A PICTORIAL GUIDE FOR MUD CRAB FARMING

CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE
(Indian Council of Agricultural Research)
160, Mahalingapuram Main Road, Nungambakkam, Chennai-600 034

JUNE 2000
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M. KATHIRVEL, S. SRINIVASAGAM AND S. KULASEKARAPANDIAN

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PREFACE

Mud crabs belonging to *Scylla* spp. are in great demand by virtue of their delicacy, medicinal value and export trade. Mud crabs form a lucrative fishery in brackishwater bodies (estuaries, backwaters and coastal lagoons) and inshore seas. In order to meet the ever increasing demand for both local markets and live mud crab export trade, the exploitation for mud crabs, especially in brackishwater sector has intensified in recent years. Since the mud crab resource in the wild is limited, the other alternative to augment the overall production is through aquaculture practices.

The mud crab farming is practised in China, South-east Asian countries and Taiwan from the beginning of twentieth century. From 1994 onwards, the shrimp farmers of India who were affected with consistent disease problems in shrimp farming have taken up mud crab farming on a small scale as a diversification in brackishwater farming in the coastal states of West Bengal, Orissa, Andhra Pradesh, Tamil Nadu and Kerala. In the absence of hatchery raised seeds, the juveniles collected from the wild are at present utilized for stocking purposes. Two types of farming is carried out, one by growing sub-adult and adult crabs to marketable size and the other by rearing "water crabs" to gain weight in suitable fenced earthen ponds.

The Central Institute of Brackishwater Aquaculture has taken up R & D programme in mud crab culture, captive broodstock development and larval rearing and the salient findings are brought out in two technical bulletins, the first one in March 1997 and the second on in March 2000.

I appreciate the hard work put in by S/Shri M. Kathirvel, S. Srinivasagam and Dr. S. Kulasekarapandian, Senior scientists of the Institute in preparing this pictorial guide for the benefit of researchers, students and farmers.

Chennai-34
17-6-2000

Dr. G.R.M. RAO
DIRECTOR
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1. CANDIDATE SPECIES

1.1. Identification of two species of mud crabs

Look for the colour pattern on chelipeds, walking legs and swimming legs and the number of spines present on the outer margin of wrist of chelipeds.

**Larger species - Scylla tranquebarica (Fabricius)**

- 2 spines on the outer margin of wrist of chelipeds
- Polygonal markings on chelipeds, walking & swimming legs

**Smaller species - Scylla serrata (Forskal)**

- 1 spine on the outer margin of wrist of chelipeds
- No polygonal markings on chelipeds, walking & swimming legs
2. SALIENT BIOLOGICAL ASPECTS OF TWO SPECIES OF MUD CRABS

2.1. Habitat of two species of mud crabs

2.2. Sexual identity

Look at the ventral side of the crab and observe the shape of abdominal flap.
2.3. Maximum size attained

2.4 kg
*Scylla tranquebarica*

0.7 kg
*Scylla serrata*

2.4. Food and feeding habits

**FOOD OF MUD CRABS**

- Small crabs
- Bivalve molluscs
- Dead and decayed fish and shrimps
2.5. Moulting and growth

Old shell (exuvia)

Moulted crab coming out of old shell

Increase in size after absorbing water

Absorption of water by moulted crab

2.6. Maturity

**MALE-TESTES**

- Creamy in colour
- Creamy white in colour
- Milky white in colour

**FEMALE-OVARIES**

- Yellow in colour
- Pink in colour
- Orange-red in colour

**IMMATURE**

**MATURING**

**MATURE**

T-Testes; VS-Vas Deferens; ED-Ejaculatory duct

O-Ovaries; SR-Seminal receptacle; OD-Oviduct
2.7. Breeding

2.7.1. Extrusion of eggs

During the spawning, fertilized eggs get attached to the pleopods present in the abdominal flap. No. of eggs extruded: 1 to 5 million.

