Project "Integrated planning and practices for mangrove management associated with agriculture and aquaculture in Myanmar - 2017P1-MYR"

CRAB HATCHERY AND SEED PRODUCTION
Technical guideline

Myanmar 2018

Chapter I: INTRODUCTION

I. Information on mud crab biology and reproduction

I.1. *Taxonomy*

English name: Mud Crab, Green Crab, Mangrove Crab

There are four species of *Scylla* have been clarified: *Scylla paramamosain* ; *Scylla olivacea; Scylla serata; Scylla tranquebarica.* There are two main species of mub crab in Myanmar are *Scylla serata* and *Scylla olivacea* in which *Scylla olivacea* is the most common species in Myanmar.

Taxomomy of four species of *Scylla* according to Keenan et al. (1998)

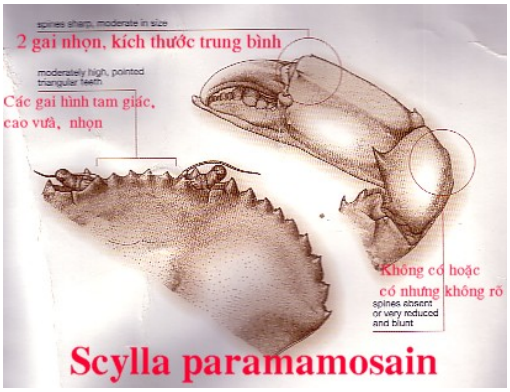
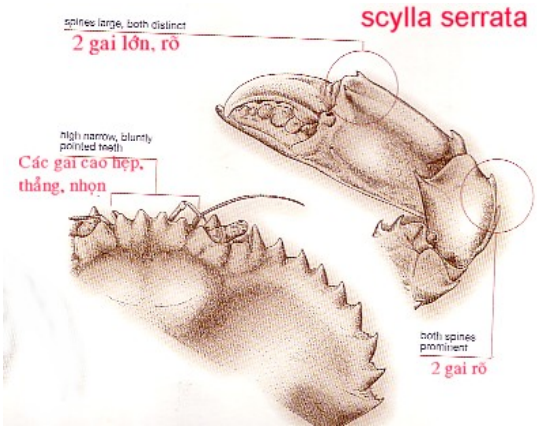


Figure 1

Figure 2



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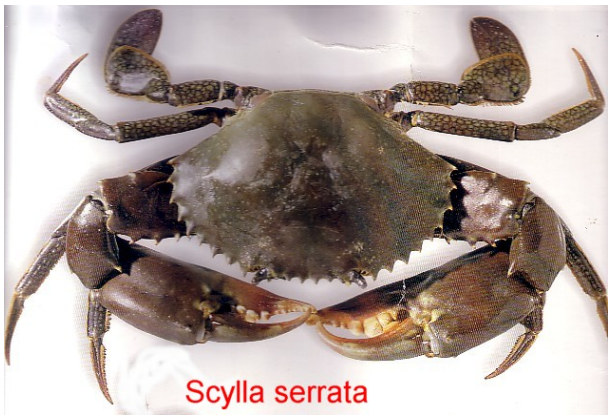

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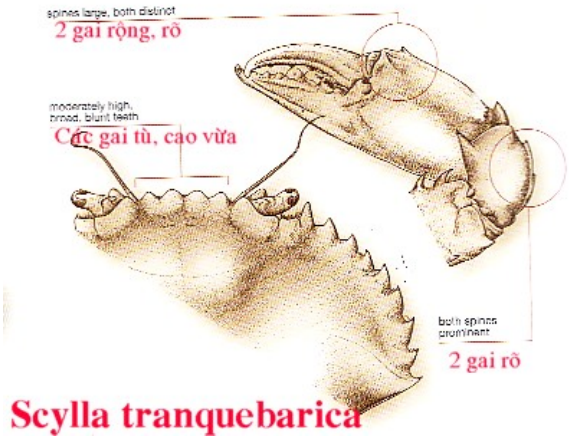

Figure 7

Figure 8

I.2. External anatomy

Mud crab has a large size, with the carapace (outer shell) as a thick hard shield, made of chitin (a protein) or bone, that provides rigidity and protective covering. Its dorsal part has green color, where as the ventral part has white-yellow color. Mud crab body is mainly divided into two parts: head and thorax (center) which are covered by the carapace, addoman which is folded under the body (or called apron).

