Sustainable coastal aquaculture in India

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Fisheries is a sunrise sector both at the national and state levels in India, playing a vital role in the economic development of the country. However, it was recognised as an important allied sector of Indian agriculture only after independence. When our country gained independence food storage was the most important problem and hence the First Five Year Plan addressed this issue almost exclusively. In order to evolve technologies for increasing fish production, the erstwhile Central Marine Fisheries Institute (CMFRI) at Mandapam and Central Inland Fisheries Research Institute (CIFRI) at Barrackpore were established in 1947. Since then, several fisheries research institutes have been formed. The vibrancy of the sector can be visualised by the 11-fold increase in fish production in just six decades, i.e. from 0.75 million tonnes in 1950-51 to 10.07 million tonnes in 2014-15. The unparallel average annual growth rate of over 4.5% over the years has placed the country on the forefront of global fish production, only after China. Besides meeting domestic needs, the dependence of over 14.5 million people on fisheries activities for their livelihood and foreign exchange earnings to the tune of 304 billion rupees (2014-15) from the fisheries produce, amply justifies the importance of the sector on the country's economy and also livelihood security.

Shrimp farming is the most important aquaculture activity of the coastal States and Union Territories along the 8,118 km coastline of India. Since the late 1980s the shrimp farming sector has witnessed a boom resulting in many entrepreneurs opting for setting up of hatcheries, feed mills and integrated farms in many areas of the coastal states. However, the unregulated growth of shrimp farming since 1990 has posed a number of social, ecological and economic issues mainly due to improper planning and lack of regulatory frameworks. The *Coastal Aquaculture Authority Act 2005* received the assent of the President of India on 23rd June 2005 and consequently was promulgated by the government. The Act provides for the establishment of a Coastal Aquaculture Authority (CAA) for regulating the activities concerned with coastal aquaculture in the coastal areas and for matters connected therewith or incidental thereto in the notified coastal areas and to promote responsible and sustainable aquaculture.

The major problem faced by the farmers practising the black tiger shrimp, *Penaeus monodon*, culture was the lack of quality seed. Viral infections, which plagued the shrimp sector, could not be contained and the shrimp production in the country declined to a level of 76,000 metric tonnes in 2008-09 from 140,000 metric tonnes in 2005-06. Consequently, the area under shrimp culture declined; many developed farms were abandoned; several hatcheries were closed. This was reflected in the decline in feed production and usage of other inputs, decline in exports of shrimps and loss of labour and the consequent impact on the livelihood of dependent coastal people. Crisis in the shrimp aquaculture prompted the farmers and hatchery operators to look for alternative species for culture and strategies to tide over the crisis. Considering the success of SPF *Litopenaeus vannamei* culture in many of the Southeast Asian countries and China, the Indian Government decided to introduce the species initially on experimental basis and based on the results of experimental culture and risk analysis studies, decided to allow commercial scale farming of SPF *L. vannamei* after formulating guidelines.

In view of the regulations, SPF *Litopenaeus vannamei* is taking strong roots in India and the results achieved thus far have been spectacular. Identification of broodstock suppliers based upon evaluation of genetic as well as disease status has ensured supply of quality SPF broodstock to Indian shrimp hatcheries. Farms with poor productivity have successfully been utilised for highly productive SPF *L. vannamei* farming with adequate biosecurity and effluent treatment systems. Cluster-based farming systems, where small-scale farmers with properties in a local area are brought together to cooperate, were introduced in order to facilitate farmers having small farm holding by having common ETS and biosecurity measures. Many abandoned shrimp farms, closed hatcheries and feed mills have been revived after the introduction of SPF *L. vannamei*. All these have culminated in Indian shrimp production and exports reaching all-time high levels with substantiall increased productivity, increased employment generation and development of many ancillary industries dealing with inputs, equipment and processing. In order to fully harness the advantage of the coastal aquaculture sector, all the stake holders need to comply with the notified statute, rules, guidelines and regulations of CAA and ensure that biosecurity is not compromised in hatcheries and farms and that good aquaculture practices (GAP) are adopted to prevent introduction and spread of diseases and negative impacts on the coastal environment.

