

Crab hatchery

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For the operation of a hatchery of seed production of crab the following are component of crab hatchery

- **Brood stock development unit**
- **hatching unit**
- **larval rearing unit**
- **live feed culture unit**

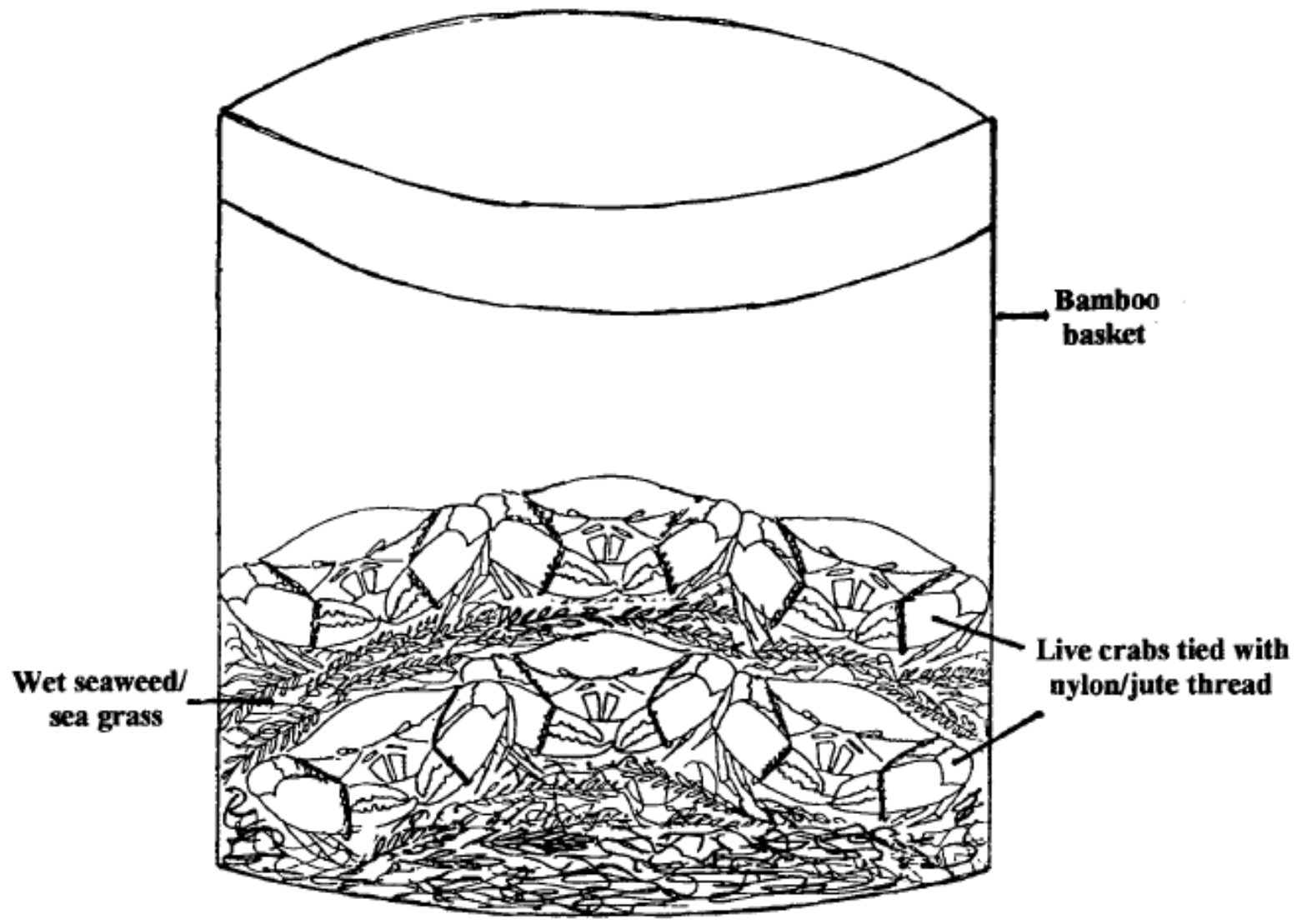
Brood stock development and maintenance

Source of brood stock

Live mature male and female *s. tranquebarica* and *s. serrata* can be obtained from the inshore sea and brackish water region