2.7.2. Colour of the berry

Freshly attached eggs: orange red in colour
Eggs before hatching: Black in colour

Incubation period: 8-14 days

2.7.3. Breeding

Throughout the Year

2.7.4. Breeding season

<table>
<thead>
<tr>
<th>Region</th>
<th>Peak season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerala coast</td>
<td>September-February</td>
</tr>
<tr>
<td>Tamil Nadu coast</td>
<td>September-April</td>
</tr>
<tr>
<td>Andhra Pradesh Coast</td>
<td>October-February &amp; May-June</td>
</tr>
<tr>
<td>Orissa coast</td>
<td>November-January</td>
</tr>
<tr>
<td>West Bengal coast</td>
<td>May-August</td>
</tr>
</tbody>
</table>

2.7.5. Occurrence of juvenile mud crabs

<table>
<thead>
<tr>
<th>Place</th>
<th>Peak season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vembanad backwaters</td>
<td>May-October</td>
</tr>
<tr>
<td>Lake Pulicat</td>
<td>December-May</td>
</tr>
<tr>
<td>Ennore estuary</td>
<td>January-March</td>
</tr>
<tr>
<td>Adyar estuary</td>
<td>April-June &amp; September-Oct</td>
</tr>
<tr>
<td>Kovalam backwaters</td>
<td>December-April &amp; July-Aug</td>
</tr>
<tr>
<td>Pitchavaram</td>
<td>March-June</td>
</tr>
<tr>
<td>Tuticorin</td>
<td>November-February</td>
</tr>
<tr>
<td>Kakinada backwaters</td>
<td></td>
</tr>
<tr>
<td>Lake Chilka</td>
<td></td>
</tr>
<tr>
<td>Hooghly-Matlah estuarine</td>
<td></td>
</tr>
</tbody>
</table>
2.8. Larval stages

2.8.1. Larval duration

<table>
<thead>
<tr>
<th>Stage</th>
<th>Duration (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoea I</td>
<td>2 - 4</td>
</tr>
<tr>
<td>Zoea II</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Zoea III</td>
<td>3 - 5</td>
</tr>
<tr>
<td>Zoea IV</td>
<td>6 - 7</td>
</tr>
<tr>
<td>Zoea V</td>
<td>5 - 8</td>
</tr>
<tr>
<td>Megalopa</td>
<td>10 - 11</td>
</tr>
<tr>
<td>Zoea I to First Crab Instar</td>
<td>27 - 30</td>
</tr>
</tbody>
</table>
2.9. Diseases

Acorn barnacles found attached on carapace, cheliped and walking leg

Goose barnacles found in the gills

Helminth worms in gills, hepatopancreas and foregut.
3. CULTURE PRACTICES

3.1. Types of culture

**MONOCULTURE**

Larger species
*Scylla tranquebarica*

Monoculture in earthen ponds/pens

Smaller species
*Scylla serrata*

Monoculture in cages

**POLYCULTURE**

Milk fish (*Chanos chanos*)

Grey mullets (*Mugil spp.*)

Tiger shrimp (*Penaeus monodon*)

Seaweeds (*Gracillaria spp.*)
4. GROW-OUT CULTURE

4.1. Location of suitable site

4.2. Size and shape of the pond

- 0.1 to 0.4 ha
- Rectangular
4.2.1. Tide-fed pond

4.2.2. Cross section of tide-fed and pump-fed ponds

4.2.3. Pump-fed pond
4.3. Pond preparation

4.3.1. Fencing

Material required for fencing:

<table>
<thead>
<tr>
<th>Casurina poles</th>
<th>Bamboo split</th>
<th>Nylon netting</th>
<th>Plastic coated</th>
<th>Asbestos sheet</th>
</tr>
</thead>
</table>

4.3.2. METHODS OF FENCING

Fixing on the top of the dyke

Fixing a little away from the inner periphery the dyke
4.3.3. Fixing up of plastic sheet in the net fencing

A plastic sheet to a height of 40 cm is fixed on the inner side from the top of the fencing to prevent the escape of reared crabs by their climbing habits.

4.3.4. Sluice/drain pipes for water management
4.3.5. Provision of hide-outs

Placement of earthen/PVC pipes and worn-out tyres as hide-outs/shelters to reduce the fighting among the normal hard crabs and mortality of moulted crabs.

4.3.6. Removal of black soil from the pond bottom
4.3.7. Quality of water required

Water having a salinity range of 10 to 35 ppt; ideal 15-25 ppt.

4.4. Source of stocking material

Since there is no commercial hatchery for mud crabs in India and elsewhere, the stocking materials have to be procured from wild. Juveniles of mud crabs are available throughout the year and their peak abundance in major and minor estuarine systems of India already indicated in Section No. 2.7.5. (Page No. 5) is given below.