Tiger shrimp farming

The coastal aquaculture activities in the country have been involved in the farming of three species, *L. vannamei, P. monodon* and scampi *(M. rosenbergii)*. Tiger shrimp farming has been undertaken for a long time and India dominated the international market for tiger shrimp, particularly for the Japanese market, in the past. Brackishwater aquaculture in India has been concentrated around the black tiger prawn as the single most important species.

In terms of farm area where tiger shrimp was cultured, we see a disturbing trend. The area under tiger shrimp farming halved from 157,400 ha in 2001-2002 to 71,400 ha in 2014-15, about a 56 % decline. The maximum area under tiger shrimp farming was 157,400 ha in 2001-02. West Bengal and Kerala were the two coastal states where traditional tiger shrimp farming is still undertaken, mostly as an extensive method of farming with minimal or no input use.

Farmed tiger shrimp production too followed a similar trend. It went down from 102,940 metric tonnes in 2001-02 to 73, 156 tonnes in 2014-15, declining about 29 %. It peaked in 2006-07 with an estimated output of 144,347 tonnes. West Bengal doubled its tiger shrimp production. Orissa too reported an increase but Kerala saw a decline in the output. The major loss was in the case of Andhra Pradesh which

reported a production of 51,230 tonnes in 2001-2002 which increased to 75,414 tonnes in 2006-07 but fell to a mere 2,962 tonnes in 2014-15. Thus, tiger shrimp production has become almost confined to traditional extensive farming in West Bengal, Orissa and Kerala. Though farmers evince interest in the revival of tiger shrimp farming the lack of availability of SPF tiger shrimp seed in the country still remains a constraint. The Department of Animal Husbandry, Dairying and Fisheries of the Ministry of Agriculture and Farmers Welfare is seized of the matter and has commenced permitting of broodstock multiplication centres (BMCs) for both *P. monodon* and *L. vannamei* to minimise dependence on supply of SPF broodstock from overseas.

L. vannamei farming

Decline in the tiger shrimp farming due to diseases particularly whitespot (WSSV) led to introduction of exotic Pacific white shrimp, *Litopenaeus vannamei*, because of its fast growth, perceived low incidence of native diseases, availability of specific pathogen free domesticated strains and culture feasibility over a wide salinity range with possibility of high density farming. With the production levels of 10-12 tonnes/ha/crop in 3-4 months the production of this species has reached to phenomenal levels.

The Coastal Aquaculture Authority was established in 2005, replacing the erstwhile Aquaculture Authority by an act of Parliament called The Coastal Aquaculture Authority Act, 2005 on the directions of the Supreme Court of India to regulate coastal aquaculture in the country. A risk analysis study on the introduction of SPF *L vannamei* broodstock from overseas for healthy seed production and farming was commissioned and the central Institute of Brackishwater Aquaculture (CIBA) was engaged to carry out the study. Also, pilot scale import of the SPF broodstock was permitted to two private hatcheries for seed production and farming. Based on the recommendations of the study as well as on the results of pilot scale shrimp seed production and farming it was decided to allow import of SPF *L vannamei* broodstock for healthy seed production and farming in 2009. A process was carefully developed for this purpose. First the CAA will approve the farm and hatchery as per the guidelines framed for this purpose. Overseas suppliers of SPF *L vannamei* broodstock were shortlisted by the Technical Committee of the CAA based on certain features like the genetic history of the stock, disease free status as per OIE list, government guarantee that no OIE disease was reported in the country of origin of the supplier, etc. The approved hatchery would then obtain a Sanitary Import Permit (SIP) from the Union Ministry of Agriculture and Farmers Welfare based on the Annual Import Allocation order issued by the CAA. The Anna International Airport in Chennai, Tamilnadu State was designated as the single port of entry for the SPF broodstock into the country. Once the SPF stock enters the port then it would be taken to the Aquatic Quarantine Facility specially created for the *L vannamei* where it will be kept and tested for presence of OIC list of pathogens. After the clearance by the AQF the broodstock will be handed over to the hatchery operator who will then take it to the hatchery for seed production as per the CAA guidelines. The shrimp hatcheries shall abide by the technical guidelines and other rules of the CAA and the CAA regularly monitors the hatcheries for compliance of the guidelines.