transport of brood stock

- Generally live mud crab are tied with jute or nylon thread to impede the movement of chelipeds for easy handling
- Live adult crab obtained from fisherman are dipped in fresh and clean sea water to maintain moisten the gill and packed in bamboo basket with wet sea grass/sea weed to provide a cool and moist condition during transport
- Mud crab survive for maximum -3-4 days
- If transportation are longer than crabs with all limbs intact are given another dip in sea water survival for next 3-4 days
- Another method - adult crab are weight **350 to 700 gm are packed at the** rate one crab per packet in polythene bag each containing **6 litre of oxygenated sea water**

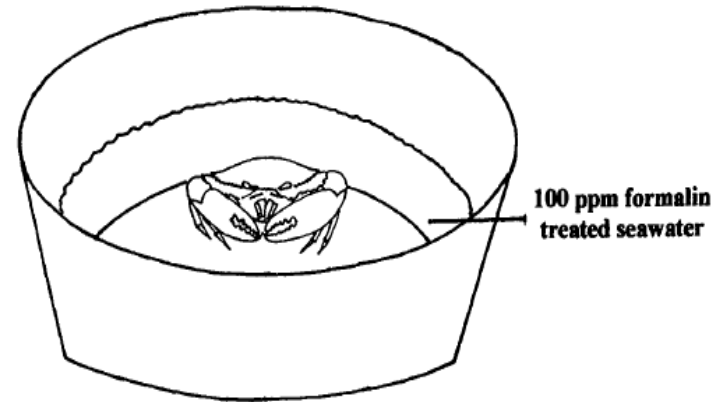


Prophylactic treatment of brood stock

Mud crab obtained from wild or from culture ponds they are disinfected in 100 ppm formalin for 30 min before transferring to the brood stock holding tanks

Acclimatisation of brood stock

After disinfection the adult mud crab should be held in tank containing sea water -30-35 ppt for a week

