

Genetic improvement of the Giant Freshwater Prawn (*Macrobrachium rosenbergii*) and the development of culture technology for previously unexploited local species of *Macrobrachium* in Malaysia

Aizam Zainal Abidin

Universiti Putra Malaysia
43400 UPM, Serdang, Selangor
Malaysia

Telephone Number of Corresponding Author:
E-mail of Corresponding Author: aizam@i

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Introduction

Freshwater prawn (*Macrobrachium rosenbergii*) are members of the phylum Arthropoda. They are decapod crustaceans related to crabs and marine shrimp. But in their native land of Malaysia and Southeast Asia, *M. rosenbergii* has evolved to survive in brackish water of the estuaries and the freshwater rivers. Commercial production of the species of freshwater shrimp or prawns (*Macrobrachium rosenbergii*) has periodically been the subject of research and commercial enterprise. Basic production techniques were developed in late 1950's in Malaysia, Hawaii and Israel during the last three decades. During the past 6 years, new management practices have dramatically increased the potential for economic success of prawn culture. Research efforts have been complemented by demonstration project design to evaluate methods under large-scale and commercial types conditions.

Materials and Methods:

The research methodology was divided into two parts:

Part 1

This involved studies on the habitat, reproductive biology and also the development of appropriate culture techniques for selected *Macrobrachium* species. The species that have been selected for this study were *Macrobrachium rosenbergii* and *Macrobrachium lanchesterii*. The following experiments were carried out on each of the species:

Studies on the habitat and the reproductive biology such as:

- Size and weight at maturity,
- Fecundity, egg shape and diameter,
- Larval development stages,
- Food and feeding of the different stages,
- Development of appropriate rearing techniques for each species,
- Restocking of the species into their natural habitat.

Part 2

The study on the genetics involved the determination of the genetic markers to distinguish between different populations of *Macrobrachium rosenbergii* in Malaysia and selection for preferred traits in the species.

Results and Discussion

The study on the population distribution of *Macrobrachium rosenbergii* was conducted at Marang River, Terengganu. It is shown that the abundance of the prawn occurs in June, although there the gears used were different. The abundance study also showed that the first during 3 month of study (April, May and June), the CPUE indexes were at the highest level. Through the length and weight relationship study, the parabolic equation for the relationship of total length (TL) and the body weight (BW) obtained was $W = 0.004 L^{3.339}$, while for the relationship of orbital length (OL) and body weight (BW) parabolic equation, the equation obtained was $W = 0.009 L^{3.341}$.

The study on the influence probiotic bacteria on *Macrobrachium rosenbergii* larvae breeding showed a positive result. The results were encouraging for the aquaculture industry especially in Malaysia. In 42 days of culture, the results observed showed that the amount of unionized ammonia, nitrite and ortho-phosphate in both probiotic treated tanks was higher than those without probiotic. Even though, the statistical analysis showed that there is a significant ($p < 0.05$) difference for water nutrient in both systems. Three dry micro-bound hatchery feeds (squid based-SDF, prawn based-PDF and squid prawn based-SPDF) were prepared using locally available feed ingredients for the rearing of *Macrobrachium rosenbergii* (de Man) and their efficiency was evaluated with the larval feeds now being widely used such as *Artemia* nauplii and prawn-egg custard. They were tested in different feeding schedules-T1 (prawn-egg custard), T2 (*Artemia* + SPDF), T3 (*Artemia* + PDF), T4 (*Artemia* + SDF) and T5 (SPDF only). *Artemia* only served as a control (C). Among the dietary treatments, better survival was recorded in T2 (10.55%), followed by T4 (9.03%) and (8.25%). Dry feed without *Artemia* combination (T5) does not support life after the 4th stage. The results of the present study showed that it would be possible to minimize the usage of live *Artemia* for the rearing of the larvae of *Macrobrachium rosenbergii* by incorporating micro-bound diets by resorting to different types of feeding schedules.

Inadequate yield, and the generation of nonspecific Polymerase Chain Reaction (PCR) products can complicate fingerprinting studies of *Macrobrachium rosenbergii*. Application of the technique can be troublesome and time consuming to establish the optimization of the PCR. To ensure that the results will be consistent, reproducible and to amplify true genetic variation, RAPD-PCR conditions must be optimized. In this study, the ability of PCR to enhance the specificity and yield of amplification was evaluated. A significant enhancement of PCR yield had been improved by the elimination of nonspecific PCR product, thereby promoting successful results. This study also showed that the PCR conditions used could be applied in RAPD-PCR analyses of *Macrobrachium rosenbergii*.

Conclusions

From these studies, some pertinent aspects of the biology, culture techniques, feeding and genetic study were initiated. More work especially on the genetics must be continued to achieve the ultimate result. Genetic study must be continued because there is a need to establish and standardize the optimization procedure for the consistency of PCR yields for the preparation of RAPD-PCR analysis of this prawn species.

Benefits from the study

Better prospects in the yield from culture pond. Good management techniques especially in obtaining better survival rates, good quality and healthy prawns with the use of probiotic bacteria. This will help prawn farmers to obtain better yields from their culture ponds.

Patent(s), if applicable :

Nil

Stage of Commercialization, if applicable :

Nil

Project Publications in Refereed Journals:

In process

Project Publications in Conference Proceedings

1. . Aizam, Z.A., M.R. Joseph, I. Patimah, and M. Rozihan. 2002. "Optimization of RAPD-PCR Technique On The Identification Of Wild Malaysian Prawn(*Macrobrachium rosenbergii* de MAN)". Pameran Rekacipta dan Penyelidikan Fakulti Pertanian 2002. 22-23 Ogos 2002. 4th Asian Science And Technology Congress 2002 (4ASTC 2002). 25-27 April 2002, Hotel Nikko, Kuala Lumpur Malaysia.
2. Aizam, Z.A. and Zaidi, M.N. 2001. Development and Efficiency Evaluation of Micro-Bound Larval Diets of *Macrobrachium rosenbergii* (de Man). Proceeding 23rd MSAP Ann. Conference 29 May 2001 Langkawi, Malaysia.
3. Hamid, K.B., Aizam, Z.A., I.R., Alimon and M.Y. Khanif. 2003. Technological Development and numerical assessing of the Freshwater Prawn (*Macrobrachium rosenbergii*) Production in Integrated Aquaculture/Agriculture Systems. 25th Malaysian Society of Animal Production Conference 1-3 August 2003. Melaka, Malaysia.

Graduate Research

| Name of Graduate | Research Topic | Field of Expertise | Degree Awarded | Graduation Year |
|------------------|---|--------------------|----------------|-----------------|
| Tan Lea Joo | The Reproductive Biology, Breeding And Larval Rearing of <i>Macrobrachium lanchesteri</i> (de Man). | Aquaculture | M.Sc. | On going |

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