Ciba Extension Series No. 68

FARMING OF INDIAN WHITE SHRIMP, *Penaeus indicus*

(Under Tribal Sub Plan)

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Brackishwater aquaculture in India is synonymous with shrimp farming and a single species i.e. Whiteleg shrimp, *Penaeus vannamei* dominate the Indian shrimp industry. *P. vannamei* is an exotic shrimp, native to the pacific coast of North America. *P. vannamei* is also the largest farmed species of shrimp around the world in terms of production and area under culture. However, off late the culture of *P. vannamei* in India has been seriously affected by an array of issues like emerging diseases, poor growth, lower success rates, higher incidence of viral diseases and rising productions costs. Several of these issues are an effect on over dependence on a single species. Indian white shrimp, *Penaeus indicus* is an indigenous candidate species of shrimp that can bring about diversification in the sector and act as supplementary species to the exotic *P. vannamei* to sustain the Indian farmed shrimp production. Most shrimp farming regions in the Gujarat coast experience high salinities and *P. indicus* has a preference for such hyper saline conditions, thus making it a suitable species for Gujarat. Low density farming of *P. indicus* in monoculture or along with brackishwater finfish can also be used as an alternate livelihood option for coastal tribal communities.

Species

Shrimp aquaculture in India began with Indian white shrimp in the eighties and nineties and gradually gave way to the faster growing tiger shrimp, *P. monodon* and subsequently replaced by *P. vannamei* post 2009. *P. indicus* is a fast growing shrimp and PL produced from captive wild caught brooders exhibit similar or superior growth to domesticated SPF *P. vannamei*. *P. indicus* is a euryhaline shrimp and can grow optimally at salinities ranging from 5 ppt to 50 ppt. The species attains an average body weight of 18 to 20 g in 100 to 120 days of culture (DOC). Indian white shrimp is also amenable to high stocking densities although commercial

operations keep stocking densities at 30 PL/m^2. However, at higher stocking densities there are reports of productions to the tune of 16-18 tonnes/ha/crop for *P. indicus*. *P. indicus* being an indigenous species the production of disease free stocks would be easier and cheaper and it is not the natural host for an array of diseases that affect *P. vannamei*.

Site Selection

Standard procedures followed for the identification of suitable sites for shrimp farming holds good with the farming of *P. indicus* as well. The optimal water and soil quality parameters required for the culture of *P. indicus* is shown in the table. Site selection for shrimp aquaculture shall also follow the regulations by Coastal Aquaculture Authority and it is mandatory that all shrimp farms are registered under CAA.

Table: Optimum water and soil quality parameters for *P. indicus* culture

Water quality variables			Soil Quality parameters	
Sr. No.	**Parameter**	**Optimum range**	**Parameter**	**Optimum range**
1	**Salinity**	10-25 ppt (Range 5-50 ppt)	**Soil type**	Sandy clay, Clay loam or sandy clay loam
2	**pH**	7.5 -8.5	**Soil pH**	6.5 to 7.5
3	**DO**	>4 ppm	**Organic carbon**	1.5-2.0%
4	**Temperature**	23-32°C	**Calcium carbonate**	>5%
5	**Alkalinity**	150 to 200 ppm	**Electrical conductivity**	>4 dS m^{-1}
6	**NH_3-N***	<0.01		
7	**NO_2-N***	<0.01		

Pond design considerations

Ponds shall be provided with a water outlet structure (monk or sluice gate) for ease of harvesting and water exchange. Ponds shall have a design water

depth of 1.8 to 2.0 m in order to hold 1.2 to 1.5 m of water. A free board of 30-50 cm may be provided in the dyke to prevent over tipping during heavy

rains or winds. Pond bottom slope of 1% may be provided towards the water outlet structure. Rectangular or square shaped ponds may be used for this *P. indicus* culture and the recommended pond size is 0.4 ha or 4000m^2. Lined ponds may also be employed for rearing of *P. indicus*. A reservoir pond of greater depth and size based on the area and number of the growout ponds may also be constructed to ensure biosecurity.

Pond preparation

Pond bottom soil should be allowed to dry and crack after harvest of the last crop and fallow period (inter crop duration) of 30-40 days may be provided. Sludge on the pond bottom may be removed and placed away from the dykes. The pond bottom soil may be tilled using a cultivator and excess soil at the bottom or dyke sides which has settled down shall be lifted and placed back in to the dykes for strengthening. Depending on the pH of the pond bottom soil and based on quantity of organic matter present, liming shall be done and soil may be tilled again for proper mixing. Following this, pond bottom may be compacted using a tractor or other heavy machinery depending on the stocking density and proposed number of aerators to be used. Following this filling of water shall be initiated.