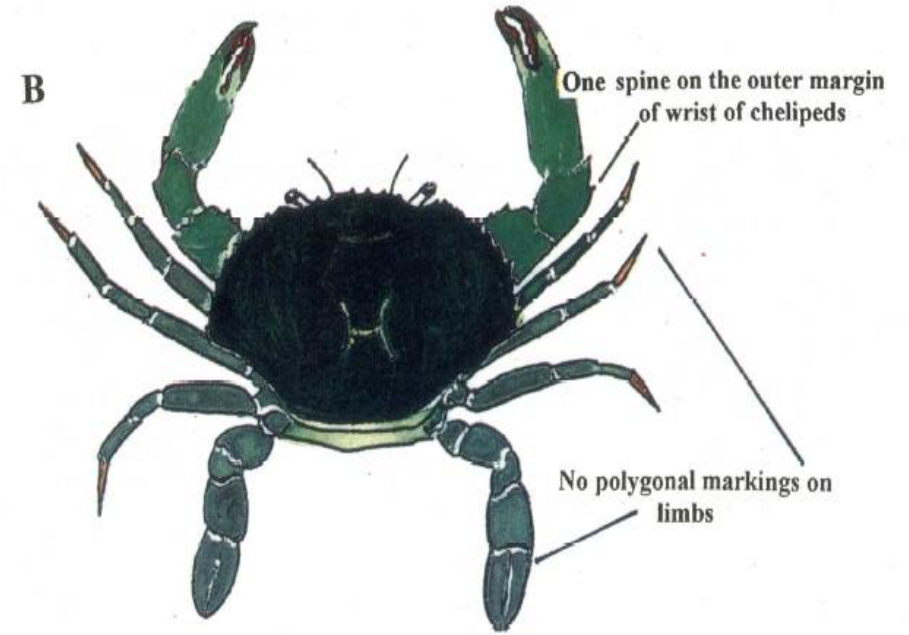
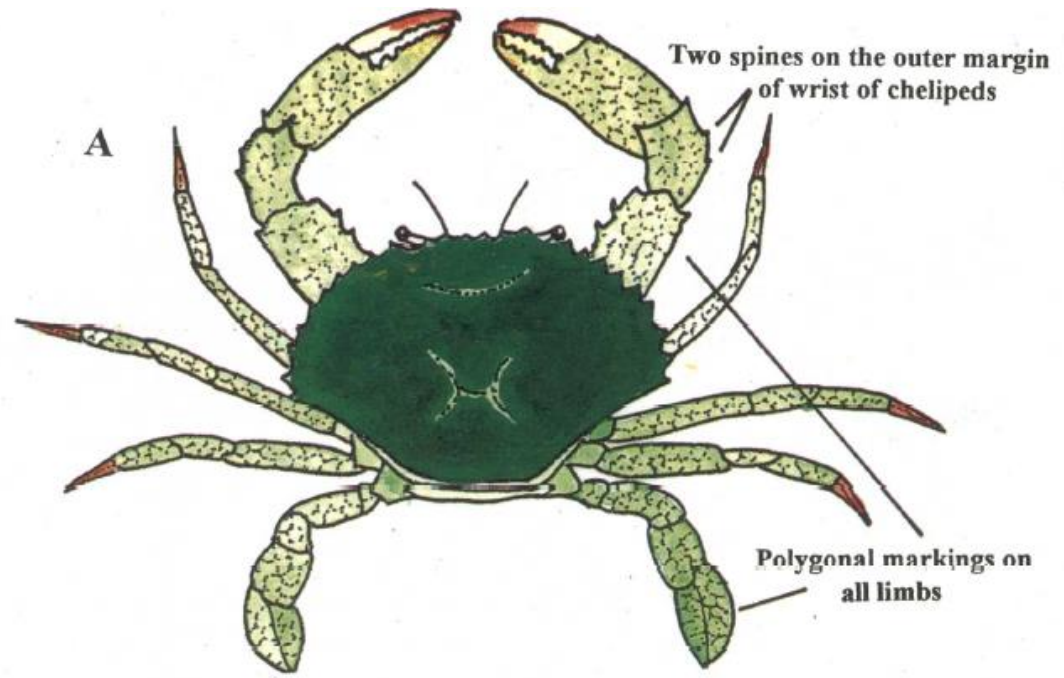


Induced maturation

Selection of mature crab – mature male and female crab

Eye stalk ablation

- X– organ sinus gland complex in mud crab play important role in the regulation of metabolism
- Hyperglycemic hormone (HGH) present in the eye stalk is responsible for the metabolic regulation
- **Eye stalk ablation Also remove the moulting inhibiting hormone**
- Eye stalk ablation in mud crab results in increased in food intake, faster growth of ovary and significant increase in weight and size of oocytes and advantage of extrusion of egg



