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TRAINING ON BRACKISHWATER AQUACULTURE
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CRAB FARMING

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MUDCRAB, "ALIMANGO" PRODUCTION IN BRACKISHWATER POND WITH MILKFISH¹

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INTRODUCTION

Mudcrab commonly known as "alimango" in the local dialect is probably one of the most edible and widely sought crustaceans species that inhabit the estuarine areas of tidal rivers and creeks in the Asian and Indo-Pacific regions.

Systematically, mudcrabs are classified under the genus *Scylla* and is reported to consist of three species: *Scylla serrata*, *S. oceanica*, *S. tranquebarica* and a variety of *S. serrata* var *paramamosain*. The *S. serrata* being considered to be the most widely caught species in the mangrove swamps of the Philippines. While the *Scylla oceanica*, commonly called the "king crab" or locally called "bulik" (Tagalog) or "manginlawod" (Visayan) is the biggest among the mudcrab species mentioned.

Hailed as "food for the gods", mudcrab is recognized as candidate species for culture in ponds. So far, the culture is largely traditional. Mudcrab becomes a subsidiary species to milkfish or penaeid shrimps with seeds entering the pond without intentional stocking by the farmer. Though conceived as a fishpond crop, mudcrab is considered nuisance in the pond when it deliberately burrow into the dikes causing inevitable leakages.

The feasibility of raising mudcrab in ponds in combination with milkfish has been demonstrated in a series of trials at the facility of Leganes Research Station of Southeast Asian Fisheries Development Center, Aquaculture Department, Leganes, Iloilo. Outside SEAFDEC/AQD, same operations were also carried out satisfactorily in R. Diamante Farm in Dumangas, Iloilo and Buenavista, Guimaras. Within a bamboo-fenced pond, mudcrab fed with trash fish were also observed to thrive on penaeid shrimps that are less mobile or incapacitated, small crabs, soft shelled clams, animal entrails or hides, filamentous algae and detritus. Milkfish on the other hand subsists on natural food (lab-lab, plankton, lumut).

Although culture of mudcrab in brackishwater environment has been practised for years in other Asian countries such as Taiwan, and Thailand, it is relatively a new industry in the Philippines.

With the availability of mudcrab juveniles from the wild throughout the year and the recent development in the hatchery technique thereof, there is a strong indication that production of mudcrab in pond along with milkfish in commercial quantities could be a lucrative industry.

¹ Paper read during Training on Brackishwater Aquaculture organized by the Department of Science and Technology (DOST) in cooperation with the Society of Aquaculture Engineers of the Philippines (SAEP), held in Puerto Princesa City, Palawan on 28-31 January 1997.

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SITE SELECTION

A typical brackishwater pond designed for the culture of milkfish or shrimp can be used for the farming of mudcrab. Enclosed areas of newly or partially developed fishponds provided with water control structures could also serve the purpose to some extent. This will somehow reduce initial expenditure required during the course of establishment involving extensive renovation of pond bottom. Soil type must be sandy clay or clay loam with rich organic matter base and preferably alkaline.

Water of good quality should be adequate all year round coming directly from the sea or tidal river. The farmer should consider an area where seawater could advance to fill a depth of at least 60cm during high tide. When drained even at neap tide, the pond bottom could be exposed completely. This is where engineering expertise is required to determine pond bottom elevation including dike and gate construction.

To prevent the increase of pond water salinity especially during long summer months, it is advantageous to have freshwater source. This will enable the farmer to adjust the salinity to a level favorable to the growth of mudcrab and milkfish.

Other socio-economic factor such as, cheap and skilled labor, market accessibility of construction materials and production inputs as well as the peace and order situation in the locality should be considered.

SOURCE OF JUVENILES

Mudcrab juveniles (10 to 40 g or 5 to 20cm carapace breadth) are available throughout the year (with peak during the month of May to September). They are caught in sizable quantities together with marketable size crabs in marshlands and estuarine areas. Common collecting gears used are baited traps (bintol), bamboo cage (panggal or bobo), scissor nets (sakag), fish corral (baklad), baited line with scoop net and oftentimes with bareheads. In Panay Island, collecting areas are situated in Barotac Nuevo and Dumangas, Iloilo; Pontevedra, Capiz; and New Washington, Aklan. Other areas outside Panay include some municipalities of Negros Occidental, Masbate, Bicol Region, Bataan, Lanao, Zamboanga and Misamis provinces. Depending on size, quantity, sex and species, crab seeds are available to the farmer through advance notice made to the collectors. This will give ample time for collection, handling, storage and transport. Mudcrab for fattening, about 5 to 10 pieces to a kilo maybe available also in local markets at relatively lower price. In ponds this will take only a few culture days to grow to much bigger and/or marketable size.

