BROOD STOCK MANAGEMENT:

Brood stock management covers three particular aspects of the rearing process:

(a) The selection of fish with desirable hereditary qualities typical of improved strains such as rapid growth potential, higher resistance to dissolved oxygen deficiency and adverse water quality, strong appetite, omnivorous feeding regime.
(b) The selection of fish with well-developed sexual organs.
(c) The rearing of these selected fish to produce healthy potential spawners, with dormant eggs well developed in the females.

Criteria to select good future breeders:

The selection of future carp breeders should take into account the general shape of the fish body, scale distribution, state of health and development of sexual organs. In particular,

(1) The selected fish should be in good health.
(2) With no body wounds.
(3) No parasites.

(4) A typical scale distribution.
(5) No fin deformation.

(6) Body deformation.
(7) The body should possess the required shape and proportions, being neither too fat nor too thin.

Source of brood fish:

Since selective breeding and hybridization programmes of pedigreed fish are not carried out in fish seed farms, the source of future brood fish is stock ponds from the same farm or different farms or live adult of different species procured from capture fishery waters like rivers, lakes or reservoirs.

Difference between male and female carp:

Male and female breeders may be easily differentiated by the shape of the body and the relative position of the genital papilla. In females, the body is plump and the genital opening is situated above the genital papilla. In males, the body is slender and the genital opening is found behind the genital papilla.

External signs of the breeder's maturity:

To check whether a carp breeder has reached maturity (presence of dormant eggs or sperm) and may be selected for artificial propagation, the belly and genital papilla should be examined carefully:-

- A mature female has a well-rounded and soft or semi-soft belly.
- Its genital papilla is erect and reddish.
- Its anal opening is enlarged and protruding.
- A mature male will release milt(semen) under a slight abdominal pressure.
- Its belly is not blown up but rather slim.
- It sometimes has callosities (thickened & hardened) on the head.

Management of brood fish ponds:

- Brood fish is a prerequisite for all induced breeding programmes, as it produces eggs and milt, which are required for the production of larvae.
- Proper brood-stock will lead to better breeding responses, increased fecundity, fertilization, hatching and larval survival rates and more viable fish seed.
- Hence, the subject of brood fish management has assumed great importance in hatchery management.
- The number of brood fish ponds depends on hatchery requirements.
- Large-scale of operation and sex-wise segregation of fish requires more ponds.

Care of brood fish:

1. The carp brood-stock pond should be prepared following standard procedure to ensure sustained production of zooplankton.
2. The recommended stocking density of carp brood fish is 1,250-2,500 kg/ha, depending upon the species.
3. While rohu and mrigal are stocked at a higher rate, catla is stocked at a lower rate since it requires more space for proper gonadal development.

4. Stocking rates are manipulated to permit individual and collective care of broodfish, enabling them to get nutritional and environmental advantages for onset of right degree of maturity.
5. During immature stage, feed the fish with a traditional diet consisting of rice bran and oil cake (1:1) at a feeding rate of1- 2% of body weight daily.
6. During the maturing phase, feed the fish with a special feed containing rice bran, oil cake, fish meal, cereals, grams and mineral and vitamin mixture.
7. Alternatively, one can use commercial floating pelleted feed (protein content: 30%)
8. In addition to the artificial feed the grass carp is also given tender aquatic weeds/terrestrial grass.
9. However, the breeding habits of some species like common carp demand their separation from other carp species due to their natural breeding in ponds with aquatic vegetation.
10. As a result the common carp brood fish is segregated sex-wise and stocked in separate ponds to prevent accidental spawning in pond.
11. However, the rest of the species can be stocked in a communal pond or stocked in separate ponds after species-wise and/or sex-wise segregation.

12. Catla, in particular, needs to be separated from the rest of the species as it shows poor response to hormonal injection when stocked with other species.
13. A gravid fish when held by hand with tail up should practically ooze milt and also ova.
14. Paddle-wheel aerator, particularly in catla pond, can provide additional aeration, particularly during morning hours.
15. Segregation of sexes at least one month before increases the affinity between male and female during spawning.
16. Care should be taken to maintain water quality and plankton level by periodic manuring, i.e. at one tenth of the initial dose.
17. Algal blooms and oxygen depletion are controlled by water exchange.
18. Parasites and pathogens should be controlled by periodic checking of brooders
19. Common parasites like Lernea and Argulus are common on major carps (catla is more susceptible) can be controlled by manually removing and disinfecting the affected fish with a solution of KMnO4 (about 5 ppm)

Brood stock Management in ponds:

- Brood stock ponds are 0.5-1 train size end 1-2m deep.
- The dikes should be protected by vegetation.
- Water control structures exist at the inlet and outlet of the pond.
- Access by road and good protection against poaching should be ensured.
- The stocking rate varies from 100 to 300 breeders per hectare.