Biosecurity

Biosecurity is vital for any form of shrimp aquaculture. A reservoir pond of required size and depth based on the number and area of grow out ponds are mandatory. Water pumped in to the reservoir pond may be disinfected using bleaching powder or other commercial sanitizers prior to pumping in to the grow out ponds. Additionally, fertilisation, application of probiotics and mineral mixtures may also be carried out in the reservoir pond to minimise issues in growout pond. The dyke of the growout and reservoir ponds shall be secured with crab fencing made using shade netting/PVC

netting of small mesh/120-150 gsm plastic sheets to prevent entry of crabs in to the shrimp pond. Bird fencing using large meshed nylon netting or nylon twines may be erected on the upper side of the pond to prevent entry of birds in to the ponds. Biosecurity measures are carried out to prevent the entry of external pathogens in to the shrimp pond. Foot dips, hand dips and tyre baths may also be provided at the farm for disinfection of farm tools, and labourers etc.

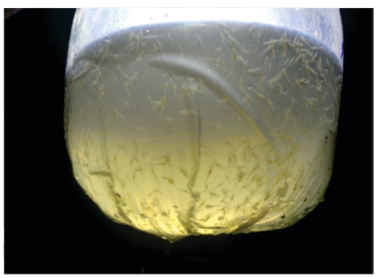
Fertilisation

The disinfected water may be fertilised using inorganic fertilisers, organic slurry or commercial plankton booster formulations. ICAR-CIBA has developed a plankton booster formulation CIBA Plankton^{Plus} made from fish slaughter waste which has been giving excellent phytoplankton and

zooplankton bloom resulting in high survival, lower FCR and faster growth, may also be applied if necessary. Fertilisation may be repeated in case bloom fails to develop. Once sufficient bloom has been noted or the transparency readings denote 25-45 cm range, stocking shall be carried out. Water quality analysis shall be carried out prior to stocking. If blooms fail to emerge even after frequent fertilisations, liming and chain dragging may be carried out. Liming can also be done in case of water pH being less than 8.0. Aerators may be switched on during fertilisation to ensure uniform distribution of the contents around the pond.

Stocking

Hatchery reared *P. indicus* PL 10 to PL15 are ideally suited for stocking to growout ponds. The seed shall be screened for WSSV, EHP and IMNV prior to stocking using standard PCR techniques. The seed shall be acclimated to the required salinity from the hatchery and transported in media of salinity similar to that of the salinity of the target pond. In case the pond water salinity is more than 35 ppt, seed may be transported at 30-35 ppt and the PL can be acclimated to the higher salinity at the pond site. In such cases keep an FRP tank, aquarium blower and oxygen cylinder handy for acclimation process. Salinity shall



be increased at the rate of 4 ppt/hour and the seed can be released in to the pond by siphoning. Similar procedure may also be followed in case hatcheries that are unable to provide seed at lower salinities. However, in case of salinity drop below 10 ppt the rate of salinity reduction shall be kept at 3 ppt/hour. It is recommended to have a stocking density not exceeding 30 PL/m^2.

Feeding and water quality management

Commercial Indian white shrimp formulated feeds are not available in the markets and hence *P. vannamei* feeds may be used. ICAR-CIBA has developed specially formulated feed for *P. indicus* which has a higher protein level than commercial white shrimp feed based on nutritional

requirements of the species. Crumbled feed may be broadcasted until the average body weight reaches 3.5 g following which pelleted feed shall be

broadcasted. Feed shall be broadcasted 4-5 times a day in equal or varying ration sizes. Blind feeding shall be carried out until 30 DOC and subsequently feed volume shall be adjusted based on the average body weight, estimated survival rates, and check tray observations. For a unit of 4000m^2, four check trays may be installed for optimal recording of feed data. Water and soil probiotics may be applied once every fortnight based on water quality data. Additionally, organic juice application may be carried out on weekly or fortnightly basis to maintain optimum water quality and C:N ratio in the water. Addition of mineral supplements in feed or water and other feed supplements like Vitamin C or immuno-stimulants may be given depending on the pathological status of the animal and shall not be broadcasted unnecessarily to minimise production costs. Aerators shall be operated continuously from 30 DOC onwards during the late evening and early morning hours. Subsequently operation of aerators shall be regulated depending on ABW, DOC, estimated stock, weather conditions etc. As a thumb rule 1HP aeration is required for 500 Kg of biomass.