I.3. Life history and habitat

I.3.1. Stages in mud crab's life cycle:

- After spawning, the eggs were carried under the abdomen of female crab prior to hatching to become the zoeae.
- The zoeae floats, grows and transforms into a megalopa, it moves inshore and settles on the seabed then moults into a juvenile crab.
- The juvenile crab moves to an estuary and settles in sheltered areas. It migrates from seawater environment to brackishwater or even freshwater during their lifecycle.
- After mating, female migrates offshore to spawn. Due to this habit of mud crab, therefore, the grow-out crab ponds should be surrounded by a short fence to ensure crabs cannot walk away from the pond.

I.4. Feeding

- There appears to be difference in their food preferences from juvenile to adult.
- The zoeae feeding on algae, rotifer, nauplii artemia... The megalopa feeding on nauplii artemia, artificial feed such as grinded meat or fish and clam. The crablet feeding on plankton, small animals or copepodas.

I.5. Growth features

- Growth in the crustacean is generally periodic and characterized by a sudden increase in size and weight after each moult. Changes in the outer shell occurring in 70% or all of the time between moulting, 30% of the remaining time of the moulting cycle, crabs retain the stored energy in their liver in which this energy would be used to form the new shell.
- The eyestalks have a important influence on the process of moulting and maturation of the mud crab. The eyestalks produce hormones that regulate calcium and blood levels, blood sugar. If the calcium levels decrease then crabs cannot moult and die.
- Cutting the eyestalks could stimulate the growth in young crabs and influence to the maturation of the adult crabs.
- The moulting occurs throughout the life of the crab. At the larvae stage, their body needs to grow rapidly, so that the larvae would moult once about 2-3 days or 4 to 5 days. The time between moulting increased with adult crabs, they maybe moult every 15 to 30 days. When moulting, crabs not only remove the carapace but also the old shell of their stomach and gill.

- The moulting lasts about 30 ÷ 60 minutes with adult crabs. New moulting crabs have wrinkled shell then gradually stretch. At this time they are very weak, do not eat, can not defend themselves, lying at the bottom 2 ÷ 3 hours to restore normal state and after 1 ÷ 2 days their shell would be more hardened. After each moulting, the weight of crabs gain from 40 - 80%. In the moulting period, the soft shell crabs are usually attacked by the other strong crabs and this leads to loss of quantity.
- The moulting of mud crab is one of the issues that need attention in order to find the suitable rearing and grow-out method. Good water quality is needed and the feed should be appropriated, it is also important to create the shelter for moulting and avoid to culture with high stocking density.

I.6. *Reproduction and individual development*

I.6.1. Male and female

- In female mud crab, the characterisric of U shape of their abdominal flap (comprised 6 segments), the change of the abdomen from the more triangular in immature female to the more rounded and broad form, is a more obvious sign of maturation, together with their heavily pigmented abdomen. In male mud crab, the abdominal flap has V shape and is comprised 5 segments only.

