

# Freshwater prawn culture in China: an overview

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## Development and present status

Freshwater prawns are one of the most recently introduced animals in freshwater Chinese aquaculture production despite the traditional preference of the people to the product in many areas of the country. Real commercial culture of freshwater prawns did not commence until the 1990s although its experimental culture was reported as early as the late 1970s. Freshwater prawn culture has grown very rapidly. This can be attributed to several factors including the traditional preference of Chinese to shrimp and prawn, the decline in the production of marine shrimp culture in the early 1990s caused by disease problems and an increasing demand for high quality products as the living standards of the Chinese people have improved through economic development.

The rapid increase in production of cultured freshwater prawn is the result of growth in the area under culture, improved culture techniques and diversification in species. There is no national data available on the total culture area of freshwater prawn at the moment. However, freshwater prawn culture has expanded very quickly across the country. For example, *Macrobrachium rosenbergii* was cultured only in 12 provinces in 1993 and there was just one province with production of more than 1000 tons. By 2000, culture of *M. rosenbergii* has expanded to 24 provinces and autonomous regions in China and 7 provinces had production exceeding 1000 tons each.

Overall, cultured *M. rosenbergii* accounted for only 0.06% of the total freshwater aquaculture production in China in 1993. By 2000, this had increased to 0.64%, nearly 10 times higher. In some areas, freshwater prawn culture has become a locally important component of freshwater aquaculture.

Production of another cultured freshwater prawn species, *M. nipponensis* was estimated to be around 100,000 tons in China in 2000, close to the total capture production of the species. In 2000, the total production of cultured freshwater prawn was estimated to be over 200,000 metric tons in China<sup>1</sup>.

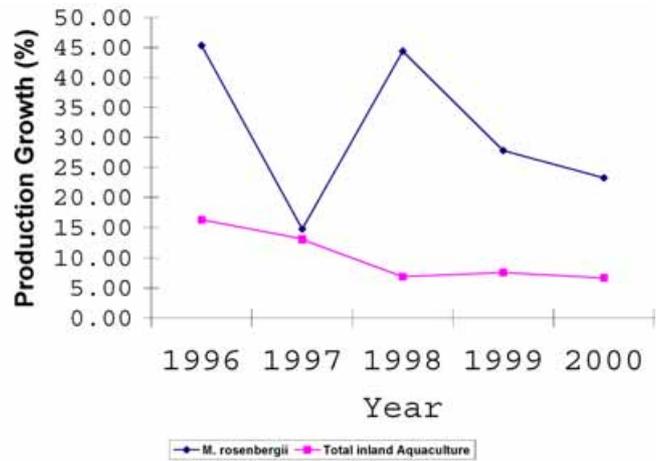


Fig. 2. Production growth of cultured *M. rosenbergii* and inland aquaculture, China, 1996-2000.



Fig. 3. *M. rosenbergii*.

## *M. rosenbergii* Production (ton)

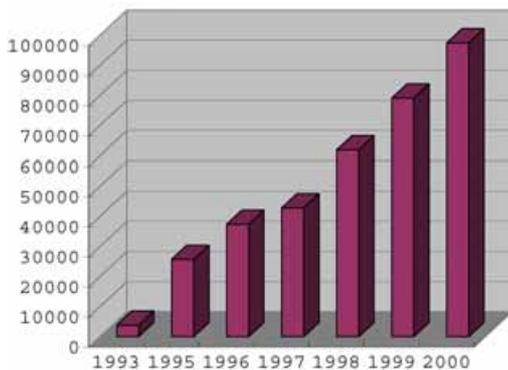


Fig. 1. Cultured production of *M. rosenbergii*, China, 1993-2000.



Fig. 4. *M. nipponensis*.



Fig. 5. *Penaeus vannamei*.

## Species and culture methods

### Cultured species

Only two species of real freshwater prawn are involved in the culture, *M. rosenbergii* and *M. nipponensis*.

*M. rosenbergii* (Fig. 3) is an exotic species which was cultured in limited areas in the Southern China with minimal production for more than a decade after it was first introduced in 1976. Now, it is one of two major freshwater prawns cultured in China.

Another freshwater prawn species widely cultured in China is *Macrobrachium nipponensis* (Fig. 4).

