Pen and Cage Culture:

Based on special operational techniques, fish culture practices may be classified as below:

(i) Cage Culture:

- In this culture the fishes are held in a section of water, either in a flowing river or in a big impoundment.
- The fishes are imprisoned in a cage made of galvanised steel wire frames with nylon meshes or simply of bamboo frames with split bamboo mats.
- The cages are of various sizes and the commonly used size is about 10 sq. metres.

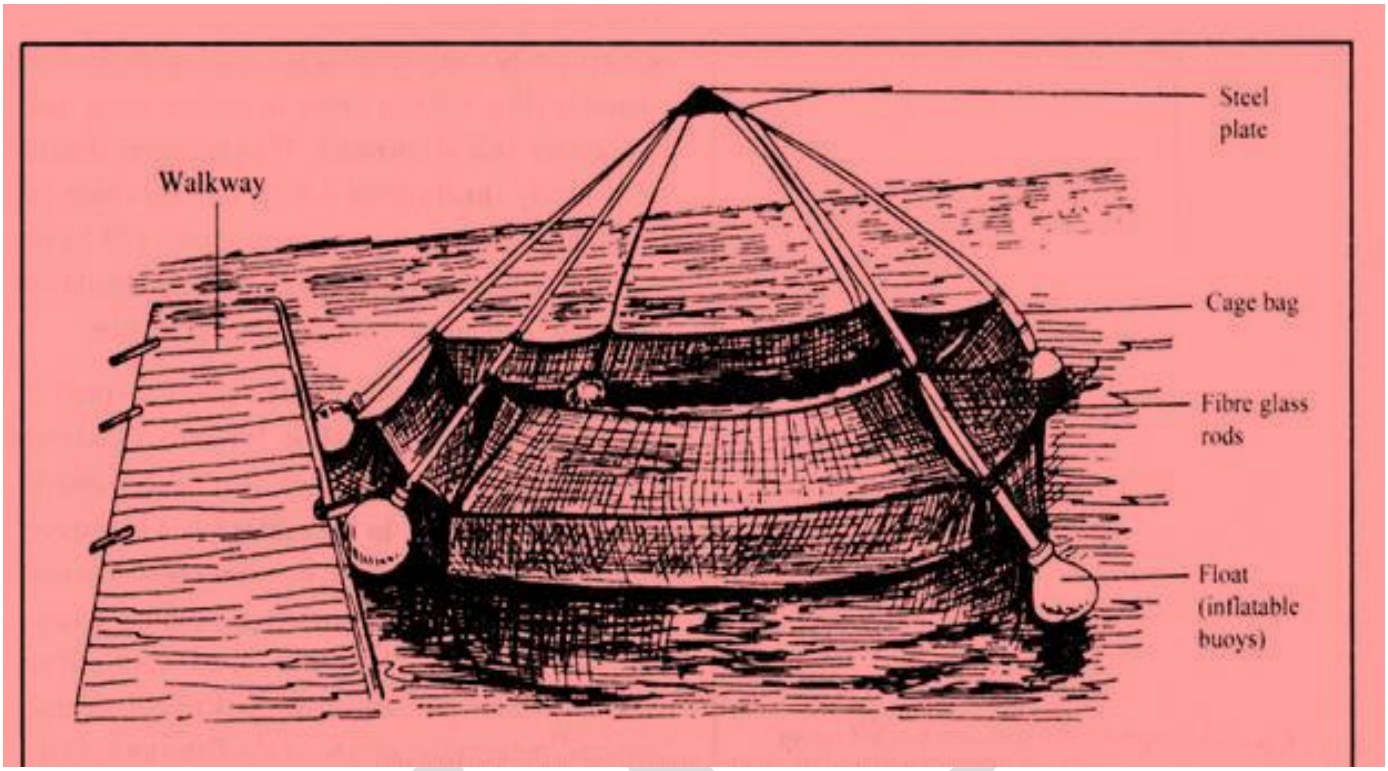

Fig:1 Floating cage.

Cages are of the following types:

(a) Floating cages (Fig. 1),

(b) Fixed cages (Fig.2)

(c) Submerged cages (Fig.3) and

(d) Moveable cages (Fig.4)

- The principal aim of culturing fishes in cages is to practice monoculture of selected species.
- Cage culture was first started in Cambodia.

- Since 1980 cage culture has been in practice in India.
- Cage culture has proved a boon for reclaiming extensive waste waters, i.e., swamps and derelict (Disuse and neglect) waters of Assam, Bihar and Karnataka.
- Air breathing fishes (Clarias, Heteropneustes, Anabas, Channa, etc.) have responded well to cage-culture practices.