<table>
<thead>
<tr>
<th>Place</th>
<th>Peak season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vembanad backwaters</td>
<td>May-October</td>
</tr>
<tr>
<td>Lake Pulicat</td>
<td></td>
</tr>
<tr>
<td>Ennore estuary</td>
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<td>Tuticorin</td>
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<tr>
<td>Kakinada backwaters</td>
<td>December-April &amp; July-August</td>
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<tr>
<td>Lake Chilka</td>
<td>March-June</td>
</tr>
<tr>
<td>Hooghly-Matlah estuarine</td>
<td>November-February</td>
</tr>
</tbody>
</table>

4.5. Period of culture

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3</td>
<td>3-31 1</td>
<td>1 2 3 4 5</td>
<td>3 4 5 6 7 8 9 10 11 12</td>
</tr>
<tr>
<td></td>
<td>11 12 13 14 15 16 17</td>
<td>13 14 15 16 17 18 19 20 21 22 23 24 25</td>
<td>27 28 29 30</td>
<td>3 4 5 6 7 8 9</td>
</tr>
<tr>
<td></td>
<td>8 9 10 11 12</td>
<td>13 14 15 16 17 18 19 20 21 22 23 24 25</td>
<td>27 28 29 30</td>
<td>10 11 12 13 14 15 16</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td>11 12 13 14 15 16 17 18 19 20 21 22 23 24 25</td>
<td>27 28 29 30</td>
<td>17 18 19 20 21 22 23</td>
</tr>
<tr>
<td></td>
<td>20 21 22 23 24 25 26 27 28 29 30</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>

120 days i.e. from 1-6-2000 to 28-9-2000
4.6. Stocking

4.6.1. Selection of crabs

Uniform sized crabs

Crabs with all limbs intact

4.6.2. Stocking rate
4.7.1. **Water exchange**

- In tide-fed ponds, water should be exchanged at every high and low tides.

In pump-fed ponds, fresh saline water should be pumped into the pond at every alternate days after draining 30% of bottom water through the drain pipe.

4.7.2. **Monitoring of water quality**

Weekly monitoring of water parameters such as salinity, dissolved oxygen and pH should be carried out.
4.7.3. Effect of fouled water on reared crabs

The reared crabs come out of water and occupy the dyke area during the day, when the pond water got polluted. On such occasion, the entire pond water should be drained out and clean water should be provided.
4.8. Feeding

4.8.1. Types of feed

- Chopped fish
- Squid meat
- Clam/mussel meat

4.8.2. Feeding rate

As a guide line, at a stocking density of 1 crab per square metre in 0.2 ha pond, the quantity of feed required for 4 months culture is worked out and presented in the following table.

<table>
<thead>
<tr>
<th>Day of Culture</th>
<th>No. of crabs stocked</th>
<th>% of survival</th>
<th>Av. body weight (g)</th>
<th>% of feeding</th>
<th>Total quantity of feed required (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-30</td>
<td>2000</td>
<td>100</td>
<td>90</td>
<td>5</td>
<td>270</td>
</tr>
<tr>
<td>31-60</td>
<td>2000</td>
<td>90</td>
<td>150</td>
<td>6</td>
<td>486</td>
</tr>
<tr>
<td>61-90</td>
<td>2000</td>
<td>80</td>
<td>225</td>
<td>8</td>
<td>864</td>
</tr>
<tr>
<td>91-120</td>
<td>2000</td>
<td>70</td>
<td>300</td>
<td>10</td>
<td>1260</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 2880</td>
</tr>
</tbody>
</table>

4.8.3. Time of feeding

- 10 A.M.
- 6 P.M.
4.9. Monitoring of reared stock

4.9.1. Periodical sampling

16\textsuperscript{th} day
31\textsuperscript{st} day
46\textsuperscript{th} day
61\textsuperscript{st} day
76\textsuperscript{th} day
91\textsuperscript{st} day
106\textsuperscript{th} day