Although on its refining stage, technology in the hatchery of mudcrab is still being developed by researchers of SEAFDEC/AQD in Tigbauan, Iloilo.

Milkfish fingerlings /juveniles(hatchery-bred or wild) on the other hand can be obtained either from farmer- owned or operated nursery pond system or from outsider's milkfish fingerling banks.

REARING POND OPERATION

Area and other Physical Requirements

Compartments for mudcrab should range in size from 1/4 to 1 hectare in order to be manageable. Preferably, they should be rectangular in shape and positioned in series with an independent supply/drain canal. Each compartment should be provided with about 12 earthen mounds (5 meter) installed in strategic areas of the pond. These mounds serve as breathing spots where mudcrabs could climb during times of low oxygen tension. Sawed off bamboos or used PVC pipes (50 cm long with 15 cm diameter opening at both ends) may be added to serve as hides/shelter to avoid mortality due to fighting and cannibalism. Used tires, stacked and tied up in layers and wooden or bamboo platform are utilized as substitute for earthen mounds. These should be installed in the middle of the pond high enough so that the peaks remain above water even when maximum depth of 60 to 80 cm is reached (Fig. 1).

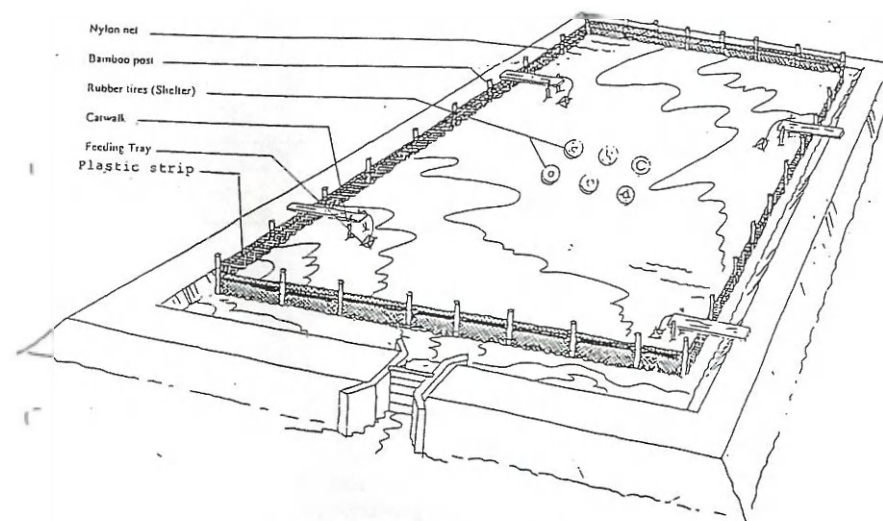


Figure 1. TYPICAL MUDCRAB POND

Note: Nylon net fence may not be necessary for relatively steep concrete-walled (not riprap) dikes.

To prevent the crabs from escaping, the area should be fenced-in by nylon net (1-2 cm mesh size) extending about 30 cm above the waterline. The nets should be supported vertically with bamboo posts and horizontally with bamboo splits and imbedded about 50 to 70 cm along the base of the dike (Fig. 2). Plastic strip/sheet of about 50 cm wide should be installed along the top edge of the net fence to prevent mudcrabs from climbing over the top.

For concrete-lined ponds with relatively steeper slopes, nylon net fence is no longer necessary. Catwalks and feeding trays may be constructed to provide ease during feeding, monitoring and stock sampling.