Advantages of cage culture:

1. Minimum use of all available water resources.

2. Economic use of water.

3. Easy observation and handling of the fish population on daily basis.

4. It reduces fish mortality.

5. Easiness in the control of competitors, predators and parasites.

6. Easy and complete harvesting of fishes possible.

7. Control of diseases and isolation of the diseased fishes is easy in floating cages.

8. Initial investment is relatively less.

Limitations cage culture:

1. Risk of theft is high.

2. Adequate renewal of water in the cages for eliminating metabolites is not possible.

3. There is a need for maintenance of high dissolved oxygen content.

4. Fouling agents like snails, etc. accumulate at the bottom of the cage (mesh) which needs periodic removal.

5. The release of uneaten food and faeces adversely affect the water quality.

Fig.2 Fixed cage.

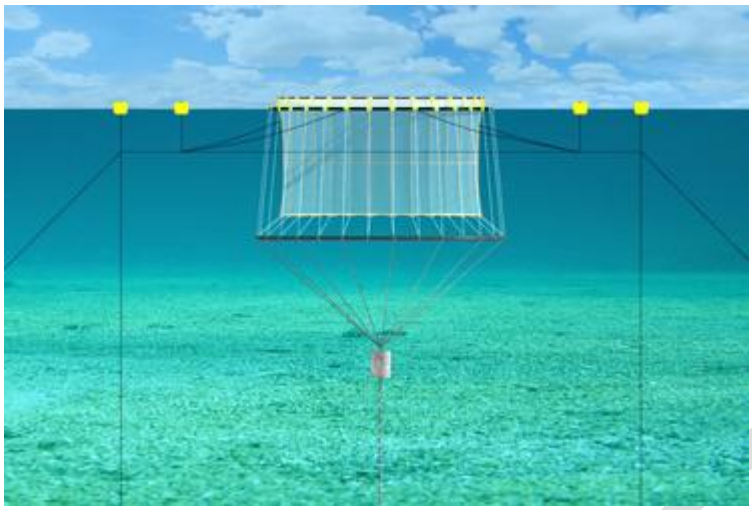

Fig.3 Submerged cage.

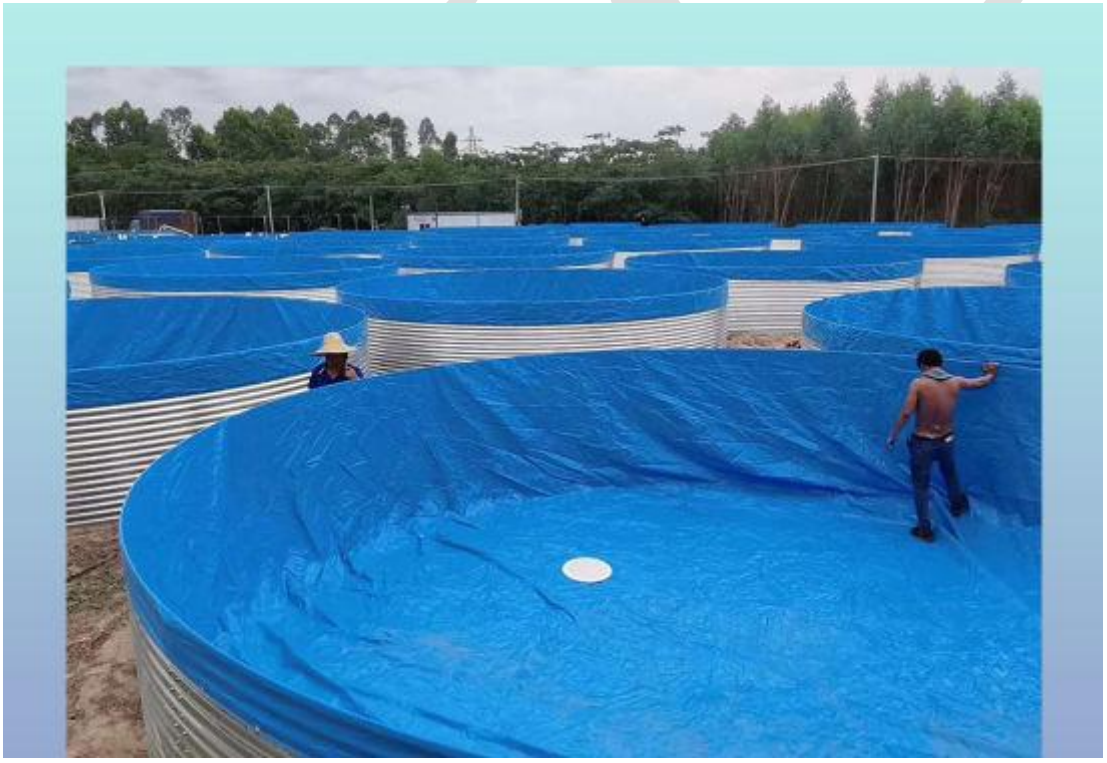

Fig.4 Movable cage.