4.9.2. Method of collection of crabs for sampling

Using a baited lift net
4.9.3. Method of handling of crabs

Step 1
Insert the thread between the chelipeds and ventral portion of body

Step 2
Thread being coiled around the finger portion of chelipeds

Step 3
Thread being drawn above all the four walking legs

Step 4
Both the ends of the thread knotted
4.9.4. Record of size of reared crabs

A METHOD TO MEASURE THE SIZE OF MUD CRAB
(CARAPACE WIDTH IN MM & TOTAL WEIGHT IN GRAMS)

A divider and a scale for measuring carapace width

Carapace width (CW)
4.9.5. Record of weight of reared crab

A single-pan balance for measuring total weight
4.10. Harvest

4.10.1. Size attained at harvest

At stocking

Av. 100 grams

After 4 months culture

400-450 grams

After 7 months culture

700-1000 grams

4.10.2. Gears used in harvest

Scoop net

Lift net

Cylindrical trap

Box trap
4.10.3. Using the swimming behaviour of reared mud crabs

Water let into the pond during the high tide

Using a scoop net, crabs can be fished out

Reared crabs swim against the flowing water and tend to congregate near the sluice gate

4.10.4. Draining and hand-picking
Draining of pond water and hand-picking of crabs
4.11. Packing

4.11.1. Bamboo basket

4.11.2. Perforated thermocole box used in the export trade
4.12. Marketing

4.12.1. Local consumption

Sale of live crabs in markets

4.12.2. Processed products

4.12.3. Live mud crab export

![Graph showing quantity and value of live mud crab export from 1987-88 to 1997-98.]
5. FATTENING

5.1. Selection of suitable site

5.2. Objective of culture

Whenever the crab molts, it utilize the stored energy for molting. Hence, the molted crab or "water crab" is weak, less weight and no value in export market. Such 'water' crabs are reared on an animal diet for period of 3 to 4 weeks to gain weight.

5.3. Period of culture

3 to 4 weeks
5.4. Size and shape of the pond

5.4.1. Fenced pond with compartments

To facilitate the size-wise stocking, fenced area is divided into equal compartments
5.5. Net pens and cages

5.5.1. Pens

Size of each pen: 100 to 500 square metres

5.5.2. Cages

Size of each cage: 4 m x 2 m x 1.5 m to 6 m x 3 m x 1.5 m
5.6. Stocking

5.6.1. Selection of stocking material

Uniform sized crabs

Crabs with all limbs intact

5.6.2. Stocking rate

Number per square metre

To

Number per square metre
5.7. Water management

In tide-fed pond, water should be exchanged at every high and low tides.

In pump-fed ponds, fresh saline water should be pumped into the pond at every alternate days after draining 30% of bottom water through the drain pipe.

Weekly monitoring of water parameters such as salinity, dissolved oxygen and pH should carried out.

5.8. Feeds and feeding rate

Chopped fish
Clam/mussel meat
Squid meat

5 to 10% of stocked biomass

Feeding time:
10 A.M. & 6 P.M.
5.9. Monitoring of reared stock

Method of collection of crabs for sampling

Periodical sampling

Using a baited lift net

16th day

5.10. Harvest, packing and marketing

Draining and hand-picking
Draining of pond water and hand-picking of crabs

Bamboo basket

Perforated thermocol box used in the export trade

Live crabs tied with nylon/jute thread

Wet seaweed/sea grass

Plastic sheet fixed at the bottom of box to prevent leakage

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6. ECONOMICS

6.1. GROW-OUT POND CULTURE IN 0.2 ha

A. FIXED COSTS
   Pond lease amount for one year 5,000
   Pond development 2,000
   Sluice gate, screens and fencing materials 10,000
   Watchman shed 2,000
   Miscellaneous 2,000
   Total 21,000

B. OPERATIONAL COST FOR 1 CROP OF 4 MONTHS
   2000 crabs; 80-100 g in size; total stocked biomass 180 kg;
   stocking rate: 1 crab per sq.m.; (Rs. 3 per crab) 6,000
   Feed - Trash fish; feeding rate 5-10% of stocked biomass; total quantity
   required for 120 days of culture: 2,880 kg; (Rs. 10 per kg) 28,800
   2 labourers for 4 months 6,000
   Pond maintenance 750
   Miscellaneous 500
   Total 42,050

C. INCOME
   Production at 70 % survival: 1,400 crabs; av. size 450 grams;
   630 kg; Rs. 100 per kg 63,000

D. GROSS PROFIT FOR ONE CROP (C - B) 20,950
E. GROSS PROFIT FOR 2 CROPS PER YEAR 41,900
F. NET PROFIT (after allowing 20% interest on capital cost) 37,700
6.2. FATTENING IN 0.025 ha POND