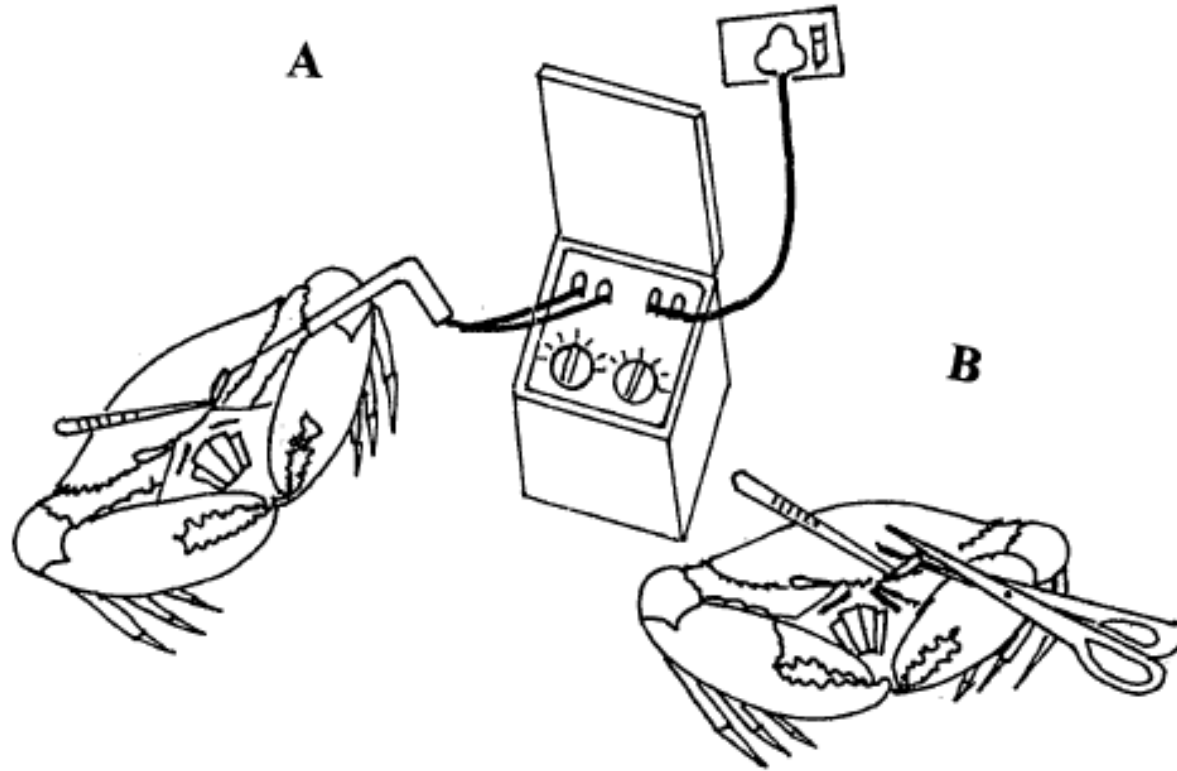


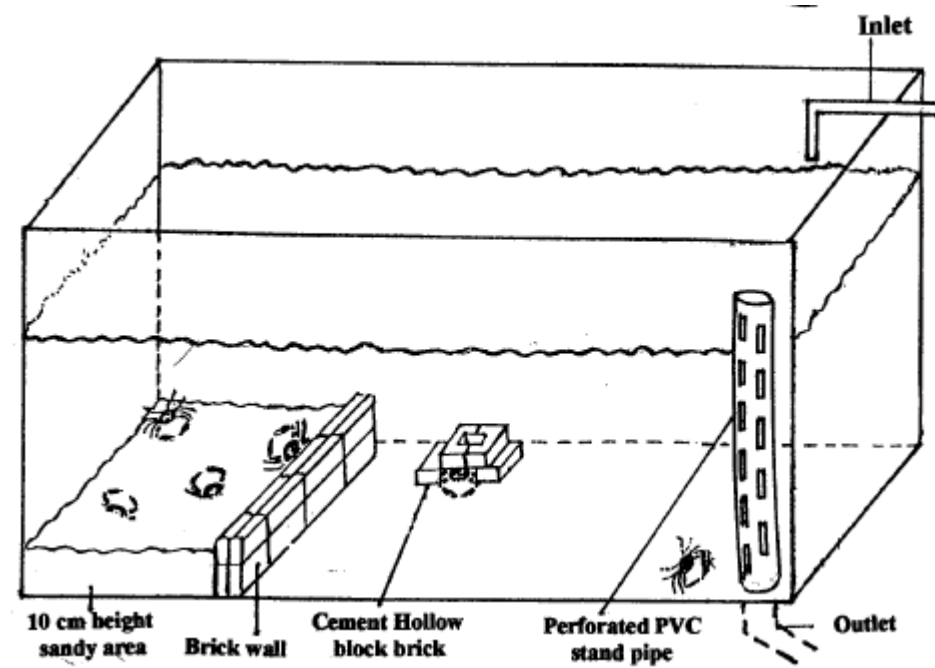
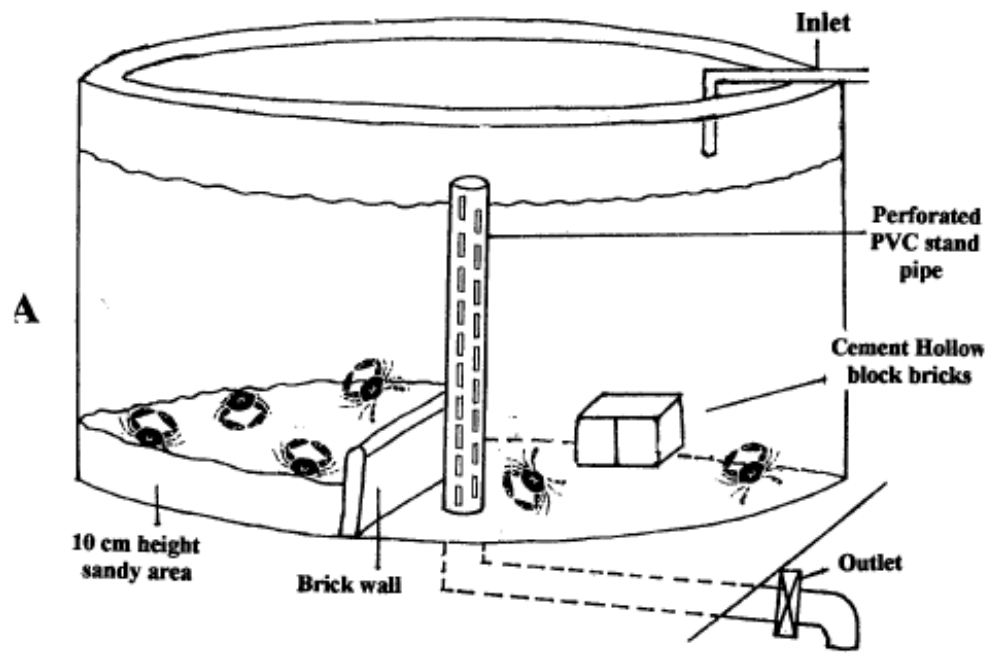
Fig. 6. Method of eye-stalk ablation. A. Electro-cautery apparatus; B. Scissors and forceps.

Right or left eye stalk of mature female can be remove either by using an electro cautery apparatus or cutting the eye stalk with the help of scissors and a forceps

- If the berried female are available from the natural ground only the holding tank shall be required in a hatchery for the maintained breeder
- **Berried female with yellow egg mature to grey egg within 5-7 days** and it can be fed on **squid meat daily twice**
- If the brood stock to be raised, stock the young crab (Crablings) collected from wild
- In the pond earthen pipe PVC pipe tyres are kept which will hide out or shelter which will reduce the fighting among hard shell crab and prevent mortality of soft crab
- ***S. Tranquebarica*** can grow from the initial size mentioned above to 400-500 gm in 4 months and 800-10000 gm in 7 months rearing

Size of the tank

- RCC or brick Rectangular or circular tank
- Capacity- 5- 10 tone capacity
- With facility draining facility used holding ablated female and unablated male
- The size of tank may be vary – 0.1 to 0.4 ha