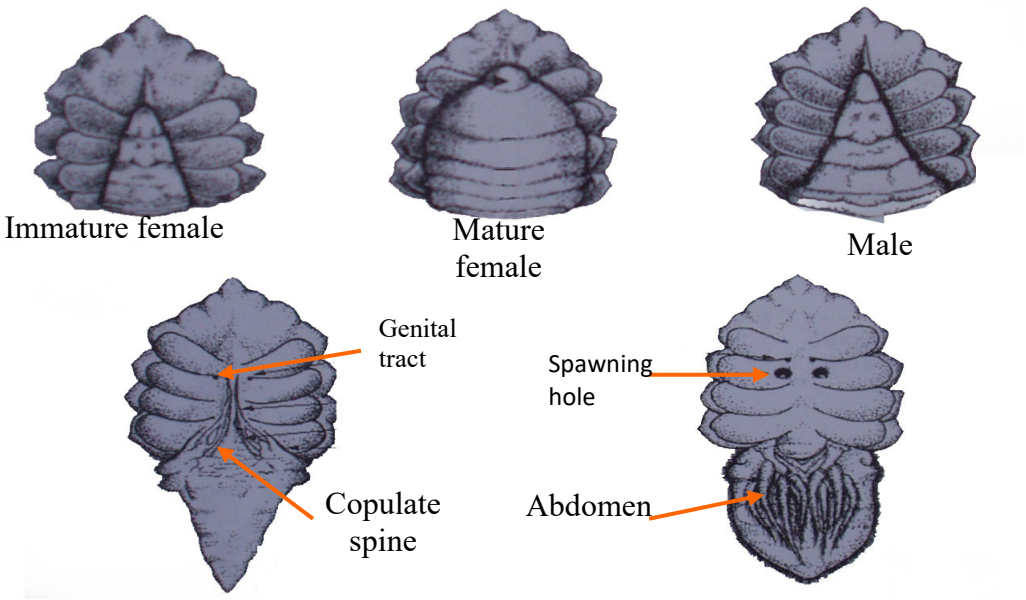

Figure 10: The anatomy for the external genital organ of female and male crab

I.6.2. Reproduction

- As reaching sexual maturity, mud crabs migrate to the estuary region for the copulation and spawning. Mud crabs usually migrate in July to August, and the breeding season is mainly occurred during October to February. However, berried crab (female with eggs attached to the abdominal flap) could be appeared during the year.
- About 2-10 days prior to moulting for copulation, male and female crabs will couple together. The male carries the female underneath him within 3-4 days or even more by using his walking legs. The male can successfully mate and transfer their spermatophores into the female once she has moulted and is soft shelled. During copulation, which may last 5 hours or whole day, the female stays in the protection of the male until her shell is fully hardened. In breeding season, female crab could spawn 1-3 times with the sperm retained in the beginning of the season.

I.6.3. Spawn and hatching

- When spawning, the female crabs are at the bottom, they use their legs to raise up the body, the abdomen (abdominal flap) would be opened, the fringe setaes are are raised up, the eggs ripen are then fertilized with the retained sperm.
- Due to the movement of the abdomen, the eggs would be attached to the setaes and by the external action of the outer membrane of the egg, the eggs form to be the eggshell, which is attached but remain "free" and not sticked each other.
- The amount of egg in each spawning is very large, a female crab weighing 400g can spawn and carry over 1 million eggs. During the breeding season, a female can spawn more than one time.

I.6.4. Individual development

- The subsequent development of ovary can be seen by changing colour as crab mature, progressing from transparent through to yellow, grey and finally dark orange prior to hatching.
- When the eggs turn to gray colour, legs and eyes begin to appear. Heart begins to work and other organs continue to form.
- The zoeea floats upstream in the water. A zoeae grows by moulting five times then transforms into a megalopa.

Table 1: Characteristics of the zoeae larvae stages

Stage	External feature	Day after hatching (day)	Average size (mm)
Z_1	Compound eyes with black colour, 5 abdominal segments	0÷3	1,65
Z_2	Similar Z1 but a bit bigger	3÷6	2,18
Z_3	Bigger eyes, eye stalks are formed but have no segments, 6 abdominal segments	6÷8	2,70
Z_4	Abdominal legs are formed, eye stalks have segments	8÷11	3,54
Z_5	Abdominal legs splited into two parts, setaes appeared in its outer edge.	10÷16	4,50

- The megalopa has big stalked compound eyes, spines disappear.
- The megalopa has 5 pairs of abdominal legs: the first pair is big and will develop into claws. Its long and narrow abdomen has 7 segments but no longer splited.
- The megalopa swims aggressively. In the experimental condition, with temperature ranged from 26 ÷ 30^{oC} and salinity 25 ÷ 30‰, a megalopa will moults and transforms into crablet 1 after 6-7 days.
- Crablet 1 has fully developed carapace, its abdomen becomes smaller and folds underneath the carapace, namely abdominal flap.

II. Water treatment techniques

Water is a very important factor in artificial crab seed reproduction. Water treatment techniques vary depending on site, region and seasons.

II.1. Water intake

Pumping water into the sediment tank at the highest tide, best to pump when river water in silver color, salinity of 25 ppt or more.

II.2. Chemical treatment

II.3. Meaning of chemical treatment

Stwater pumped from the sea or from rivers contains a lot of impurities: suspended matter, organic solvents and other factors such as: chemicals discharged in the process of agricultural production, wastewater from seafood processing factories and living; organisms and other adverse factors. These unfavorable factors, if not eliminated thoroughly, will have negative effects on the larval and juvenile stages of rearing.