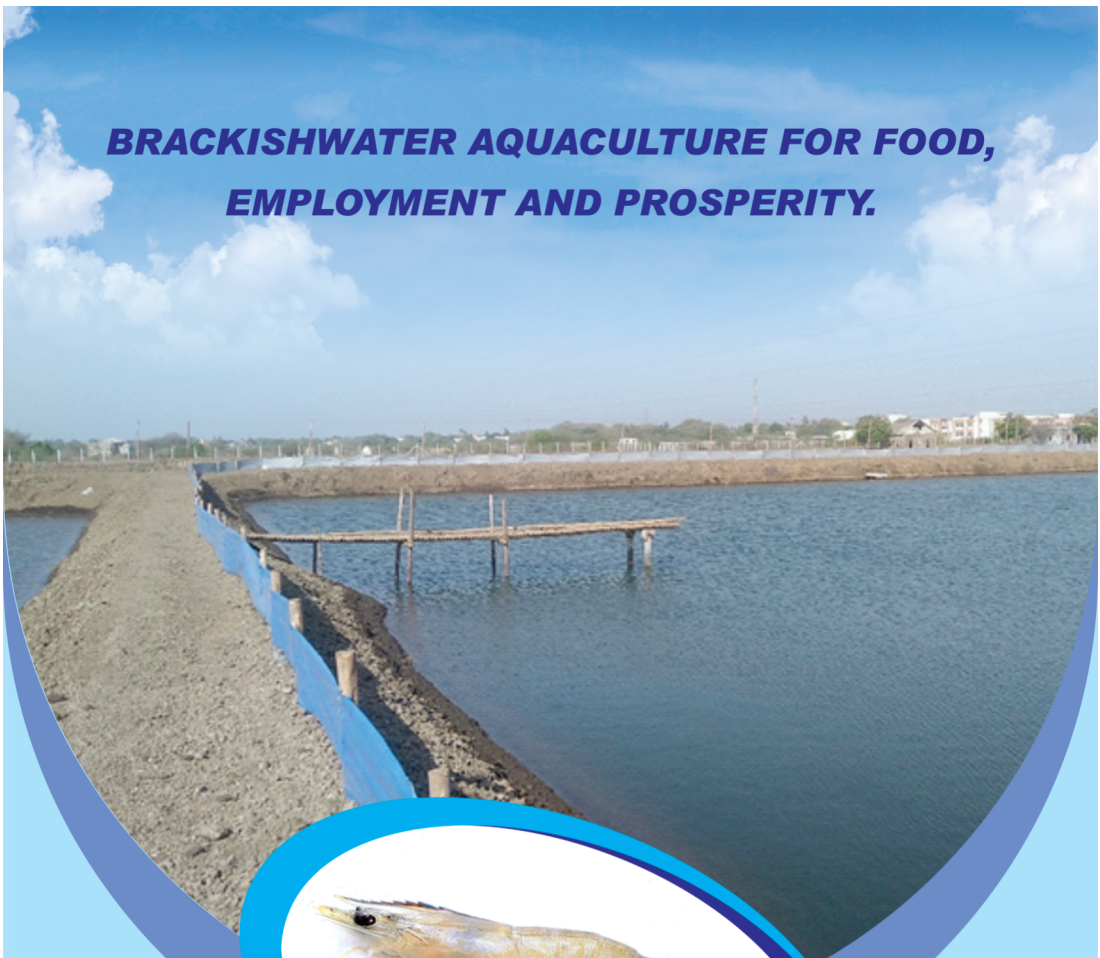
Disease management

Maintaining optimal water quality parameters in the pond is pivotal for disease management. There are an array of viral diseases that can cause large scale mortality in shrimp ponds for which no treatment exist. Outbreak of viral diseases can be controlled only through rigorous biosecurity, selection of disease free PCR screened seed, usage of certified products and proper management. Bacterial infections especially Vibriosis causes significant losses during the culture and arise mostly due to poor water quality, stressed shrimp and over feeding. Most diseases can be prevented through maintenance of optimal water quality and proper feed management. In case of severe bacterial infections, application of permissible antibiotics (CAA guidelines) may be carried out at requisite levels. Withdrawal period of these antibiotics shall also be kept in mind before harvest to avoid antibiotic residue in shrimp muscle. Continuous and repeated application of antibiotics may be avoided.

Harvest and economics

P. indicus attains an average body weight of 20 g in 100-120 DOC and can be harvested at the desired size. Subsequent rearing also may be done to produce larger sized shrimp that shall fetch a premium price. *P. indicus* fetches similar or higher price to exotic *P. vannamei*. From a 4000 m^2 pond stocked with 1.2 lakh PL (30 no./m^2) a total production of 2 to 2.5 tonnes shall be obtained when shrimp of 50 to 40 count are harvested. Depending on the farm gate price an average profit of 1.5 to 2 lakhs/acre/crop can be realised through the farming of *P. indicus*.

BRACKISHWATER AQUACULTURE FOR FOOD, EMPLOYMENT AND PROSPERITY.



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