(ii) Pen Culture:

- Pens generally refer to small enclosures used for confinement or safe keeping of domestic animals.
- In fisheries pens are formed by damming a bay, cove (concave arch), fjord (an arm of a sea), estuary, river, lake or reservoir.
- Sites are selected where the barriers can be constructed across narrow sections or channels (Fig. 5) in order to reduce costs and increase the ease of operation.
- The enclosures should be relatively small (about 2.0-7.0 ha). However, in Japan large enclosures measuring up to 120 ha or more are also seen.
- The depth of the pens should be more than 1 metre, even in low tide condition.

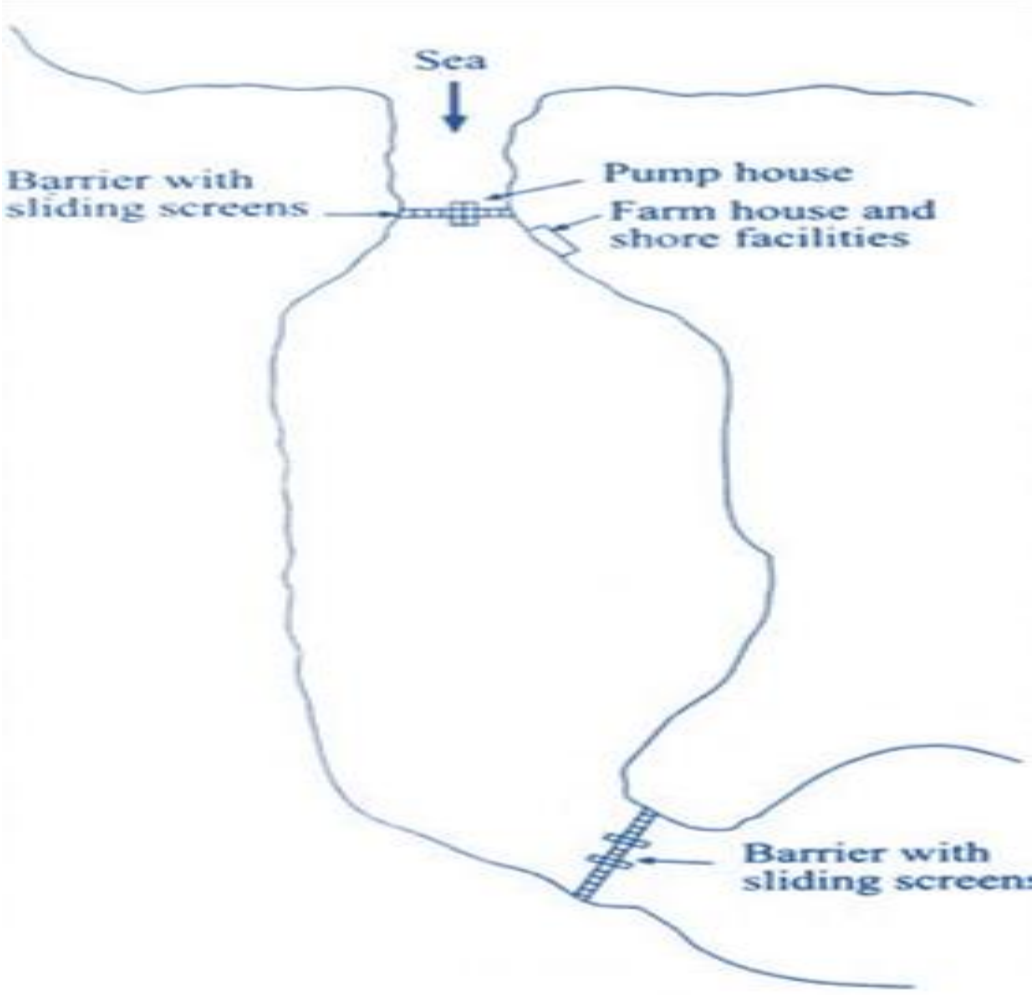

Fig. 5 Diagram of a pen constructed on an enclosed fjord.

