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Pond Secrets: 17-Point Checklist for Shrimp Stress and Disease Detection

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Abstract

Shrimp aquaculture, especially involving *Litopenaeus vannamei*, is a fast-growing industry with major contributions from India. Despite its economic benefits, shrimp farming faces challenges from disease outbreaks and environmental stress. To tackle this, early detection through regular shrimp health assessments is critical. A 17-point checklist was developed to help farmers detect signs of stress, disease, and nutritional deficiencies in shrimp ponds through routine sampling and observation. This checklist covers both external and internal features of shrimp.

Introduction:

Shrimp farming becomes fast-growing small-scale business in south East Asia as a global industry than other aquaculture farming systems. The impressive growth of shrimp farming bed a major player on global shrimp Industry, it plays a virtual role on offering quality nutrition, employment and rural development (Venkateswarlu et al., 2019). Shrimp is one of the most successful species in the blue revolution (Anderson et al., 2019; FAO, 2019). Shrimp farming is a valuable global industry, driven by high demand and rapid expansion—especially of Pacific white shrimp (*Litopenaeus vannamei*) due to its fast growth and high nutrition. India, the second-largest aquaculture producer, contributes about 17.5% of global farmed shrimp, supporting livelihoods, jobs, and foreign exchange earnings.

Commercial shrimp farming mainly focuses on *Litopenaeus vannamei*, *Penaeus monodon*, and *Macrobrachium rosenbergii*, with *L. vannamei* leading due to its fast growth, salinity tolerance, and taste. In India, the industry saw rapid growth in the 1990s, driven by individual farmers but faced challenges due to limited regulatory oversight.

The Art of Shrimp Sampling

Shrimp sampling is a pond health check, where a small group reflects the condition of thousands. Regular sampling detects stress, disease, or growth issues early and provides data on growth, survival, feeding, and health. Use gentle handling soft nets, aerated water, and quick observation. Sample from multiple areas, with frequency depending on culture stage. Check external signs (color, shell, appendages), internal health (gut, hepatopancreas, gills), growth, and behavior. Sampling combines science and skill, enabling farmers to spot early warning signs and maintain healthy, productive ponds.

17-Point Checklist for Observation"

1. Total Shrimp – Evaluation of the shrimp population begins with observation of body coloration, which serves as an important indicator of health and nutritional status. Shrimp may exhibit colors ranging from blue, normal, and pale to genetically bright yellow. The body color of shrimp is mainly regulated by astaxanthin, which mainly presents in the exoskeleton and in the surface of abdominal muscle beneath the exoskeleton (Menasveta et al., 1993; Boonyaratpalin et al., 2001; Tume et al., 2009) In *Litopenaeus vannamei*, the presence of yellow bands often reflects underfeeding, whereas in *Penaeus monodon* (Tiger shrimp), yellow banding may indicate mineral deficiencies. Such color variations provide immediate visual cues regarding the physiological condition of the stock and overall pond environment. Morphological assessment is also critical.

Deformities, including abnormal appendages, twisted bodies, or malformed exoskeletons, may arise from moulting disturbances, nutritional deficiencies, exposure to toxins, or pathogenic infections. Early identification of these abnormalities is essential to mitigate potential spread and maintain stock integrity. Finally, size variation within the population should be monitored. Significant disparities in shrimp size may result from uneven feed distribution, intra-specific competition, or underlying stress and disease. Smaller individuals are often more vulnerable to infection and environmental stressors. Systematic monitoring of growth patterns enables optimization of feeding regimes and stocking density, thereby promoting uniform growth and overall pond productivity.

2. shell: Examine the shrimp for the presence of black spots, noting whether they are irregular or bilaterally symmetrical. Irregular spots should be further assessed to determine whether they result from mechanical damage or disease. Evaluate the shell for looseness or softness, as well as hardness or roughness. Additionally, observe for external fouling and the presence of white spots on the exoskeleton. “Check the shrimp shell for external fouling, including *Zoothamnium*, barnacles, keelworm tubes, and black matter.”

3. Moult stage: Moulting, the cyclic exchange of exoskeleton, is a growth-related phenomenon in crustaceans. Moulting, the ecdysis itself, is intercalated by a preparation (premoult), recovery (post-moult) following an intermediate (intermoult) period with the longest time spent in premoult (Dall et al., 1990). “Observe the shrimp to determine their moulting stage, including intermoult, premoult, postmoult, or partial moult, as monitoring these stages is essential in shrimp culture.”

4. Antennae: Antennular appendages are widespread in both aquatic and terrestrial taxa, serving as sensory organs for the detection of chemical, tactile, and vibrational stimuli (Vickery et al., 2012) . Examine the shrimp’s antennae for color, noting whether they are red or normal. Check for any cuts, determining if both antennae are affected or only one, and whether the cut is close to the body. A blackened tip of the antennae is considered normal and not a cause for concern.