- After filling the tank with water, use potassium pemanganate (KMnO4), with a dose of 1.5 - 2ppm (1.5 - 2gam/1m3 water), KMnO4 must be dissolved before putting into the tank. Aeration tanks continuously for at least 30 minutes, followed by using CaCO3 (or Dolomite lime) lime with a dose of 50 grams /1m3 of water, followed by aeration for 30 minutes. Then turn off the aeration to let the water settle all suspended organic matter. When the water is clear, pump to tank Number 2 through filter bag, mesh size 5 - 10 micron.

- In tank # 2, water is treated with chlorine, dose depending on the level of water pollution, usually from 30 to 50 grams/1m3 of water, strong aeration for about 30 minutes to dissolve chlorine in the tank then turn off the aeration for 6-12 hours, then continue to open aeration strongly to let Chlorine out, best exposing water to the sun.

- During the aeration process, the pump can be combined and circulated in tank 2 with an ultrafiltration bag, mesh size 2-5 microns

II.4. To neutralize toxins in water before use

Chlorine is a very strong disinfectant that can kill most microorganisms and molds that are present in the water, but if left untreated it is toxic to the larvae. Therefore, chlorine in water must be removed before use. If left, neutralize with sodium thiosulphate Natri. It is also possible to have strong aeration in the sun for chlorine to evaporate.

- After sterilizing chlorine, pump through the filter to use for brood stock and laevae rearing tanks.

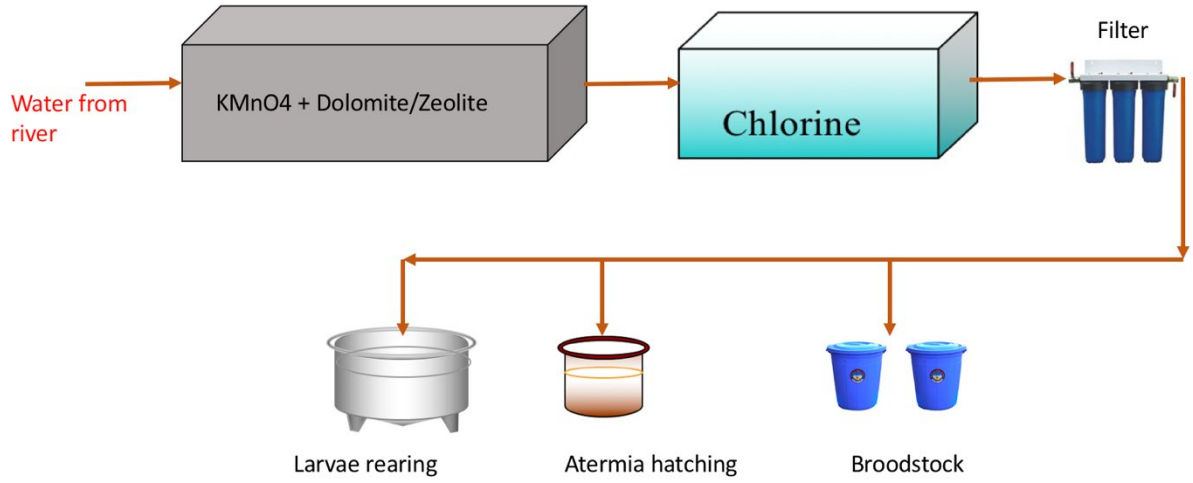

Figure 11 Water neutralization system

III. Broodstocks

In crab artificial propagation, female crabs are very important. The size, weight, and development of the ovaries greatly affect the quality of the larvae and the weight of the crab at harvest. If crab broodstock are large, live and mature in a clean environment, rich in nutrients that produce healthy larvae.

III.1. Tank preparation

Female crabs are alimented separately in a plastic container. Salinity of sea water is about 28 - 32ppt. The container is aerated with air stone.

III.2. Broodstock selection

Choose mature female crabs with a weight of 450 - 600 grams, clean outside full of legs and full of ovary inside, preferably crabs from the sea (from fishing boats).

III.3. Stocking density

For convenience of monitoring, and health control, each female crab is kept in a separate container, volume of 30 - 50 L

III.4. Feeding and management

Female crabs are fed twice a day, morning and afternoon. The feeds can be squid, oyster, oyster or blood cockle.

Checking regularly, removal excess food and siphon feces from the container bottom 2 hours after feeding to keep the water environment clean.

Do water exchange once a day with level of 100%, during doing water exchange, bath crabs with Iodine (7 drops in 20 liters of salt water) about 5 minutes before putting back into the container.