Pacific white shrimp was farmed in 283 ha in 2009-10 when it was just introduced into the country to replace tiger shrimp. It recorded increase in the farm area continuously reaching 57,267 ha in 2013-14 but fell to 50,240 ha in 2014-15 due to diseases and other farm problems. In terms of production, Pacific white shrimp output was estimated at 1,731 tonnes in 2009-10 which rose to 353,413 tonnes in 2014-15 recording increase in the farm production every year. The trend is expected to continue in future too.

Sustainable farming

CAA has been taking steps to ensure compliance with technical guidelines and related rules for sustainable coastal aquaculture in the country. It shortlists overseas suppliers for SPF *L. vannamei* broodstock. The registered hatcheries should import such stocks from them only after obtaining Sanitary Import Permit (SIP) issued by the Union Ministry of Agriculture and Farmers Welfare. The hatcheries should use the imported SPF broodstock for six months only for seed production and after six months they should discard this stock and inform the CAA accordingly. CAA monitors this activity regularly. The Seafood Exporters Association of India has signed an MoU with the CAA under which CAA supplies the list of importers of the SPF *L. vannamei* broodstock for the last six months which the Association publishes in the newspapers in Andhra Pradesh. CAA also publishes the list in its website www.caa.gov.in. This initiative was undertaken to disseminate information on actual importers of broodstock so that the shrimp farmers could buy healthy seeds from any of them. Any registered farmer could also complain to CAA if unhealthy seeds were sold to them.

Disease is another major issue and many institutions are involved in addressing this issue. The Central Institute of Brackishwater (CIBA), Chennai, MPEDA, RGCA and state fisheries colleges are undertaking regular disease monitoring activities and necessary advisories are issued by the competent authority. Good management practices (GMP) are to be followed by the stakeholders. Many awareness and capacity building programmes are being undertaken regularly by all relevant institutions. CAA also conducts Trainers Training Programme (ToTs) to the officials of the state departments of fisheries on such issues besides the technical and legal aspects of coastal aquaculture.

CAA is mandated with registration of inputs and formulation of standards for the inputs used in coastal aquaculture. Accordingly it started registering such inputs since 2015. So far 842 input products from 135 companies under 8 categories have been registered by the CAA and the farmers are advised to use these products as they were certified free of antibiotics. Rejection of Indian exports of marine products had become another major issue and all institutions are engaged in addressing this issue at their respective level. The list of such registered products are available in the CAA website. CAA plans to make this voluntary initiative into a mandatory activity and CAA will regulate the use of the inputs in accordance with the CAA Act 2005 and other relevant guidelines and notifications for sustainable coastal aquaculture.

Conclusion

Pacific white shrimp has successfully replaced tiger shrimp in India, thanks to the rigid policy framework implemented by the CAA with necessary government support besides other

related government institutions. CAA registers all coastal aquaculture activities in the country and the area between HTML and 2 km towards land comes under its jurisdiction besides saline waters like estuaries, backwaters, lagoons, etc. It is headed by a chairperson, a judge of the High Court (the apex court in each state in the country) and run by a member secretary who is an academician of not less than 25 years of academic or research experience in coastal aquaculture and holds the rank of Additional Secretary in the Union Government. It has experts in coastal aquaculture, environment protection, trade, agriculture in addition to four representatives (usually secretaries or commissioners of fisheries) from coastal states on rotation basis. It has various committees to shortlist overseas suppliers of shrimp brood-stock, and to undertake technical work relating to aquatic quarantine activities among others. It registers all coastal aquaculture activities in accordance with the *Coastal Aquaculture Authority Act* 2005, rules, regulations, government notifications and technical guidelines and has legal power to close down any such activity which does not conform to these rules. It is registering all coastal aquaculture inputs to ensure that they are antibiotic free. The CAA is working for the sustainable coastal aquaculture towards the goal of doubling the coastal aquaculture output in the next few years.