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SAFIS Extension Manual Series No.8, 1984

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MACROBRACHIUM CULTURE



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SAFIS Manual No.8

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The Secretariat
Southeast Asian Fisheries Development Center
May 1984

This manual is a translation of the Thai information pamphlet entitled "Karn Liang Kung Kam Kram" published by the Information and Publication Unit, Fishery Conservation and Extension Division, Department of Fisheries, Thailand, in 1981. The translation was prepared by Mr. Vijai Srisuwantach, Senior Fisheries Biologist, National Inland Fisheries Institute, Bangkok.

MACROBRACHIUM CULTURE

by

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INTRODUCTION

Macrobrachium rosenbergii de Mann or giant freshwater prawn, called locally "Kung kam kram", "Kung nang", "Kung loung" or "Kung yai", is the biggest freshwater prawn and the most used for commercial farming. The species is found in inland freshwaters that are directly or indirectly connected with the sea. It exists in all the major rivers of the central plain region of Thailand including the Chao Phaya, Tha Jeen, and Bang Pakong rivers. In the south of Thailand this species is found mainly in Songkhla Lake.

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About ten years ago, the natural stock of *Macrobrachium rosenbergii* started to decline. The Department of Fisheries of Thailand considered this problem and established a culture development program to stimulate the expansion of freshwater prawn farming. However, the development of prawn culture is seriously handicapped by lack of experience, and difficulties in obtaining sufficient juveniles and mature prawns for culture purposes from their natural breeding grounds. Research and experiments on seed production on a commercial scale will certainly help to ease this problem. Recently, the Department of Fisheries established a program for producing juvenile prawns under controlled conditions. Currently there are two government-funded freshwater prawn hatcheries in Thailand, namely at the Chachoengsao Fisheries Station, and the National Institute of Coastal Aquaculture (NICA), formerly known as the Songkhla Fisheries Station.

CHARACTERISTICS AND HABITS

Macrobrachium rosenbergii is an invertebrate with exoskeleton or shell. The body of a prawn is composed of three parts: head, abdomen and tail. There are five pairs of walking legs at the head part. The first pair is used for putting food into the mouth. The second pair is much larger than the others and ends in pronounced claws. It is used for self-defence and catching food. The rostrum develops at the tip of the head. Dorsal and ventral rostrum teeth number 12 to 15 and 8 to 14 respectively. There are five pairs of swimming legs at the abdomen with one pair at

each abdominal somite, except the last one. The tail part is composed of two uropods and one telson.

Mature male prawns are considerably larger than the females and the second walking leg is much larger. The head of the male is also proportionally bigger. The genital pores of the male are between the bases of the fifth pair of walking legs. During the spawning season, the abdomen of the female is larger, and gravid females can easily be distinguished.

Postlarvae of freshwater prawns usually migrate upstream from brackishwaters into freshwaters. They are able to swim against the current and require high oxygen concentration. They crawl over stones, dead trees and bushes. The latter also provide substrate for prawn food organisms and shelter. Prawns seek food at night and hide during daytime.

In nature, prawns are omnivorous. Their diet includes zooplankton, aquatic animals, small molluscs and crustaceans, algae, and organic material both of animal and vegetable origin. They are also cannibalistic, especially during moulting.

GUIDELINES FOR PRAWN FARMING BY THE BEGINNER

The following are guidelines for farmers taking up prawn culture:

- (1) Farmers should take good care of their ponds during the culture period.

(2) Prawn farming being a new enterprise, farmers should try to seek the advice of their local inland fisheries stations. They will find the officers helpful and ready to assist in the farmers' projects.

(3) Experience in farming is considered to be relevant to managerial ability and leads to successful operations. Learning from trial and error is still a main feature of prawn farming. It is recommended that the beginner should start with a small farm.

(4) Farmers should not expect a very high profit in the first year.

(5) Before farm operations begin, all required materials and equipment as well as farm facilities should be prepared.

(6) Farmers should set up their own hatchery for producing juvenile prawns under controlled conditions in order to solve the problem of an insufficient seed supply.

SITE SELECTION

As in the rearing of other aquatic animals, site selection is an essential factor for successful prawn farming. No site has all the desirable characteristics, so there are a number of choices to be made for each site. The following site selection criteria can be used to help in making a decision:

(1) Freshwater prawn ponds should be constructed on soil that has good water retention characteristics. Clay and sandy clay are best for pond construction because their clay content is high enough to hold water.

(2) The farm should not be situated in an area that is subject to natural phenomena, such as floods in the rainy season and lack of water in the dry season.