Checking regularly, if crabs open their abdomen, moving them to the bucket with sand on the bottom so that females can lay egg easily and convenience. Normally, crab will spawn eggs after 7 to 10 days of feeding.

III.5. Egg brooding and hatching

Brooding.

Keep barried female crab (carrying eggs) in plastic container with clean seawater and aeration. Doing water change daily with rate of 100%. During water exchange period, bath with iodine at dose of 15 ppm for 1 minute before putting back into the container.

Embryo development time is about 10-12 days depending on the water temperature. Then eggs hatch to become larvae zoea 1.

Figure 12 Egg brooding and hatching

Hatching

When the zoea larvae appear in the container (usually on the 10th day of brooding), moving the barried crab to the composite tank of 500 - 1000 liters to allow the eggs to hatch. The water supplied to this tank is similar to that supplied to the larvae rearing tanks. The hatching tanks is aerated gentally to avoid negative effects to embryo and newly hatched larvae.

IV. Larvae rearing techniques

IV.1. Larvae rearing tanks and food prepartion

Rearing tanks: The larval rearing tank can be either a composite tank or a ciment tank.

Water preparation: Water supply to nursing tanks 1 day before hatching, aeration and chemical treatment.

Treatment of the drug: When the water supply is completed, installing air stone, then use EDTA with dose of 5 ppm to precipitate heavy metals in a period of 30 minutes, then use Shrimp Falavuor with dose of 2 g/1m3. After 12 hours use probiotic to improve water quality.

Food preparation: Feed for zoea1 larvae is a artificial feed and umbrella artemia, so feed need to be prepared in order to feed larvea immediately 1 hour after the hatching

IV.2. Collecting and transferring larvae to nursing tanks.

This is a very important stage, the contamination during larval rearing can lead to some diseases for larvae: lobster, glow, mucus ... so be very careful and do the following:

After hatching, female crab should be immediately removed from the tank to minimize contamination of faeces and side eggs to the larvae.

Reducing aeration so that all broken eggs sediment to the bottom of the tank, also the membrane floating on the surface, then siphon the dirty residue at the bottom of the tank.

After siphoning clean the larvae with a fine net, bathe in iodine solution (10 ppm for 1 minute) and bring to a rearing tank.

Density of larvae in tanks: 50 - 70 individuals / liter

IV.3. Nursing of larvae (stage 1)

IV.3.1. Feeding:

Newly hatched larvae were fed with Friipark II and artemia umbrella.

Feed 4 times a day of artemia: 6h, 12h, 18h, 0h. and 2 times of artificial feed 9:00 and 15:00

Feeders and feed intake are shown in the table below.

IV.3.2. Larvar rearing tanks managemnet (stage 1)

Adjusting appropriate aeration to prevent the larvae to settle to the bottom of the tanks .

If the artemia cyst stick in to the wall or settle to the bottom of the tank, turn off the aeration and remove them to clean the tank.

Usually on day 5th, siphon and do water exchange. If water is too dirty, it can be done on day 3. Water level change is not more than 30%.

(all management techniques will be guided during the practice)

IV.3.3. Nursing of larvae (stage 2)

In order to achieve high survival rate in reproduction, it is necessary to reduce larval density to appropriate level. The simple way is to transfer the larvae to new tanks with cleaner environment, larger volume so the moulting period will be more convenient.

Time for seedlings: When the larvae migrate to the stage of zoea 4, the new tanks will be managed the same with old tanks and the food will be maintained as well. Crab larvae.

When the larvae migrate to the megalopa stage, feed the artemia with processed food or lansy post. Feeding 6-8 times daily, depending on the eating ability of the larvae.

When the larvae are completely transferred to megalopa, they are moved to nursery area. This tank is designed simply, with the shelter net. Feed is grill or artificial aquafeed.

About 24 - 26 days, megalopa completely transferred to the crab when they can be collected and sold to the open farm.

V. Harvesting and transporting of mud crab seeds.

V.1. Harvesting

Before harvesting crab juvenile, brass, bucket to hold water, plastic basket and net should be prepared.

Draining the water in the tanks and collect the substrate, manipulating it gently to avoid damaging the crabs.

When the water colum in the tanks is shallow, use a net to collect crabs then quantified by use scale or individual counts.

V.2. Crab transporting

The technique of transporting crab depends on distance and time of transportation

Will show in field trip