This is an indigenous species that can naturally reproduce in all kinds of freshwater bodies. Production of this species was mainly from natural fisheries. The earliest culture practice of this prawn was reported in the 1970s, the development of real commercial production of the species started at more or less the same time as *M. macrobrachium*. Currently, cultured production of the prawn accounts for about 50% of its total production in China.

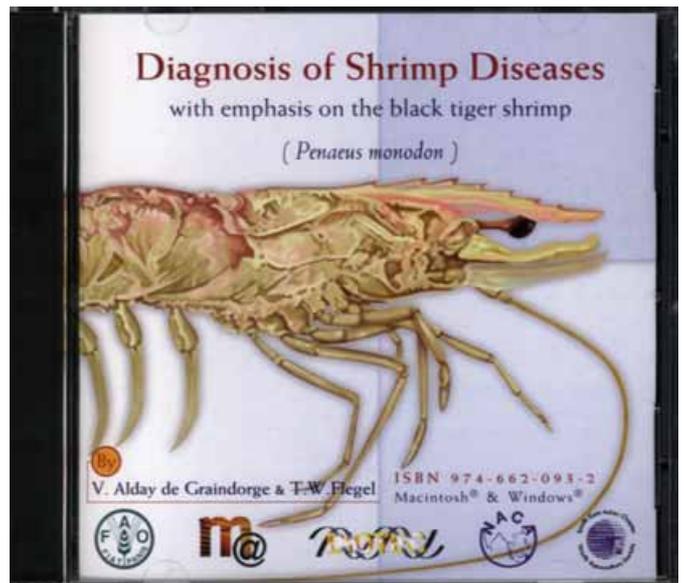
*Penaeus vannamei* (Fig. 5) is a marine shrimp species originally distributed in South American countries along the South Pacific Ocean. It was first introduced to China for sea water culture. However, it has very recently been tried for culture in freshwater.

Due to its fast growth rate, longer breeding and growth period (compared with *M. rosenbergii*) the culture of this shrimp in freshwater has expanded very quickly in the last two years. It has become another important freshwater cultured prawn/shrimp species in China.

### Culture methods

Earthen pond culture is commonly used for all species of prawn and shrimp cultured in freshwater in China. The practice for different species differs according to their biological characteristics. For stocking, both brood prawn or post larvae can be stocked in grow-out ponds. For *M. rosenbergii* and *Penaeus vannamei*, post larvae can only be stocked for grow-out after acclimatization to freshwater.

A single crop used to be dominant practice for the culture of all species before. However, double-crop and rotating culture of *M. rosenbergii* and *M. nipponensis* have become more popular to raise the unit production, prolong the marketing season and raise the economic efficiency. Such changes have effectively raised yield levels from 1.5-3.0 ton/ha to 5 ton/ha. This yield improvement is important to maintaining an adequate level of economic benefit to compensate for a fall in market price.



**About 90% of the seed of *M. rosenbergii* now used in production are the offspring of the stock introduced a quarter century ago.**

## Diagnosis of Shrimp Diseases

*This CD provides high-quality information, photographs and illustrations about the life cycle, anatomy and histology of shrimp and assessment of post larval quality. It covers the main pathogens of cultured shrimp including white spot virus. Laboratory and diagnostic procedures are demonstrated in animated sequences. \$US 50. Contact NACA to order.*

Culture in rice paddy is another method commonly adopted in the culture of *M. rosenbergii* and *M. nipponensis*. Usually only one crop of prawn is produced a year with a much reduced stocking rate (*M. rosenbergii*: 1cm PL, 150,000-180,000 pieces/ha or 2-3 cm juvenile, 60,000-75,000 pieces/ha; *M. nipponensis*: brood prawn, 15 kg/ha or 1cm PL, 300,000-375,000 pieces/ha, Shen Delin, 2001). 300-450 kg of prawn can be produced through supplementary feeding and good management in addition to the normal rice production. It is a very effective approach to improve the economic return of traditional rice cultivation. It also has a very sound environmental effect due to much reduced use of pesticides and other chemicals. Cage culture and indoor running water culture are also practiced for *M. rosenbergii* and *M. nipponensis* in some areas of the country. However, they are far less popular than pond culture and rice-paddy culture. Their contribution to the total cultured prawn production is limited.

