intestines is preferred by small-scale farmers because they are free or relatively inexpensive. However in the long run we foresee greater use of commercial feed pellets due to their better FCR, reliable supply and lesser water quality problems.

The enterprise budgets indicated better returns if more tanks are used. From our experience, one small-scale farmer can manage up to 10 tanks effectively, even on a part-time basis and the adoption period for the technology is only between 7 to 10 days. With better quality food and water quality management, we are confident that farmers can obtain better harvests. The high tolerance to water quality extremes of clariid catfish, their ability to breathe air and their omnivorous habits recommend them for this kind of tank culture. Species with more stringent water quality requirements such as tilapia *(Oreochromis* spp.*)* would not be suitable unless continuous aeration and/or water flow is provided.

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Present Status of Mangrove Crab (*Scylla serrata* (Forskal)) Culture in China

SHEN YALIN and LAI QINGSHENG

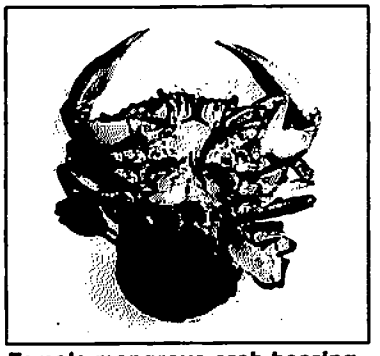
The mangrove crab *Scylla serrata*, locally called "Xun", is valued in China for its delicate flavor and good nutrition. Few crabs are caught by fishers and the demand is great so the price is expensive. Crab culture in Dong Wan, Guangdong Province, China, dates from 1890. Farmers there have accumulated rich experience on crab rearing in ponds through one hundred years of practice. Mangrove crab culture from southern Guangxi Province to northern Jiangsu Province has also been forging ahead in the past decade. The area under mangrove crab culture in 1988 was more than 20,000 mu (1 mu = 0.067 ha), producing in total more than 2,000 t.

Basic research has been carried out by Huang Shengnan and Li Wanli (1965), who described larval development; Wang Guizhong and Li Shaojing (1989), who reported that diethylstilbestrol influences the survival, feeding intensity and molting of juvenile crab; and Zheng Chaoshu et al. (1991), who studied the effects of temperature on embryonic development, inducing mature females to spawn out of normal spawning season and hatching unattached eggs.

Artificial Propagation

Before 1980, all cultured crabs were grown from natural seed. Thereafter, research institutes in Guangxi, Guangdong, Fujian, and Jiangsu Provinces have reported successful rearing (e.g., Wu Qinse and Zeng Weibing 1990). The problems of inducing spawning, hatching and rearing larvae have been solved step by step, although the quantities supplied by artificial reproduction are not yet enough to meet farming needs. The East China Sea Fisheries Research Institute, Shanghai, has also carried out research work on mangrove crab culture. Records of hatching 600,000 zoea larvae from one crab and getting 3,700 seed per cubic meter have been reported by Zhangjiang Fisheries University.

The key to artificial propagation is getting sufficient berried crabs. Crabs whose ovaries are well developed are selected, fed with good quality food and provided with a good environment. Water temperature is usually kept at 25-30°C during hatching. The eggs hatch after an 11-18-day incubation period. Hatching rates vary with culture conditions and can reach 90%.

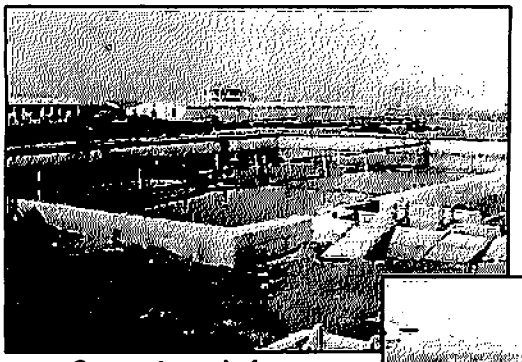


Female mangrove crab bearing eggs.

The new larvae can eat algal cells, Artemia, rotifers, fertilized mollusc eggs, yolk and minced bivalve meat, etc. The survival rate of zoea larvae is highly related to the type, size, quantity and suitability of early diets.