(3) The quality and supply reliability of freshwater at the site are critical factors in site selection. Water must be able to flow into the ponds throughout the rearing period.

(4) The site should not be near an industrial estate. The water supply must be free from pollutants, such as pesticides, and industrial and urban wastes.

(5) Accessibility is important for daily operations. The farm must be close to a market and should be accessible by waterway or road.

(6) The farm site should be close to hatcheries or sources of postlarvae. The cost of transporting postlarvae may add huge sums to basic stocking costs if there is a great distance between the farm and the hatchery.

(7) The feeds needed at the farm site must be available all the year round and must not be too costly.

(8) Site selection must also take into account the possibility of poaching by local people. Losses caused by poaching are perhaps the hardest to prevent. A watchman should be hired during the growing period.

(9) The farm should not be located in an area affected by acid soil, which results in poor production.

GROW-OUT OPERATIONS

There are two steps in prawn culture grow-out operations:

1. Growing small postlarvae to larger sizes

Juvenile prawns from hatcheries are fairly small, measuring 1.5 to 2.0 cm. One of the problems of stocking small juveniles directly in rearing ponds is that it is almost impossible to tell if the fry will survive until harvesting time. It is better to grow prawns in nursery ponds for two months to reach a size of 5 to 8 cm before transferring them to rearing ponds. This is a good technique because it is cheaper to replace the weak small juveniles at this stage.

Both earthen and cement ponds can be used as nursery ponds. The pond surface area should be larger than 50 m², with a depth of 0.8 to 1.0 m. Before stocking juveniles in the earthen pond, the pond bottom should be allowed to dry out. If the pond cannot be completely dried out,

all predators and competitors should be killed by applying pesticides. The use of natural products such as derris root is recommended. The roots should be cut into pieces and soaked in water overnight. After soaking, the roots are pounded to get a solution which is then added to the pond water. About 500 g of dry root are required for 200 m² of pond area. Dead fish should be removed. The water level in the pond should be raised to 50 cm the following morning and left at that level for seven to ten days. It is important to screen all water that is let into the pond. The screen must be fine enough to prevent fish eggs and larvae as well as adult fish from entering the pond.

The types of feed, which include raw animal or vegetable materials, vary widely. They include trash fish, mussels, cattle bones and worms. The feed for postlarvae must be minced or chopped before use. When given to the postlarvae it can be placed on trays to prevent it polluting the water. The feeding frequency should be twice a day, in the morning and afternoon.

During the early stages, soon after stocking, there is no need for frequent change of water since the prawns are small and are given so little feed that any excess could not cause water pollution. A scum of phytoplankton should not be allowed to cover the surface of the pond water, causing a problem of low dissolved oxygen at night. This can be controlled by reducing the amount of feed and by changing the water. Low dissolved oxygen should be suspected if prawns begin to crawl out of the pond or

congregate near the banks of the pond in daylight. If this problem occurs, flushing the pond is the solution. Frequent change of water has beneficial effects not only on the quality of the water but also helps towards synchronous moulting of the postlarvae.

By using the above-mentioned techniques the authors obtained a nursery survival rate of 78 per cent. The postlarvae that measured 1.5 to 2.0 cm (1.5 to 2 months old) were stocked in the nursery ponds at a density of 84/m² and grown there until they reached the size of 5 to 8 cm (4 months old) with a weight of 1.2 to 6.5 g before being counted and transferred to the production ponds. However, it is suggested that the optimal stocking rate in nursery ponds should not be more than 40/m².

2. Growing small or large postlarvae to market size

There are many methods of rearing prawns to market size. The prawns can be stocked in ponds, ditches, pens or natural waters. The following methods of prawn culture are outlined and some of the general principles are discussed.

(a) Pond culture

A freshwater prawn pond is very similar to a freshwater fish pond. It should be an earthen pond. The most easily managed pond size ranges between 3,200 and 4,800 m². Average depth should be 1.0 to 1.5 m. The pond should have separate water intake and discharge gates or be of a simple construction with screened pipe inlets and outlets. Aquatic plants can be

grown in the pond to provide shade and habitat, but care must be taken that their growth does not become excessive. Other materials like net can be used for increasing the area of the pond. Rows of netting can be suspended from floats across the pond and weighted with sinkers. The use of twigs, pipes, and bricks as prawn habitats is possible but may interfere with the harvesting process. Pond preparation is similar to that of a fish pond. The mud must be dug out and the pond bottom dried out and treated with a pesticide. New ponds should be limed. As to quantity, the standard application of 100 gm/m^2 of agricultural limestone is recommended. After two to three days' liming the ponds are filled with water. Animal manures, such as droppings of chicken, duck and cattle, may be used as fertilizers. The manure should be dry and added about one week after application of rotenone.