A. FIXED COSTS
   Pond lease amount for one year                      Rs. 1,000
   Pond development                                   500
   Sluice gate, screens and fencing materials         2,000
   Watchman shed                                      1,500
   Miscellaneous                                      1,000
   Total                                              6,000

B. OPERATIONAL COST FOR 1 CROP FOR 1 MONTH
   500 'water crabs'; 250-350 g in size; total stocked biomass: 150 kg;
   stocking rate 2 crabs per sq. m.; (Rs.10 per crab)   5,000
   Feed - Trash fish; feeding rate 10% of stocked biomass; total quantity
   of feed required for 30 days: 450 kg; (Rs. 10 per kg) 4,500
   1 labourer                                          750
   Miscellaneous                                      750
   Total                                              11,000

C. INCOME
   Production at 80 % survival: 400 meat crabs; av. size 400 g;
   160 kg; Rs. 100 per kg                              16,000

D. GROSS PROFIT FOR ONE CROP (C - B)                  5,000
E. GROSS PROFIT FOR 10 CROPS PER YEAR                50,000
F. NET PROFIT (after allowing 20% interest on capital cost) 48,800
6.3. **FATTENING IN A BATTERY OF 10 CAGES, EACH OF 50 SQUARE METRES**  
*(TOTAL 500 SQUARE METRES)*

<table>
<thead>
<tr>
<th>A.</th>
<th>FIXED COSTS</th>
<th>Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.D.P.E. knitted netting (2.0 mm dia &amp; 50 mm mesh size); 350 kg for 10 cages; (Rs. 150 per kg)</td>
<td>52,500</td>
<td></td>
</tr>
<tr>
<td>Fabrication of cages and fixing</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72,500</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B.</th>
<th>OPERATIONAL COST FOR 10 CAGES FOR 1 MONTH</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 'water crabs'; av. size: 250-350 g; total stocked biomass; 300 kg; stocking rate 2 crabs per sq. m.; (Rs. 10 per crab)</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>Feed - Trash fish; feeding rate 10% of stocked biomass; total quantity required for 10 cages for 30 days: 900 kg; Rs. 10 per kg</td>
<td>9,000</td>
<td></td>
</tr>
<tr>
<td>2 labourers for 30 days</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2,500</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.</th>
<th>INCOME</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production at 80 % survival: 800 meat crabs; av. size 400 g; 320 kg; Rs. 100 per kg</td>
<td>32,000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D.</th>
<th>GROSS PROFIT FOR ONE CROP (C - B)</th>
<th>9,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.</td>
<td>GROSS PROFIT FOR 8 CROPS FOR 10 CAGES IN A YEAR</td>
<td>72,000</td>
</tr>
<tr>
<td>F.</td>
<td>NET PROFIT (after allowing 20% interest on capital cost)</td>
<td>57,500</td>
</tr>
</tbody>
</table>
### 6.4. FATTENING IN 500 SQUARE METRES PEN
**WITH 5 EQUAL COMPARTMENTS**

#### A. FIXED COSTS
- H.D.P.E. knitted netting (2.0 mm dia & 50 mm mesh size): Rs. 55,500
- 370 kg for 500 sq. m. pen; Rs. 150 per kg: 20,000
- Fabrication and fixing: Total 75,500

#### B. OPERATIONAL COST FOR 1 MONTH
- 1000 'water crabs'; for 500 sq. m. pen; av. size: 10,000
- 250-350 g; total stocked biomass; 300 kg; stocking rate: 9,000
- 2 crabs per sq.m.; Rs. 10 per crab: 1,500
- Feed - Trash fish; feeding rate 10% of stocked biomass; total quantity required for 30 days: 900 kg; Rs. 10 per kg: 500
- 2 labourers for 30 days: Total 21,000

#### C. INCOME
- Production at 80 % survival: 800 meat crabs; av. size 400 g; 32,000
- 320 kg; Rs. 100 per kg: 90,000

#### D. GROSS PROFIT FOR 10 CROPS (C - B) 90,000
#### E. NET PROFIT (after allowing 20% interest on capital cost) 74,900