Mangrove Crab Culture

Traditionally, culture was actually a method of fattening. Farmers simply caught crabs of at least 200 g, put them into enclosed ponds, and fattened them for 15-50 days. It is important to select robust young crabs for pond culture.



Growout ponds for mangrove crabs.

Stocking density varies with seasons, water exchange rate, food and the species mix in polyculture.

One new method is to catch small crabs about or below 100 g and to rear them to marketable size in brick, concrete or earthen ponds. Pond sizes (usually 1-5 mu) vary with location. Transforming shrimp ponds for crab culture is also possible. Our institute built an experimental pond, 1 mu in size, with concrete walls and an earth bottom. This kind of pond is durable and secure for rearing crabs, although it is costly to build.

In recent years, farmers have built fenced enclosures for crab culture in the tidal zone. This has the advantages of low investment cost, ease of construction and quick projects. In addition, there is some small-scale cage culture of crabs in China.

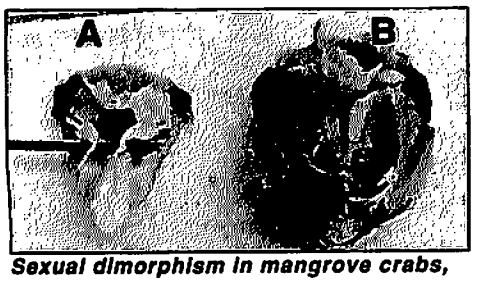
Mangrove crabs can be cultured singly, or mixed with shrimp, fish and seaweed, or grown between shrimp culture cycles. Such polycultures or rotations with the farming of other aquatic animals can make fuller use of the ponds, enhance the utilization of water, reduce costs, decrease pollution by uneaten feeds and thus lessen crab disease.

Many farmers have made profits from shrimp-crab and fish-crab culture in past years. The Dandao shrimp farm in Hepu County made an experiment on shrimp-crab-seaweed (*Gracilaria*) polyculture. The results are promising and may lead crab culture to new ways of reducing feeding, lower costs and higher profits.

To prevent crabs escaping is essential. Farmers in different areas take measures suited to local conditions. Some cheap, durable materials, such as asphalt felt, plastic cloth, polythene netting, brick and concrete slabs, are used to make barriers.

Water temperature, salinity, pH, transparency, dissolved oxygen, hydrogen sulfide and ammonia should be monitored and recorded. If these deteriorate beyond acceptable standards, corrective measures must be taken. Mangrove crabs are susceptible to changes in salinity. Strict attention should be paid to heavy rains and storms and it is advisable to drain surface water to maintain salinity. Crabs stop eating when the water temperature falls to 7°C or increases to 35°C. High water levels (1.3-1.5 m) should be kept to prevent water temperature rising too high in summer.

Different stages of growout.



Sexual dimorphism in mangrove crabs, A: male; B: female.

Feeds such as low value molluscs, trash fish, small shrimp and crabs, are often used in crab culture. Experiments have shown that fresh molluscs lead to the best results. The quantity of daily feed is determined by the size of crab. Usually 8-12% of body weight is fed when the shell length is 2-4 cm. This is reduced to 5% when the shell length is 6 cm. Special attention should be paid to prevent cannibalism caused by hunger. Artificial feed has recently been used in crab culture, and is used with a mixture of fresh bivalve meat or trash fish.

Crab diseases are not well understood. However, the efficient method of controlling them is not therapy, but suitable prophylaxis. The often used "medicines" are bleach powder, quicklime, potassium permanganate, dipterex, formalin and antibiotics.

Crab culture may become an important sector in China in the future if the following can be accomplished:

- a thorough review of the experiences of crab farmers throughout China, to determine the optimum culture conditions;
- reliable closing of the life cycle of the crabs, such that seed can be derived from cultured broodstock; and
- formulation of inexpensive diets rich in nutrients.

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Editor's note: Readers interested in this species can also consult the following recent publication:

Angell, C.A., Editor. 1992. Report of the Seminar on the Mud Crab Culture and Trade, Surat Thani, Thailand, 5-8 November 1991. Bay of Bengal Project Report 51, 246 p.