Stocking rate

stocking rate -1-2 crab per square metre

Sex ratio

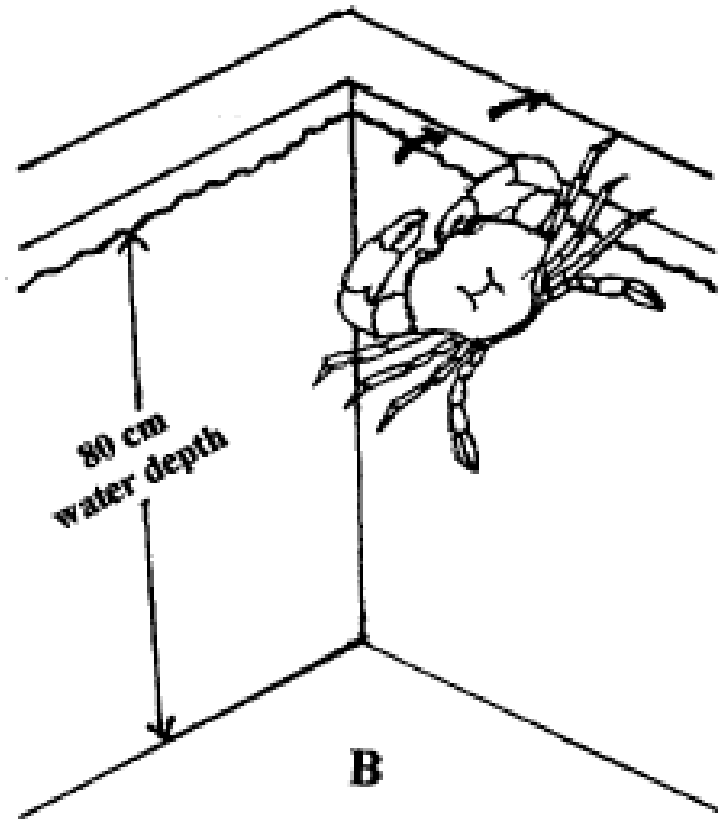
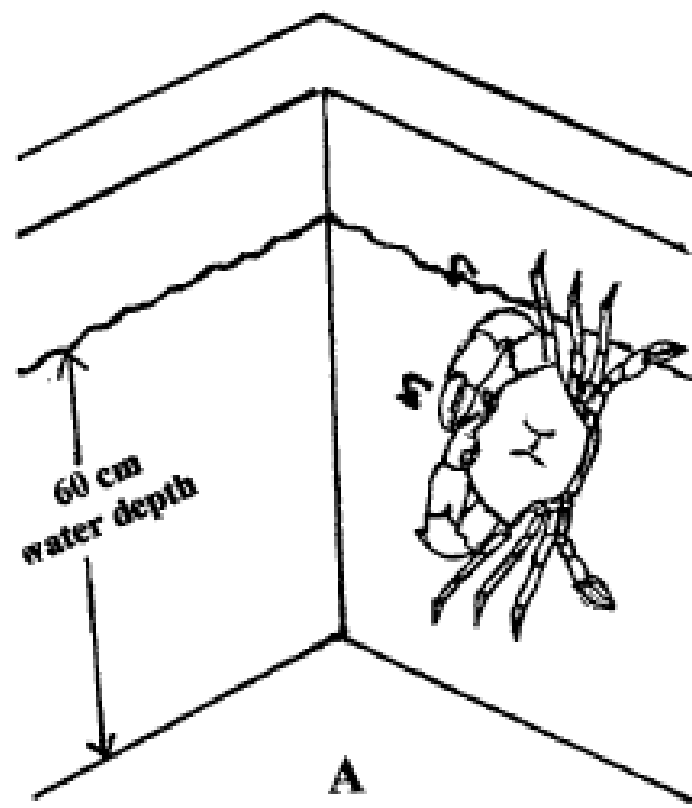
Adult **unablated males and unilaterally eye stalk ablated females** should be stocked in the **ratio 1:1 or 1:1.5**

Marking and reared crab

- Both sexes of the stocked marked on the carapace with the white colour epoxy paint
- Identity of an individual crab in the stock is continuously monitored
- Re-marking of crab may be done whenever the old marking fades away

Water quality management

- Sand filtered sea water
- Salinity -30-35 ppt
- Water should be change daily – 60-70% in the morning
- Water level should be maintain-at 60cm if the tank hight-100cm
- Water temperature – range-25-29 degree Cent



Feed and feeding schedules

- Feed bivalve meat and squid meat
- Both contain high protein
- Rate of feeding should be- 8-10%
- Daily ration may be divided into two-equal quantities morning and evening
- Either crab should be fed to their satiation level