When the postlarvae are brought to the pond bank in bags, care should be taken to acclimatize them to the temperature of the pond by floating the bags in the pond for 15 minutes before emptying them into the water. The stocking rate depends on the sources of the postlarvae. For postlarvae from nursery ponds (size 5-8 cm), a stocking rate of $5\text{-}7/\text{m}^2$ is recommended. For postlarvae received directly from a hatchery and measuring 1.5 to 2.0 cm, the recommended stocking rate is $20/\text{m}^2$.

After the prawns have been in the pond for two to three months, the pond must be examined at regular intervals to see whether the water has turned dark green. If this happens, drainage and replacement of water must be carried

out immediately. Attention should also be given to whether any excess feed is left over.

The causes of mortality or loss include cannibalism, predators, and water pollution owing to poor pond management. About six months after the postlarvae have been stocked, culling of market-sized prawns by seining at regular intervals, usually once a month, commences. Market-sized prawns are taken out and sold while smaller ones are returned to the pond for further growth.

(b) Pen culture

Pens for prawn culture are usually set up in shallow lakes with fertile waters. By selecting an area sheltered from strong wind, damage to nets and poles, and even loss of stock can be minimized. For pen culture, soft mud, clay and clay-loam soils are the best types of bottom soil. Areas with much silt and decomposing organic matter must be avoided.

A pen consists of a net and a supporting framework. The net forming the enclosure acts as a kind of fence. Its bottom edges are embedded about 30 cm in the mud and the net itself is held above the water level by the framework. The latter is made of wooden poles arranged vertically at 2 m intervals, to form either a square or a rectangle. The mesh chosen for the net is 1 cm stretched and the height of the net is 2 m. The area of the pen should not be less than 400 m². Pen culture is a suitable method for fishermen living beside a lake. In some southern provinces of Thailand such as Songkhla

and Pathalung, fishermen who capture prawns in natural waters keep the small-sized prawns in pens for further growth. The stocking rate is about 3 prawns/m². Frequent inspection is required to detect any damage to the pen, especially to the submerged part of the net.

(c) Polyculture

The culture of freshwater prawns together with herbivorous freshwater fish such as common carp, Chinese carp and Thai silver carp has been practised. The advantage of rearing several species together is that it makes more efficient use of the total pond environment. The stocking rate of Chinese carp and prawns should be 125 and 50,000 per hectare respectively. Polyculture can result in satisfactory water quality and fewer problems of aquatic weed infestation and decomposition of organic matter. Changing of pond water may not be necessary during the rearing period, but water will still have to be added occasionally.

TYPES OF FEED AND FEEDING RATE

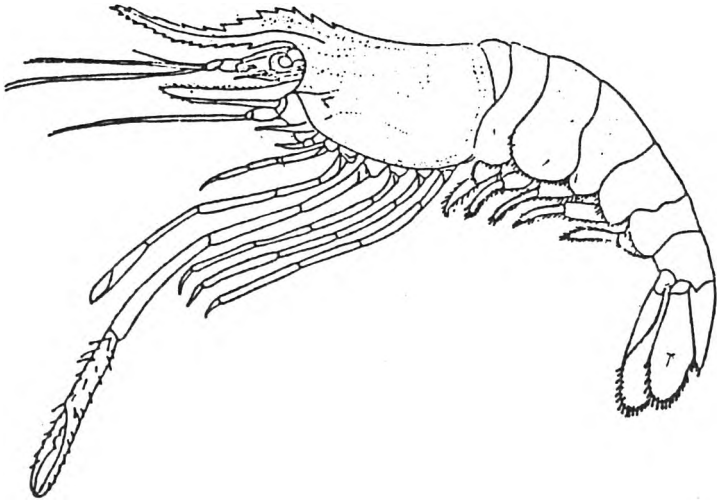
For successful commercial farming of freshwater prawns, supplementary feed must be given. The types of feed used vary widely, and include raw animal and vegetable materials, feed mixtures prepared at the pond site and pellet feeds bought from feed manufacturers. The use of raw animal or vegetable materials pose more potential pollution hazards than mixed or pellet feeds. For the first two months, the prawns should be fed with broiled chicken pellets.

