

Healthier water quality parameters ensured acceptable length-weight relationship of *Penaeus monodon* in Batticaloa, Sri Lanka

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Abstract

Successful shrimp aquaculture depends on the quality of culture environment. Although shrimp farming in Batticaloa had been practiced since the latter part of 2002, there is a lack of information available on the culture environment. Therefore, a study was conducted to analyze the water quality parameters and growth performance of farmed *Penaeus monodon*. A total of 21 farms were randomly selected to study the management aspects, water quality parameters, and performance of shrimps in Batticaloa. This study showed that mean values of water temperature, salinity, pH, total ammonia, alkalinity and dissolved oxygen were within the tolerable limit. Salinity, pH and alkalinity of pond water were different ($P < 0.05$) among the farming areas. Condition factor of cultured *P. monodon* was 0.86 ± 0.06 in Batticaloa. As shrimp farmers in the study area follow standard practices regarding pond preparation and management, performance of shrimp aquaculture also was in line with the standards.

Keywords: *Penaeus monodon*, shrimp culture, condition factor, water quality parameters

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Introduction

Shrimp accounts 15% of the total value of internationally traded fishery products in 2012 (FAO, 2014). Shrimp culture is an important industry in developing countries of East and Southeast Asia which contribute around 70% to the global farmed shrimp production (Kumar *et al.* 2012). In Sri Lanka, shrimp aquaculture is concentrated in Northwest province. Recently, the industry has emerged in Batticaloa with a newly established shrimp hatchery in Puthukudirippu. Although the income in this industry is lucrative, high risk is associated in the production processes due to rapid degradation of pond water quality and consecutive disease outbreak on shrimps. As such, successful shrimp culture depends on physical and chemical characteristics of pond water which is highly determined by pond management practices, nature of bottom soil and pond bottom sediments. In this context, there is a lack of information available on the water quality parameters of shrimp culture conditions in Batticaloa. Therefore, a study was conducted to analyse the water quality parameters and growth performance of farmed shrimps to predict the standards of shrimp culture conditions.

Materials and methods

The study was carried out in shrimp farming areas of Batticaloa viz. Vattawan, Kavathamunai, Eachchantivu and Karaiyakkantivu. A total of 21 farms were randomly selected to collect data on management aspects of shrimps, water quality parameters, and performance of cultured shrimps. Water pH, salinity, temperature and dissolved oxygen were measured using portable meters weekly, whereas measurements on total ammonia and alkalinity, and feed intake were collected from farm records. Survival rate of the shrimps was assumed to be 85%. Live body weight was measured weekly from 48th day of growth until harvest. Length-weight relationship was calculated after 120 days of growth. Data were analyzed in SAS software package (Version 9.1) using PROC UNIVARIATE, PROC GLM and PROC REG procedures.

Results

Penaeus monodon was cultured under semi-intensive system in Batticaloa. Average stocking density of post-larvae (PL) was $14 \pm 3 \text{ m}^{-2}$. One paddlewheel was installed for $0.2 \pm 0.1 \text{ ha}$ of pond. Stocking density and paddlewheel usage was different ($P < 0.05$) among shrimp farming areas. Mean values of water temperature ($30.1 \pm 1.0 \text{ }^\circ\text{C}$), salinity ($11 \pm 2.4 \text{ ppt}$), pH (8.3 ± 0.3), total ammonia ($0.22 \pm 0.2 \text{ mg l}^{-1}$), alkalinity ($135 \pm 16 \text{ mg l}^{-1}$) and dissolved oxygen ($7.43 \pm 0.73 \text{ mg l}^{-1}$) were within the tolerable limit. There was different ($P < 0.05$) in salinity, pH and alkalinity of pond water among the farming areas. However, pond water temperature and total ammonia concentration were not different ($P < 0.05$). Average body weight of shrimps was $30.8 \pm 6.4 \text{ g}$ while average length was $15.3 \pm 0.9 \text{ cm}$ at harvest. Condition factor of cultured *P. monodon* was 0.86 ± 0.06 in Batticaloa.

Discussion

Average stocking density of shrimp PL is low ($13 \pm 4 \text{ m}^{-2}$) in some areas of Batticaloa due to absence of electricity which limits the usage of paddlewheel for aeration of ponds. According to degree of pond preparation and management practices, the hatchery supplies PL at a rate of 16 to 18 PL m^{-2} , which is within the recommended range (5 to 20 PL m^{-2}) for semi intensive culture of *Penaeus monodon*. Water quality parameters of shrimp ponds are maintained within the acceptable range throughout the growth cycle in all areas. As a result, growth and length-weight relationships are not significantly different from previous studies (Ajani *et al.* 2013).

Conclusion

The length-weight relationships and condition factor revealed that Batticaloa district is suitable for the culture of *P. monodon*. Shrimp farmers in Batticaloa district take considerable efforts in managing the farm in all aspects, including pond preparation, water quality, feeding, and bio-security measures throughout the growth cycle.

References

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