Monitoring of brood stock

Daily observation should be made to record moulting, pre-mating, mating, duration of mating and appearance of berry in the brood crab

Moulting

Normally crab moulting during night

Growth

- In case of penaeid shrimp the moulted crab increase in size due to absorption of sea water
- Crab size measured in terms of size carapace width and weight

Pre-mating embrace

Pre-mating embrace takes place between a hard male and hard female which last of three day

The pairs separated from each other and after an interval of 2-3 days the same female moult

- The moulting is called pre-copulatory moulting, which the male assist the female to cast-off her old shell



Mating process

- The female crab complete moulting the male embraces the soft female again for actual mating
- The male gently turns the female over her back using the chelipeds
- The female unfold the abdominal flap and the male holds the female
- Copulation last of 5-52 hours, the actual time taken for transfer of Spermatophores is 5-7 hours, After male separate
- A moulted female allow two different male to copulate one after another with an interval 1-2 day
- Spermatophores deposited by two male co-exist in the seminal receptacle of one female

Extrusions of Egg

Fertilization

- Spermatophores are stored in the **seminal receptacles of females** till the **eggs are extruded**
- During extrusion process the stored sperm are liberated from the Spermatophores to fertilize the egg and fertilize egg are extruded through the genital opening present in the sternites of six thoracic segment
- Egg become attached to the smooth setae present in the endopodite of four pair of abdominal pleopods

Segregation of berried female

- The egg mass carried on the abdominal flap is called berry.
- Those female carry a berry are called berried or ovigerous crabs.
- If the berries female are notice in the brood stock tank it should be collected gently by using a hand net and placed in 500 litre circular tank

Number of extruded egg

- *S. Tranquebarica* –no of egg attached to the abdominal pleopods varies from 2 to 5 million
 - In *S. serrata* -1 to 3 million
- Dead egg are removed by the mother carb with the help of first and second pairs of walking leg

Repetitive extrusion of egg

- Between two copulatory moult a female can extruded 2 to 3 batches of egg

Viability of stored sperm

- Spermatophores are stored in the seminal receptacle of the female by one or two male during different mating may be utilize in more than one spawning indicating multiple fertilization
- the viability of stored sperm in mud crab may last for a period of 9 to 12 months

Time interval between eye stalk ablation and extrusion of egg

	Time interval in day			
	<i>S. Tranquebarica</i>		<i>S. Serrata</i>	
Between eye stalk ablation and first extrusion of egg	26-89	54 Average	6-96	32 Average
Between first and second extrusion of egg	34-56	47 Average	22-37	30 Average
Between second and third extrusion of egg	38-42	40 average		

Incubation

Incubation period -7-11 days- 27 to 30 degree C

- 16-17 days- 23 to 25 degree C

Colour change in the berry

- Freshly extruded egg are orange in colour
- Gradually change to brown and finally to black
- Black colour before hatching due to black chromatophores in eye of the embryo
- Colour change indicate the progress of embryo development

Prophylactic treatment of berried female

The female crab berry should be black before hatching – given a dip 100 ppm formalin for 10 minute

Hatching

Liberation of larvae

- The liberation of larvae generally takes place during night
- Before liberation of larvae from berry the abdominal flap of mother crab makes frequent jerking movement and egg mass loosened
- Simultaneously the jabbing of third and fourth pair of walking leg over the egg mass takes place
- In some case the larvae emerges as pre-zoea which in turn metamorphosis into first zoeal stage within 3-4 hrs
- The third and fourth pair of waking leg are used to pushing out the freshly hatched larvae from the berry

Behaviour of larvae

- Hatched out first zoeal larvae are photopositive and colonize the upper column of water

Species wise production of first zoea larvae

Species	Size of the crab	No. of larvae liberated per hatching (in million)	
	(CW mm/TW g)	Range	Average
<i>S. tranquebarica</i>	142-144/410-500	0.8-3.5	2.1
	155-160/500-570	0.2-5.0	3.7
	163-168/550-675	0.4-5.5	4.0
<i>S. serrata</i>	101-110/170-200	0.1-1.9	1.1
	112-120/210-270	0.1-2.1	1.2
	121-129/230-310	0.2-3.1	1.3
	132-137/340-350	0.5-2.3	1.3