After that they can be fed with chicken feed or ground fish flesh mixed with cooked broken rice.

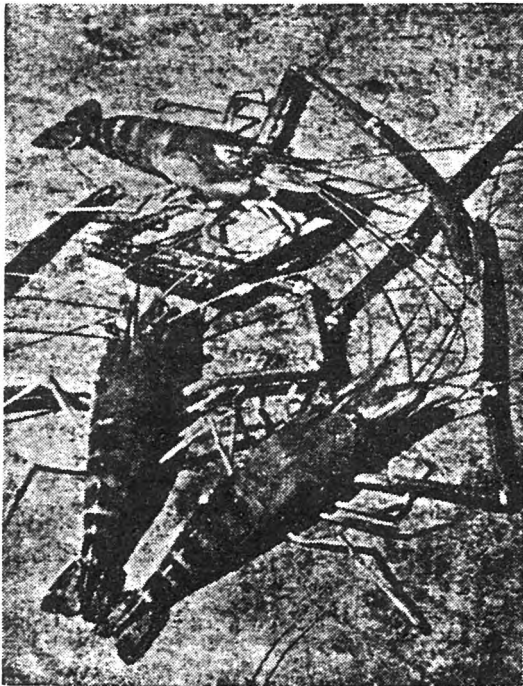
There can be no general recommendation for daily feeding rates. A good practice is for the farm operator to adjust the feed to the demand. Feed is normally spread around the periphery of the pond in the shallows which are good feeding areas. This practice enables the farm operator to see how much feed has been consumed. If there is no feed left over on the following day, the amount of feed should be increased. If some feed is left over, the amount should be decreased. However, it is recommended that the initial feeding rate when trash fish is used should be 5 per cent of the body weight. For a dry diet, such as chicken pellets or fish feed, the rate should be about 3 per cent of body weight.

HARVESTING

Prawns can be harvested monthly after six months of rearing. A monofilament net is used for seining the prawns. Only marketable prawns are harvested and under-sized prawns which are not marketable are returned to the pond for further rearing. The mesh chosen for the net is normally 4 to 5 cm stretched. Care must be taken to ensure that the bottom of the seine is kept on the pond bottom. Otherwise a great number of prawns are able to escape beneath it. The seine should be operated down the length of the pond in such a manner that the wings of the net are drawn along the banks of the pond.



Macrobrachium rosenbergii de Mann



Market-sized
Macrobrachium rosenbergii

LIST OF SAFIS EXTENSION MANUALS

- SEC/SM/1 Khumua liang pla namcheut (Freshwater
Fish Farming: How to Begin)-- in Thai
- SEC/SM/2 Oyster Culture
- SEC/SM/3 Mussel Culture
- SEC/SM/4 Ang pagpuna ug pagtapak sa pukot
(Net Mending and Patching)-- in
Cebuano-Bisaya
- SEC/SM/5 Mussel Farming
- SEC/SM/6 Menternak Ikan Airtawar (Freshwater
Fish Farming: How to Begin)-- in
Bahasa Malaysia
- SEC/SM/7 Makanan dan Pemakanan Udang Harimau,
Penaeus monodon (Nutrition and
Feeding of Sugpo, *Penaeus monodon*)
-- in Bahasa Malaysia
- SEC/SM/8 Macrobrachium Culture

SAFIS

0 What is SAFIS?

SAFIS is the Southeast Asian Fisheries Information Service. It is a project of the SEAFDEC Secretariat set up to provide extension materials for small-scale fishermen and fish farmers in the region.

0 What are its objectives?

The immediate objectives are to collect and compile fisheries extension manuals, brochures, pamphlets and related aids for small-scale fisheries development, and to translate selected literature into local languages for distribution to fisheries extension workers in Southeast Asia.

0 What services will SAFIS provide?

SAFIS will attempt to provide information and publications such as:

- lists of available texts in fisheries extension services,
- translation of suitable manuals,
- manuals of appropriate technologies,
- photocopies of appropriate fisheries extension literature,
- a current awareness service of regional fisheries.

0 How much will these services cost?

A nominal cost of US \$0.15 per page will be charged for photocopying, handling, and surface mail. Airmail costs will be extra. The publication cost per manual will vary according to the book.

SAFIS is grateful for financial
support received from the
International Development
Research Centre (IDRC) of Canada.

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SAFIS is the Southeast Asian Fisheries Information Service. It is a project of the SEAFDEC Secretariat set up to provide extension materials for small - scale fishermen and fish farmers in the region. For additional information, contact the Project Leader of SAFIS

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