Shrimp Farming in Monsoon Season

Problems and their Mitigation

Satyanarayana Sethi and Shalini Soni
Central Institute of Freshwater Aquaculture
Kausalyaganga, Bhubaneswar-751002

Shrimp farming has developed in India to a significant extent. In this process, several lacunae in the technology of farming that result mostly in disease incidence, have been causing concern. It is now felt that there is a perceived need to develop an improved appropriate technology for shrimp farming to poise India to emerge as a long-term sustainable source of shrimp in contrast to the present boom---bust cycle commonly associated with this sector. The lack of appropriate technology and non-adoption of commercial farming practices in general generate many problems, which bring about a general decline in the quantum of production.

It is generally believed in India that stocking of shrimp in culture ponds in monsoon season is more viable/ feasible than in dry or cold seasons. Recently, many farms have faced the problem of wide fluctuations in salinity and temperature resulting in the outbreak of diseases, more particularly the white spot syndrome disease (WSSD), yellow head, and luminescent bacteria disease which have caused a great loss in production. Furthermore, stunted growth or black gills are the common problems that are experienced. To avoid such problems most farmers generally prefer to stock shrimp in the rainy season, as they believe that there are no such problems observed during dry or cold seasons, as aforesaid. However, mostly due to lack of proper management practice during monsoon, various problems are faced. These are discussed in this communication with indication of some important and immediate measures to be taken during farming so as to avoid any possible disease outbreak.

Pond preparation: Before stocking for the new crop, the pond bottom should be kept dry till the soil surface opens up showing deep cracks. This facilitates aeration in the soil and mineralization of organic matter accumulated at the pond bottom. In rainy season when the pond cannot be dewatered, flushing out or physical removal of soft sediment may be the only effective way for conditioning the pond bottom. Sediment at pond bottom may also be taken out mechanically or by means of tractors with cog like tyres as used in paddy farms. In acid sulphate soil area, heavy rain causes mineral acids to leach from the pond soil and dikes. In such conditions a high rate of liming is required particularly when pH is less than 6.5. Application of hydrated lime [Ca $(OH)_2$] or quick lime (CaO) is very effective because they react faster and possess approximately 35% and 75% respectively of neutralizing activity than $CaCO_3$ and also act as disinfectant. The pond bottom may also be heavily flushed out at least once for the water pH to become higher than 7 (Alkaline). Manuring and fertilization of the ponds may be undertaken thereafter.

Salinity: Due to the wide variation in salinity levels in shrimp farming areas, it is required to understand the actual variation in pond salinity so as to acclimatize the seed beforehand to a level close to the pond salinities both for nursing, rearing and grow-out phases of farming. If pond salinity is extremely low, the post larvae may be nursed in small enclosures with 4-5 ppt salinity for higher survival. Salinity change may induce a difference in water colour. This feature can be used as an additional control to regulate salinity method. In lower water salinity, farming is easier.

Predations: If the culture pond is prepared too early for stocking, predators such as *Metapenaeus* shrimp, dwarf shrimp and weed fishes, which grow faster in rainy season, proliferate. When these species are present, they should be eliminated by the application of mahua oil cake or teaseed cake. If the treatments do not show any effective results the pond should be re-prepared, as such animals may cause poor survival of shrimp or introduce diseases including viral ones and act as a carrier for other diseases.

Problem with rain during stocking: Generally rain in the afternoon or evening during the rainy season tends to flush mineral acid from the dikes into the pond. This acid water will cause high mortality to newly stocked seed, which are generally weak after transportation and acclimatization to pond conditions. Therefore stocking of post-larvae in the morning may avoid this problem caused during evenings because of rain. Regular liming with the application of lime stone ($CaCo_3$) on pond dikes also minimizes this problem.

Problem with Shrimp floating after Raining: After heavy rain, shrimp are observed on the surface of ponds particularly in acid sulphate soil areas or in old or deep ponds that have poor water circulation. Flushing of mineral acid from dikes into pond can cause low water pH, which subsequently increases the toxicity of hydrogen sulphide (H_2S) that accumulates at the pond bottom. This causes shrimp to become weak and float on the surface. To solve this problem, bottom water should be drained out and lime solution or lime balls should be applied spreading them all over the pond in order to increase water pH over 7 (alkaline). Feed quantity should also be reduced until the shrimps are observed as normal in feeding trays.

Problems with Clear Water after Raining: This problem generally exists in acid sulphate soil or sandy soil area. It is mainly caused by the rapid change in alkalinity and carbon dioxide (CO_2) level in pond water after heavy rain which suddenly reduces the phytoplankton population. To overcome this problem, pond water should

renewed or green water containing dense phytoplankton from nearby pond or drainage canals may be added. Calcium carbonate (Ca CO_3) lime should be subsequently applied daily or every two days at the rate of 125-187 kg/ha together with fertilization. In general, application of Calcium carbonate lime or dolomite at the rate of 125-187 kg/ ha every two days during the first 50 days after stocking can improve water colour. If water continues ot be clear and lab-lab (algal mat) is developing, artificial colour may be applied in order to reduce light intensity.

