hatchery for the assured supply of quality seed and also with a feed supplier. Marketing channels also need to be developed to prevent low prices due to higher production.

The Department of fisheries of the Government of India has set an ambitious target of one lakh tonnes of scampi by 2030. An action plan for the production of 50,000 tonnes of scampi per annum is detailed below as a first step in this direction.

Action plan for the production of 50,000 tonnes of scampi per annum

As indicated in the earlier section, scampi farming at present is practiced in West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu, mostly by the small and marginal farmers who are practicing polyculture with mainly wild collected seeds except in AP where monoculture is practiced. Though there are a few small backyard-type hatcheries in Odisha and Tamil

Nadu and some large hatcheries in AP are producing and supplying scampi seed to farmers, many of the existing farmers in West Bengal and Odisha still depend on wild seed collected from rivers, or seed produced in brackish water ponds by few innovative farmers in Dhiga area of West Bengal and Balasore area in Odisha.

Any expansion in the culture area would require the establishment of new hatcheries. As the current production is around 20,000 tonnes, we need to produce an additional 30,000 tonnes to meet the 50,000 tonnes target. The tentative requirement of seed, hatcheries, and pond area for the production of an additional 30,000 tonnes of scampi production is given here. The strategy for the proposed production is to actively promote polyculture with carp farming in existing small-scale carp farming areas (80-85% of the fish farmers in India are small and marginal) in potential states, like West Bengal, Odisha, AP, Tamil Nadu, Kerala, Maharashtra, Gujarat, Bihar, Chhattisgarh, Jharkhand, and Assam. For polyculture, the recommended stocking density is 10,000 to 15,000 scampi juveniles per ha along with carp fingerlings (6000 to 7000/ha). The expected production from polyculture is 500 kg/ha of scampi in 8 to 10 months and 5 to 6 tonnes of fish. Additional feed is not mandatory as the feed provided to fish will also be consumed by prawns. Further manuring of the ponds will enhance the natural bottom fauna on which scampi feeds.

Considering an average production of 500 kg/ha per annum from polyculture, it would require an area of 60,000 ha to produce an additional 30,000 tonnes per annum. The total seed requirement for 60,000 ha, at a stocking density of 10,000 scampi juveniles per ha, would be 600 million. Thus, small (<10 million PL/annum) or

medium-scale scampi hatcheries (30-40 million PL/annum) need to be established to meet the additional demand of 600 million seeds. A total of 60 hatcheries of 10 million capacity or 20 of 30 million capacity have to be established to meet the seed demand. The broodstock requirement for each hatchery of 10 million seed would be around 3000 and this can be raised in a 0.20 ha earthen pond. The potential states for scampi farming in the initial phase are West Bengal, Odisha, AP, Tamil Nadu, Kerala, Maharashtra, Gujarat, Bihar, Chhattisgarh, Jharkhand and Assam. Hatcheries can be established in coastal states and seeds can be transported to the inland states.

Wider dissemination of the genetically improved fast-growing breed of scampi will help the farmers to gain confidence in scampi once again. Some progressive farmers can be assigned to scale up the production of improved broodstock for supplying to hatcheries.

CONCLUSION

To put scampi back into its deserved prominent position in the aquaculture sector in India, concerted efforts are essential from all stakeholders, starting from policymakers, research organizations, developmental agencies, hatchery operators and scampi farmers. Earlier attempts to revive the sector were fragmented and were not supported by strong policy. Now, the central government and the new fisheries ministry have given a lot of importance to scampi farming. The state department and prospective entrepreneurs need to make use of the provisions in the newly launched *Pradhan Mantri Matsya Sampada Yojana* (PMMSY) to develop scampi farming in their respective states.

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