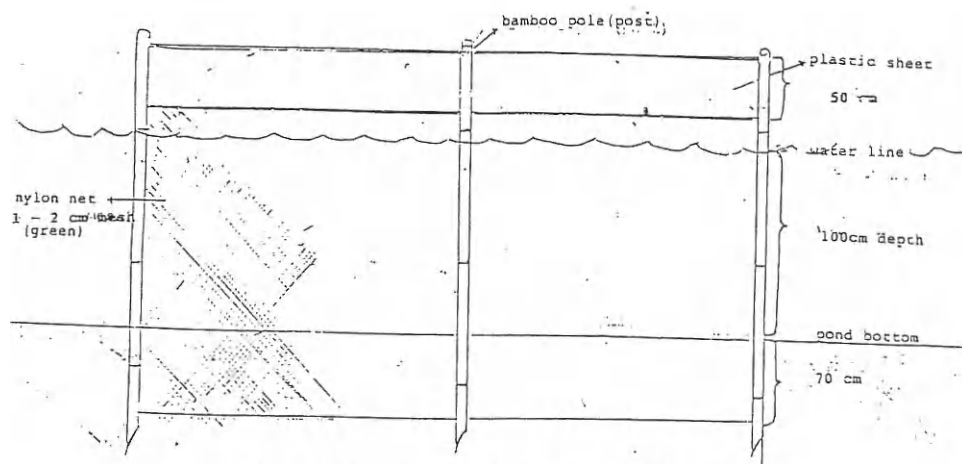


Figure 2. Nylon net fence for mudcrab pond

Pond Preparation

Since by nature the species is a scavenger, growing mudcrabs alone do not require meticulous pond preparation involving the propagation of natural food. Along with milkfish, however, the plankton or deep water method of growing natural food is advisable to ensure a repeated cropping system. The plankton method has several advantages like: (1) lead time in preparing the pond is short, thereby minimizing production cost; (2) plankton grows over wide range of salinity and (3) carrying capacity is greater because of more water volume. Plankton when maintained properly and abundantly, could be good natural food, estimated to support 500 to 600 kg/ha incremental gain weight of milkfish for a 90 days culture period.

For plankton method, the following procedures for preparations are made:

1. Drain pond completely and dry long enough to eradicate wild species and pests.
2. Admit water to a depth of at least 60 cm. Provide gates with fine-meshed screens (1mm mesh) to prevent re-entry of predators or wild species.
3. Apply 1 bag 16-20-0 or 1/2 bag 18-46-0 per hectare. Plankton should bloom after few days showing rich green color and visibility of about 15 to 40 cm. Re-apply fertilizers if plankton does not bloom.

Stocking of Juveniles/Fingerlings

Newly arrived mudcrab juveniles in monosize or mixed-sized group are normally contained in cardboard box, palm baskets ("bayong") or bamboo wicket baskets ("bakag") measuring 40 cm high and 50 cm diameter mouth opening. About 300 to 500 juveniles (chellipeds or pincers untied or tied with plastic straw or palm, "buri" leaves) are placed in each basket. Fronds of *Rhizophora* spp. (pagatpat) or *Avicennia* spp. (bungalon) are provided inside the basket to keep the temperature cool and to minimize fighting among crabs.

Stocking maybe done early morning or late afternoon preferably at night when the temperature is cool. During stocking tied pincers are freed, and crabs are released directly into strategic areas of the pond at density of 5,000 to 10,000 juveniles per hectare in combination with 2,000 to 2,500 milkfish fingerlings (10 - 15 g).

It is advisable to stock monosize mudcrab or milkfish juveniles to obtain a relatively uniform size at the end of the rearing period.

Care of Pond and Stock

After stocking, it is essential to maintain good water quality favorable both to mudcrabs and milkfish. They were observed to grow faster at water temperature between 23 to 32 degree centigrade and salinity of not more than 40 ppt. When mudcrabs start to crawl on top of the earthen mounds or cling to the bamboo fence it is an indication that water condition is not favorable. It is advisable therefore to change at least 1/3 of pond water especially during spring tide. An irrigation pump maybe necessary in case water change is needed during neap tide.

Dikes, gates and net fence should be regularly inspected for possible leakages and dilapidation.

Feeds, Feeding and Fertilization

When fed with finely chopped trash fish preferably fresh or frozen, mudcrabs have an average feed conversion value (weight of feed needed to produce a kilo of mudcrab) of 1.72. Trash fish normally costs about P5.00 to P8.00 per kilo. Animal entrails or hides maybe given to augment the protein source other than those derived from trash fish. Trash fish maybe chopped, dried and stored. However, soaking dried trash fish in water before feeding is advisable to prevent the floating feeds to go unnecessarily on sides or corners of the dike if scattered inside the pond.

Feeding is done by broadcasting. It is carried out two times every other day at an initial rate of 10 % of the total mudcrab weight. Every 30 days thereafter, feeds are adjusted to 8 %

down to 6 %, respectively.. For example, 5,000 juveniles with an average weight of 20 grams each will have a total weight of 150 kilograms. Hence, the required amount of every other day feeding at 10% is 15 kilograms. One half of the feeds is given in the morning and the other half in the afternoon.

Likewise, to maintain good growth of plankton for milkfish, it is recommended that one bag of 16-20-0 (or 1/2 bag 18-46-0) be applied in a platform, subsequently every 15 days. As discussed earlier, water visibility should range between 15 to 40 cm. If plankton visibility is less than 15 cm (meaning there is excessively abundant plankton) stop fertilization and replace about 1/3 of pond water. Re-apply fertilizer if water becomes clear.