5. Antennal scale: Examine the antennal scale for any blisters or necrosis, noting that necrosis is more commonly observed in Tiger shrimp.

6. Eye ball: The eye is a critical endocrine organ that controls most of the physiological and developmental processes of shrimp (Cooke & Sullivan 1982, Charmantier & Charmantier-Daures 1998). Examine the shrimp's eyes for early necrosis, which appears as whitening. Degeneration may also be indicated by white discoloration, corkscrew swimming, or abnormal eye color. Some eye damage can result from mechanical injury during handling, such as netting.

7. Rostrum: Kala gayan et al. (1991) provided epidemiological and histopathological evidence that IHHNV causes runting and deformities in *L. vannamei.*Examine the shrimp for rostrum deformities, which are a primary symptom of IHHNV infection."

8. Gills: Change in the colour of the gill is the first clinical symptom of fungal infection. In the early stages, the gills appear opaque white to yellow or brown in colour and finally it appears as black (Dewangan et al., 2015)."Observe the shrimp gills, recording if they appear normal, swollen, or exposed, and note any variations in color."

9. Branchiostegite Before reaching juvenile or adult morphology, the osmoregulatory capabilities of *Litopenaeus vannamei* were gradually established only during the development of branchiostegites and epipodites (Robles et al., 2022). Inspect the branchiostegite for black areas with a fingerprint-like pattern and record any blisters, whether gelatinous or fluid-filled."

10. Scapognathitescaphognathite activity is under the control of neurons in the sub-oesophageal ganglion, the damage caused by the toxicant to the ganglia and the gills might affected scaphognathite activity and in crustaceans. Watch the scapognathite in action—healthy shrimp show lively, active movement, while sluggish motion may signal illness or RMS infection.

11. cephalothorax: "Assess the cephalothorax for normal morphology or edema; edema may result from stress, WSSV, or Vibrio, and shrimp can experience stress due to osmotic imbalance, low dissolved oxygen, or high levels of melamine in feed.

12. Hepatopancreas: In several decapods the main digestive functions are carried out in the hepatopancreas, which combines several functions of the liver, pancreas and intestine of mammals. Thus, the hepatopancreas is involved in a variety of significant biological functions including developmental processes, health and survival in shrimp (Hu and Leung 2007). The main function of this organ is the synthesis and secretion of digestive enzymes, food reserve accumulation, pathogen resistance mechanisms and detoxification (Ji et al., 2009; Tsang et al., 2003).

"Observe the hepatopancreas for fullness and color: chocolate brown color indicates good health, while white, yellow, red, or black suggests poor health."

13.Walking legs: Shrimp locomotion includes walking, swimming, and tail-flipping, all essential for survival (Li et al., 2017). Check the walking legs for signs of health: white legs are normal, while red, yellow, or necrotic legs—particularly near the joints—reflect potential stress or disease."

14. Abdomen; "Examine the abdomen for deformities, red or necrotic areas, splinters, and head-to-abdomen gaps; muscles should appear clear, while white or cramped muscles indicate poor health."

15. Pleopods: "Check the pleopods for color and texture: healthy pleopods are normal, while red, yellow, black, or rough pleopods may indicate stress or disease. Black pleopods can signal NHP and loose shell disease, though they may also appear black in clear water with little plankton."

16. Uropods: "Inspect the uropods for color and condition. Abnormalities such as red or green coloration, deformities, blisters, or necrosis may occur, with necrosis often linked to tail rot in Tiger shrimp."

17. Gut: shrimp gut can help to improve both the aquaculture management for higher productivity and the safety of shrimps as food (Fan et al., 2019). the gut microbiome serves as an accessory endocrine organ in most eukaryotic animals, shielding against infectious pathogens and offering supplemental metabolic pathways for host nutrition absorption (Xiong et al., 2017a,b) Observe the gut for fullness and color, including the hindgut and anus, as these indicators reflect the shrimp's digestive health and overall condition. "Monitor feed and water quality regularly, as they directly impact shrimp health and growth. Proper feed ensures nutrition and uniform growth, while water parameters - such as dissolved oxygen, pH, salinity, and clarity - affect stress levels, disease susceptibility, and overall pond productivity."

Conclusion

Effective shrimp farming relies on careful observation and timely intervention. The 17-point checklist presented in this article provides farmers with a practical guide to detect early signs of stress, disease, and nutritional issues in shrimp ponds. From body coloration, shell condition, and moulting stages to internal health indicators like hepatopancreas, gills, and gut, systematic monitoring allows farmers to maintain optimal growth, reduce mortality, and prevent the spread of disease. Coupled with regular assessment of feed and water quality, these practices combine science and skill to ensure healthy, productive, and profitable shrimp aquaculture.

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