- Most of the perimeter of the enclosure (pen) is formed by the natural shoreline.
- When the blind end of a water area is enclosed, there may be only one or one series of barriers.
- In the enclosures where there are continuous flows of water, there may be two or two series of barriers: one upstream and another downstream.

- The barriers are made of stones, sand, soil or concrete and are provided with ‘SCREENS’.
- These ‘screens’ prevent the escape of the fish stock (Fig. 6).

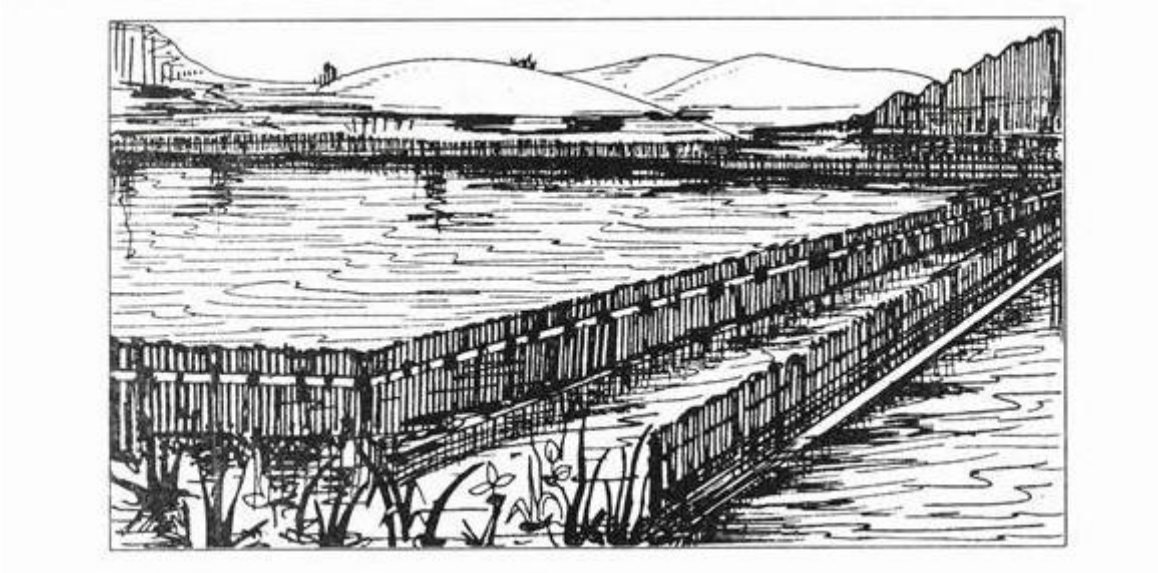

Fig.6 Bamboo Scaffolding enclosers of different size.

The types of enclosures generally seen are:

(a) Bamboo scaffolding(temporary structure) enclosures used in the bays of Philippines and in the lakes of China (Fig. 6).

(b) Floating net-enclosures useful for the culture of tilapia and milkfish in lakes. (Fig.7)

(c) Single-layered pens of nylon webbing.

(d) Double-layered pens suitable for use as nurseries for fish and prawn seeds.

Remark:

The introductions of pen culture in many countries have not met with much success. This probably is due to the difficulties in the use of intensive techniques and in some cases due to the high costs of embankments and water management (for example, through pumping).

The merits of pen culture are:

(1) As it is a continuous process due to continuous supply of water, production (yield) is greater in a limited space with rich food and oxygen supply.

(2) Higher growth rate is possible as energy is saved towards locomotion, feeding, etc.

(3) It generally generates employment opportunities for the coastal people.

(4) There is less danger of fish mortality as toxic metabolites (ammonia, etc.) are flushed regularly.

The demerits of pen culture are:

(1) Unfavorable weather conditions may damage the pen or flood the culture sites.

(2) Pen culture sites may be polluted particularly during the occasional abundance of red tide causing organisms, such as 'Dinoflagellates' (Gonyaulax) secretes saxitoxin which kills fish .

(3) Organisms like Balanus(crustacean) and certain algae (Enteromorpha, etc.) may adhere to the bamboo poles causing biofouling.

(4) Terrestrial insects sometimes take refuge in the exposed portions of pens and cause damage.

(5) The nylon-webbing enclosures may be cut and damaged by certain species of crabs.

(6) Predatory fishes sometimes may enter into the pen and cause considerable damage to seed and growing fishes or prawns.

(7) Abundance of sea weeds in the outskirts of the pen, may bring down the oxygen level through release of hydrogen sulphide on death and decay.

Fig.7 Floating net enclosure.