Identification of larval stage

- Five zoeal stage; One- Megalopa stage; One crab instar
- Important external morphological characters of different larval stage of mud crab

Stage	Important external morphological characters
First zoea	Eye sessile; five abdominal segment; telson with 3+3 spines
Second zoea	Eye stalk; five abdominal segment telson with 4+4 spin
Third zoea	6 abdominal segment
Fourth zoea	Abdominal segment with bud of pleopods
Fifth zoea	Pleopod on abdominal segment with setae; telson with 5+5 spines
megalopa	Carapace longer than wider, abdomen with five pair of pleopods, four pair of leg
Instar crab	Carapace with anterolateral teeth on either side, 3 pair of walking leg, last pair of leg with paddle shaped

Feeding of the larvae

- Suitable feed – rotifer and Artemia
- Rotifer preferred early stage whereas Artemia nauplii are given to Megalopa larvae stage
- During early stage of zoea Artemia nauplii swim faster than zoea and hence zoea stage can not catch the prey
- One day old frozen Artemia nauplii has been recommended as feed for larval stage and two day old frozen Artemia nauplii has fed to Megalopa stage

Feeding regime recommended for larval rearing of crab

National prawn fry production and research centre, Malaysia

Larval stage	Morning	Afternoon
Z1	Rotifer 5-10	Rotifer 5-10/ml
Z2	Rotifer 5-10	Frozen Artemia 6
Z3	Rotifer 10-15	Frozen Artemia 10
Z4	Rotifer 20-30	Frozen Artemia 15
Z5	Frozen Artemia 10	Frozen Artemia 20
M	2 day old Artemia 10	2 day old Artemia 40
C1	2 day old Artemia 10	2 day old Artemia 10

- In case of rotifer – no of live rotifer per ml of water in culture tank are not available frozen rotifer are used
- In case of Artemia nauplii the no refer to no of Artemia nauplii per larvae
- In case of supplementary feed – the no rotifer to weight of feed In gram given per million of crab larvae
- Feed for shrimp- protein 49% fat- 31% ash-5.5%
- Feed for giant freshwater prawn – protein- 55%, fat- 8% ash- 7%

Treflan used to fungal growth -0,7 to 10ppm

- According to Karthirvel M. et al (2000) feed and feeding rate are used for larval rearing of crab can be –

For zoeal stage I to III

- Algal culture – chlorella sps. 20000 cells/ml; Chaetoceros 1-2 lakh cells per ml tetraselmis 1000 cells; Skeletonema /Isochrysis 5000 cells/ml
- Rotifer –Brachionus plicatilis 30-60 no per ml
- Artificial feed – 0.5 gm per tone of water

For zoeal stage IV to V

- Algal culture – chlorella sps. 20000 cells/ml; Chaetoceros 1-2 lakh cells per ml tetraselmis 1000 cells
- Artemia nauplii -5-50 number per ml
- Artificial fed -0,5 gm per ton of water

For Megalopa

- Two day old live Artemia -50 number / ml
- Bivalve molluscs squid and fish flesh -150-200 gm per ton of water
- Artificial fed -0.5gm per ton of water

First crab instar to tenth and further instars

- Flesh of prawn bivalve molluscs and fish-3-5% of biomass
- Artificial feed-0.5gm per ton of water

- During the larval rearing high mortality or poor survival are reported
- Survival rate may be -5-15%
- Excess food/faecal matter /dead larvae /moulted shell at the bottom of the rearing tank have to be Siphoned out daily from the larval rearing tank
- Continuous aeration of water is also required during rearing

Rearing of post larvae (juvenile of crab)

Rearing tank for post larvae – 5cm deep sand

Stock at the rate – 5-10 crab per square meter

They are fed boiled molluscan meat rate – 1-2 % of biomass

At the end of two month s. tranquebarica grow to 4 gm and carapace width 30 cm