Brood stock Management in Hatchery:

1. Brood stock management is one of the most important elements of the hatchery production system.

2. In temperate climates, the spent spawners leave the hatchery in late spring.
3. They are given a quick salt bath (2-3% salt solution, for 30-40 seconds) against ectoparasites.
4. They are stocked in broodstock ponds where they are well fed during summer and autumn .
   Overwintering takes place in the same pond.
5. The following spring, the breeders are seined out of the pond .
6. They are sorted by qualified personnel who select the good potential breeders and separate them by sex.
7. The other fish are marketed.
8. The selected breeders receive a quick salt bath and are stored in storage ponds, the sexes being kept well separate.
9. When the reproduction season starts in mid-spring, the breeders are seined out of the storage ponds as necessary.
10. Those which are mature are chosen, receive a quick salt bath , and are then stored in the hatchery where they will be propagated artificially a few hours later .

Broodstock management in tropical climates:

- Broodstock management in tropical climates is somewhat different because of the possibility of multiple spawnings during the yearly cycle.
- Females and males are preferably kept in separate brood stock ponds.
- Two sets of ponds are used for the ripening males and females, and two sets of ponds are used for the spent spawners.
- This will prevent wild spawning. It will also enable higher protein feeds to be distributed to the females, and to lower the stocking rates.

- In the brood stock ponds, it is advisable to include some smaller (100-200 g) carnivorous fish with the carp breeders.
- About 200-400 carnivorous fish/ha is sufficient to control the wild fist which might enter the pond and compete for food with the brood stock.
- Similarly, these carnivorous fish will eliminate the juvenile' born from wild spawning.

Brood stock feed:

- Brood stock feed varies according to the season.

- After stripping, when the breeders form new eggs which develop toward the dormant stage, they should eat a mixture of 50% natural food organisms rich in protein and 50% artificial feeds with a high content of carbohydrates, such as maize.
- Later, when the dormant eggs have been developed and when the breeders await spawning, they should receive artificial feeds with a 30-40% protein content in order to prevent the accumulation of fat in their gonads.

Brood stock Management before breeding:

1. The breeders which are to be propagated artificially on a particular day, are taken from the storage ponds the day before.

2. They are crowded into a corner of the half-drained pond with a seine net.
3. A skilled worker selects the breeders one by one:(a) mature breeders are brought into the hatchery building ,(b)immature breeders are put back into the storage pond,and(c) unhealthy or invalid fish are sent to the market.
4. This selection process is especially important for the females, whose maturity should be thoroughly checked, to ensure the success of the artificial propagation.
5. It is important to avoid dissolved oxygen deficiency which may damage the sensitive breeders during seining and selection.
6. During handling, fresh water may be pumped into the crowded enclosure if necessary.
7. It is best to handle carp breeders using a special net with a strong mesh.
8. It should be open at both ends, the stiffened mouth opening measuring about 30 cm in diameter and the netting 1 m long.
9. A breeder may easily be caught in it and transported with two hands.

10. When the end of the net is released, the fish can swim out easily.

Transport of Brood stock:

- A double hammock (tent like) (85 x 20 x 16 cm) of waterproof canvas, attached to a solid frame is very useful for the transport of the selected breeders to the hatchery.
- Brood stock transport may also be mechanized, using fibre glass containers and compressed oxygen.
- A fibre glass tank (200 x 100 x 80 cm) may be put on a trailer or on the platform of a lorry.
- It should contain about 1 m^3 of water.
- The fish are introduced through the top door and removed through the back door.

- Compressed oxygen is delivered in fine bubbles from the bottom of the tank through a perforated plastic tube attached to a metal frame.
- In such a tank 20-30 carp breeders per cubic metre of water can be safely transported for journeys of up to several hours.