## Constraints to further development

### Genetic degradation of cultured species

Although the history of freshwater prawn culture in China is rather short (about 10 years), genetic degradation of cultured species has become a serious problem affecting the yields and economic returns. This problem is mainly caused by inbreeding which is largely related to the biological characteristics of the animal and seed production practices.

The seed of *M. nipponensis* are usually self-produced on farm through natural spawning. The broodstock in the same pond/tank are very often grown from the same batch of seed. Inbreeding is unavoidable in seed production if such methods are used. Very little selection of brood stock is carried out in farm production. This has resulted in significant genetic degradation of the seed. Such degradation is typically indicated by reduced growth and smaller size at sexual maturation that leads to a smaller harvesting size. In addition to the impact on the production, the smaller harvesting size has a more serious impact on the economic return of the farming practice as the price received for different size classes can vary by more than 50%.

Although reintroduction of *M. rosenbergii* has been carried out recently by some hatcheries, about 90% of the seed currently used in production are the offspring of original stocks introduced a quarter century ago. With the limited initial stock, inbreeding is unavoidable after over 20 generations of reproduction and culture. The mature size of individuals has been significantly reduced. The variation in individual size is also greater in production. This variation eventually affects the economic efficiency of production. Although the genetic degradation of some cultured freshwater prawn species and its impacts on production have already been commonly recognized, there has been little improvement in seed production practices. This has been mainly due to the technical difficulties involved in the selective breeding of freshwater prawn.

### Disease problems

Disease often becomes a key problem when the culture of an

animal develops to a certain stage. A good example is the disease problem that happened in cultured marine shrimps that had great impacts on shrimp farming in many countries.

Widespread disease in marine shrimp culture caused a drastic decline in production in China in the early 1990s. At one point cultured marine shrimp production dropped to less than 50% of pre-outbreak levels.

Although freshwater prawn culture has a history of only about 10 years in China, the rapid expansion in culture area, wide exchange of seed across the regions and intensified inputs have already formed the conditions necessary to cause significant disease problems. In the past several years a number of disease problems have already arisen.

*M. rosenbergii* is the species most seriously affected. Several diseases are now commonly found in the culture of the species. These include black gill disease, black spot disease, rotten tail disease, parasitic disease (*Ciliata* species) and milky-white body (muscle) disease. In particular, a large-scale outbreak of milky-white body (muscle) disease was found in Southern China (Guangdong Province and Guangxi Autonomous Region) in 1998. This may cause mortalities as high as 70% of the affected prawns. The disease was recently spread to Jiangsu province through seed purchased from the affected areas. Most of the diseases affect the prawn at its early stage of culture. Various diseases often affect the production and quality in the culture of the prawn though few of them cause high mass mortality.

Disease problems in the culture of *M. nipponensis* are not as serious as in *M. rosenbergii*. However, diseases such as "black gill", "black spot" and some parasitic diseases are found in culture. Such diseases can also affect production to a certain extent although mass mortality has rarely been reported. *Penaeus vannamei* was very recently introduced to freshwater culture in China. TSV (Taura syndrome virus) disease was already found in the cultured shrimps in Pearl River Delta area of Southern China. It is likely that the disease will further spread to other areas unless effective control measures are enforced.

### Issues on marketing and economic returns

The rapid development of freshwater prawn culture has been stimulated by the increasing market demand and high economic return in production. *M. rosenbergii* used to fetch a market price of US\$6.0/kg very easily several years ago. The market price of *M. nipponensis* could reach US\$ 15.0/kg or even higher during the Chinese New Year period. However, the rapid growth in production caused by the expansion of culture has already had significant impacts on the marketing and economic return of the industry.

The market price of *M. rosenbergii* has dropped to around US\$3.0/kg during the major harvesting season, almost half of the price before. The economic benefit of the culture has declined significantly although the price of the seed has also fallen. This has been compensated through an increase in unit production. *M. nipponensis* used to maintain a fairly stable market price. However, market pressure has resulted from the fast growth of production in 2001, causing a significant decline in the price of the prawn. A similar situation has also occurred with *Penaeus vannamei*. The market price for the shrimp was fluctuating at around US\$3-4/kg during most of the harvesting season.

Cultured freshwater prawn production still accounts for a small proportion of the total freshwater aquaculture production in China although it has grown very fast in recent years.