When this done, water transparency comes down because reduction of light in the water, and when this happens the problem of excessive growth and spread of aqua mats would gradually disappear.

Problems of floating shrimp after water exchange: This happens in farms close to canals or river mouth where early rain may flush acid sulphate developed in dry season from upstream. Therefore it is very risky to conduct heavy water exchange during early raining period. The best solution is to stop water exchange during the first 1-2 days of spring tide; water from outside can then be added to acclimatize shrimp in the pond before draining out water on the following day. In order to check water quality before pumping into grow out ponds, 5-10 shrimp from grow out ponds may be stocked in net cages at the inlet canal which is a good living indicator.

Problem related to Water Turbidity: In sandy or sandy soil area, there are generally suspended colloidal particles in the ponds after heavy rain. In order to remove these suspended solid particles, water should be drained out and followed by application of lime @ 62-125 kg/ha/day without aeration (air jet type) during daytime. If these particles still remain upto 2-3 days, a flocculent should be applied before water is exchanged. During this treatment, feeding should be reduced approximately by 20-50% because flocculent may affect feeding of shrimp.

Problem with Soft Shell and Abnormal Walking Legs: In acid sulphate soil and low alkalinity (less than 50ppm) areas, shrimp may have soft shell, be unable to moult and have abnormal pereopods, shrimp are not able to feed due to the balance of minerals. Application of $CaCo_3$ lime or dolomite @ 125-187 kg/ha every one to two days during the first 50 days of stocking, is effective.

Problems of Declining Dissolved Oxygen Level: Oxygen is one of the environmental parameters that exert a tremendous effect on growth and reproduction. Oxygen concentration in pond water exhibits a diurnal pattern with the maximum during peak photosynthesis time in the afternoon and minimum at the dawn due to night time respiration. Continuous cloudy days reduce photosynthetic oxygen production leading to decrease in dissolved oxygen (DO) during dawn. This phenomenon is commonly observed in the rainy season. Under these conditions, use of aerator facilitates the exposure of more water surface to air to absorb oxygen from atmosphere to maintain normal balance.

Problems with Phytoplankton Management: Phytoplankton plays a significant role in stabilizing the whole pond ecosystem and in minimizing the fluctuations of water quality. A healthy bloom decreases temperature loss, provides proper turbidity and reduces cannibalism. It also competes for nutrients with other microbes and lower pathogenic bacterial population and as a result reduces cost of supplementary feed. The rainy season and cloudy days reduce the light intensity, which consequently affect the photosynthesis rate resulting in mass mortality of phytoplankton and causing a threat to prawn survival. To overcome this problem, phytoplankton species composition and densities can be manipulated by adjusting salinity. Lowering salinity helps in the development of green algae communities. Increasing salinity favours the growth of diatoms. Inoculating phytoplankton from a neighbouring pond containing good quality phytoplankton can also change species composition. Altering pH by adding suitable chemicals can also change species composition. For example, addition of lime and Zeolite as prescribed can raise pH.

The foregoing account covers the more pronounced problems and solutions thereof. These problems will be location-specific. Therefore, farmers should regularly monitor shrimp health and water quality conditions and take needed measures to solve them immediately. Proper positioning and management of aerators, following the feeding schedule well with needed adjustments, and proper maintenance of pond bottom will contribute to reduction in shrimp mortality.

The key principle for solving the above problems however is efficient water management by having a reservoir (25% of farm area, with 3m depth) attached to grow-out ponds. Proper stocking density (less than 6-8 PL /m^2) can reduce organic load in the pond and can maintain water quality and low sludge accumulation at the pond bottom. The preventive and treatment measures suggested in this contribution are simple and inexpensive, and are also basic for successful shrimp farming. If farmers could keep the pond bottom clean, maintain needed level of colour of culture water, and undertake water exchange with care, the problems can be minimized. Finally, the authors hope that this contribution will assist farmers in understanding the problems, the precautions and treatments needed and, as a result of this they will have a successful crop in the next rainy season.

India international Seafood Show in Kolkata

The Marine Products Export Development Authority (MPEDA) and the Seafood Exporters Association of India (SEAI) will conduct the biennial India International Seafood Show (IISS) - 2005 at Salt Lake Stadium in Kolkata from February 4 to 6, 2005.

The event will be an opportunity for the buyers and exporters to interact and evolve strategies for mutual benefits. The highlight of the show will be an exhibition in which seafood exporters, machinery manufacturers, input suppliers and feed manufacturers will put up their stalls,along with the other enterprises and the developmental departments focusing on the developments in the fisheries sector in India, through their exhibits.