Filamentous -green algae or lumut, when readily available in relative quantity, maybe given as feed to crabs

HARVEST

Current Method/ Total Drainage (Total Harvest)

This is a way of inducing mudcrabs and milkfish to swim against the current by the so called "pasulang" method. The pond is partially drained (50%) during low tide and at high tide new seawater is admitted thereby causing the stock to swim against the current towards the catching pond. Together with milkfish, bigger size and fatter crabs with females having maturing eggs or "aligue" are caught. This commands a higher price in the market comparable to male crabs with massive or big pincers. Also getting a berried/gravid females (with sponge or "bukaka") or even mating crabs (in pairs) is not uncommon. While swimming against the current and concentrating along the gate, the crabs are caught with scoop nets and the pincers are then securely tied using strips of coconut sheath ("suwak") or plastic straw. Care coupled with skill in tying the pincers will safeguard someone from the likelihood of being severely pinched. The remaining crabs, milkfish and other saleable species left in the pond are collected by total drainage. Earthen mounds are examined for complete retrieval of crabs. Normally, this lasts a day or two using five persons.

Current Method/Baited Traps or Hand Lines with Scoop Nets (Partial/Selective Harvesting)

Applied to mudcrab alone, the method takes advantage of the swimming behavior of mudcrab against the current. This is done during spring tide after a period of about 45-60 days where it is normal to catch crabs weighing 200 to 250 grams and above, depending on the initial size at stocking. Majority of the catch using this technique are females with maturing eggs (aligue) as the marine phase of life or spawning stage of the animal is about to begin. Baited trap ("bintol") or baited hand line can also be used if selective harvesting falls on ebb or neap tide. This method minimizes competition for food and space of the remaining stock and likewise reduces the incidence of cannibalism, thereby allowing smaller ones to grow faster. Partial harvesting is done every 15 days thereafter, until final harvest.

POST HARVEST

Newly-harvested mudcrabs mixed or sorted by size are always tied in bunch either by kilo or dozen. Sometimes the females with maturing eggs are sorted from the males with big pincers for delivery to discriminating costumers. For long distance travel, they are kept inside wooden or styrofoam boxes, and bamboo ("tiklis") or palm ("buri" or "pandan") baskets. Mudcrabs are sturdy species and can stay alive for at most one week by simply sprinkling them occasionally with water. Prolonged holding period, however, will lessen the weight ("hagas") or eventually cause death. Price varies from region to region. In Western Visayas, 150 to 200 g mudcrab fetches from P 120 to P150 pesos per kilo while bigger sizes (200 grams and above) reaches to P 160 to P250 pesos per kilo.. Here and abroad, the market of mudcrab is still unsatiable.

Milkfish(250 grams ABW) after harvest are washed and killed in chilling tank or box. They are sorted according to size and then packed into wooden and metal boxes, metal tubs or baskets scattered with crushed ice, ready for market.

ECONOMICS AND COSTINGS

Although influenced by nationwide economic conditions, the following estimates may be made to provide general guidelines for prospective polyculture operation of a one hectare mudcrab pond in combination with milkfish.

Gross Annual Revenue	Annual Yield (3 croppings)	Unit Cost	Total Value
Mudcrab	1,800 kg*	P 180	324,000.00
Milkfish	1,800 kg*	50	90,000.00
Total Revenue			414,000.00
Variable Costs			
Crab juvenile	15,000 pcs	6.00	90,000.00
Milkfish fingerlings	7,500 pcs	1.50	11,250.00
Trash fish	3,780 kg	5.00	18,900.00
Labor:			
Installation of perimeter fence	15 days	110.00	1,650.00
Fertilizer (16-20-0/18-46-0)	18 bags	200.00	3,600.00
Bamboo poles	50 pcs	50.00	2,500.00
Polyethylene/nylon netting	400 m	80.00	32,000.00
Plastic sheet	1 roll	1,200.00	1,200.00
Miscellaneous (Tools and equipment)			2,000.00
Sub-total			163,100.00
Fixed Costs			
Caretaker's salary			36,000.00
Depreciation			
Repairs and maintenance			3,000.00
Transportation and freight			5,000.00
Sub-total			44,000.00
Total Cost of Investment			207,100.00
Net Profit Before Tax			206,900.00
Income tax (35 %)			72,415.00
Net Profit After tax			134,485.00
Return of investment			65 %
Payback Period			1.54 years

PRODUCTION/YIELD CAPACITY

Results of series of verification studies on the polyculture of mudcrab and milkfish conducted in the commercial pond of SEAFDEC, Leganes Research Station at Leganes, Iloilo and R. Diamante farm in Dumangas, Iloilo yield an average survival of about 60% and a production 600 kg per hectare per crop of mudcrab with body weights ranging from 150 to 300 g each and 600 kg per hectare per crop of marketable size milkfish. Following this system and program of works, at least three croppings can be attained in one year.

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