## Strategies for future development

Although freshwater prawn culture is now facing some problems and constraints, the industry is very likely to expand further in the future. This prediction is based on the two major factors. First, the potential new market for freshwater prawn is huge. Domestically, freshwater prawn is a much preferred aquatic products for Chinese consumers, not only because of its high nutritional value and good taste but also because it is easy to prepare. Freshwater prawn production is estimated at around 350,000 tons (including the wild catch), which accounts for less than one percent of the total fisheries production in China.

Per capita availability of freshwater prawn products is less than 0.2 kg. With the improving living standard, and the entry of China into the World Trade Organization, there will be a large space for the domestic demand to increase. Aquaculture products are considered among the most competitive with potential to enter the international market. Freshwater prawn is likely to take a bigger share in the international market than finfish. It is important however to effectively tackle the problems and implement an appropriate development strategy for sustainable development and sound economic benefit of freshwater prawn culture industry. The following are among the priority strategies and measures.

**Development strategy.** An appropriate development strategy should be developed and implemented in line with the present status and needs of freshwater prawn culture in different parts of the country. Different development targets and priorities should be set for different areas. For instance, in the provinces where freshwater prawn culture have already developed to a certain stage, the focus should be on the improvement of the quality of the products to increase their compatibility with the international market. These provinces are mostly areas with relatively easy access to foreign markets.

In areas where freshwater prawn culture is still at the initial stage, priority should be given to expansion of the industry. The target should be to develop the local market and contribute to rural economic development and increasing the income of rural people. It is also important to encourage ecologically sound and environmentally friendly culture practice in order to meet increasingly stringent food safety and environmental standards.

**Quality prawn seed production system.** The quality of prawn seed is at present an important factor affecting yield levels and economic efficiency in the culture. It is important to establish an effective system for producing and distributing high quality prawn seed. Scientific research needs to be carried out on the genetic improvement of cultured prawn species. Prawn breeding techniques should also be developed to maintain the genetic quality of species at production level. Also, to maintain the quality of prawn seed in production, a certification system should be developed and implemented for prawn hatcheries. A health certificate system and inspection mechanism should be established for the trans-boundary movement of prawn broodstock and seed within and beyond the country.

**Improvement of culture techniques.** Freshwater prawn culture is a relatively new aquaculture practice in China. There have been few studies on the culture technology of different

prawn species under different environments. The present practice is mainly based on farmer's trials and on the experience of other countries.

**Improvement in marketing and processing.** The long-term sustainability of freshwater prawn culture industry is ultimately determined by the economic performance of the industry. Maintenance of a reasonable level of economic benefit is vitally important to the further development of the industry. Development of an effective marketing strategy and modification of the culture system to increase the harvesting and marketing period is particularly important to release market pressure inhibiting the further expansion of the industry. New culture practices such as multi-crop production and rotating culture have proven to be effective in this aspect but, need to be refined further. Processing technology for freshwater aquatic products has long been lagging behind the development of culture. This is due to both consumers' habit and limited efforts on the technology development. However, appropriate processing technology can reduce the marketing pressure in the peak harvesting period and improve acceptability to the international market. Therefore, there is real need to invest money and human resource to develop suitable processing technology for freshwater prawn as well as for other cultured animals.

There is a lot of room for the improvement in feed and feeding, stocking models and related culture management. This is particularly important to maintain economic benefit with the presently reduced market price of the products. On the other hand, ways to ensure high product quality throughout the culture and marketing process is another important goal. Ecological culture minimizing the use of various chemicals and drugs needs to be studied to ensure the safety of the products. It is an important preparation for the products to be accepted in the international market.

**Development of effective disease prevention and control measures.** Disease problems are likely to become a serious constraint to the sustainable development of freshwater prawn culture industry in China. What happened to the marine shrimp culture in China ten years ago was a good lesson. It is important to take effective measures now to prevent the same thing happening to freshwater prawn culture again as there has already been early signs of a disastrous disease problem in some freshwater prawn culture practice. Efforts should be made to study the epidemiology of freshwater prawn disease already found. It is equally important to develop effective preventive and curative measures of prawn diseases. As prawn is different from fish biologically, efforts should be made to develop medicines specifically for prevention and control of disease in freshwater prawn culture. It is also important to predict the possible new health problem when freshwater prawn culture further develops based on the lessons drawn from marine shrimp culture.

## References and further reading

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