

# CULTURE IN THE PENS

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- The 'PENS' ( = a small enclosure for domestic animals. An enclosure used for confinement or safekeeping ) are considered as transitional structures between ponds and cages. They are , formed by damming a bay, fjord or an arm of sea ,estuary, river, lake or reservoir.
- **Pen culture is defined** as raising of fish in a volume of water enclosed on all sides except bottom, permitting the free circulation of water at least from one side. This system can be considered a hybrid between pond culture and cage culture. Mostly shallow regions along shores and banks of the lakes and reservoirs are used in making pen/enclosure using net/wooden materials where fish can be raised. In a fish pen, the bottom of the lake forms the bottom of the pen. Pen has the advantage of containing a benthic fauna which serves as food for the fish and polyculture can be practiced in pens as it is in ponds. The environment in fish pen is characterized by a free exchange of water with the enclosing water body and high dissolved oxygen concentrations.

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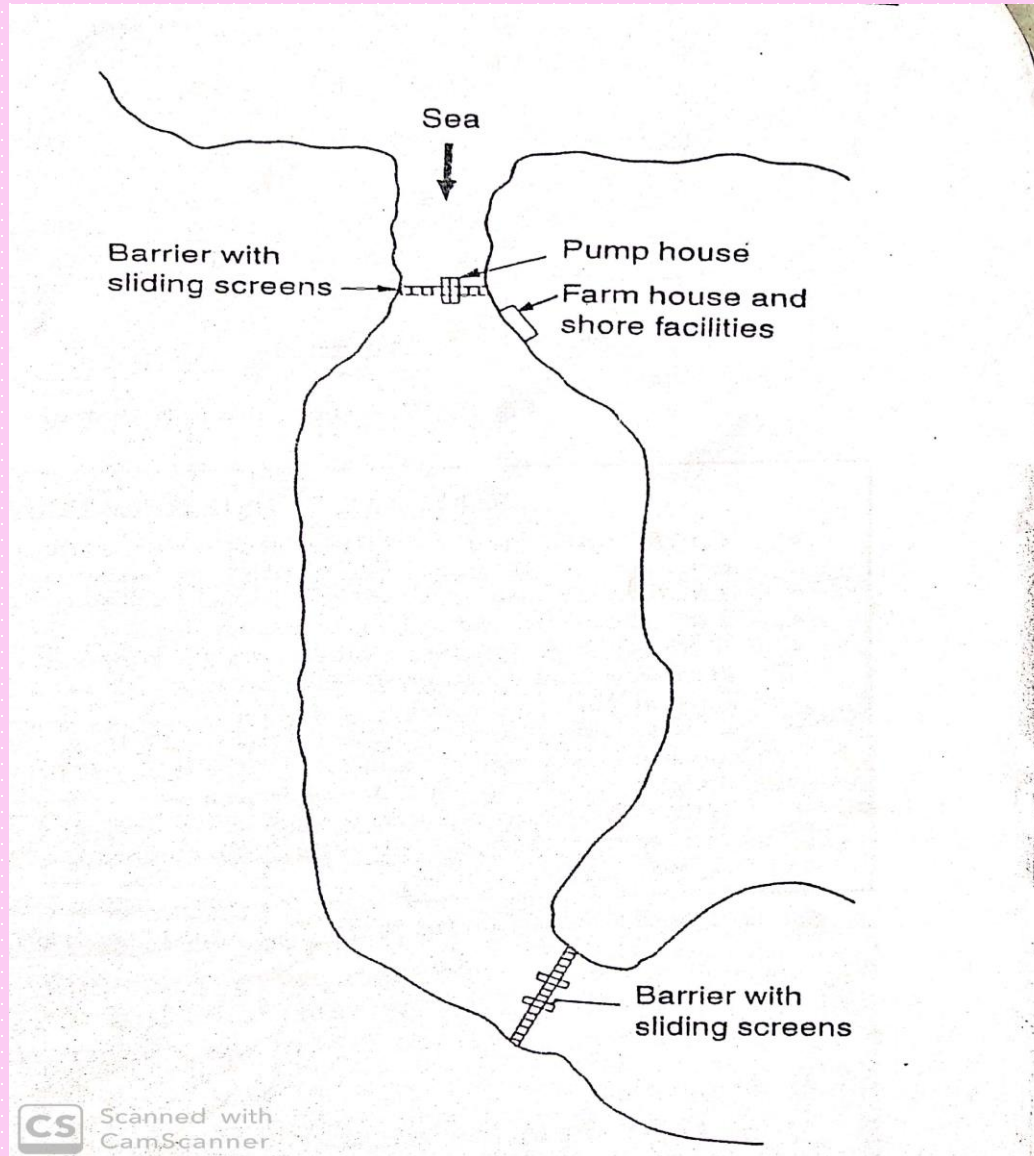
- ❖ **The Sites:** The Pens or enclosures are those where the barriers can be constructed across the narrow sections or channels , in order to reduce the costs and increase the ease of operation. The sites must be sheltered against high winds. The depth must be more than 01 m (even during low tide)
- ❖ **The Area:** The enclosures should be relatively small ( 2.0 -7.0 ha) ; although there are much larger enclosures in Japan measuring upto 120 ha or more. The areas with too much silt and decomposing organic matter should be avoided. The bottom soil should be muddy, clayey, clay-loamy, or sandy mud with detritus . Flow of water should be 0.2-0.5 m\sec.
- ❖ **The Barriers:** When the blind end of water is to be enclosed , there can be only one or one series of barriers. In the enclosures, where there is continuous flow of water , there may be two or two series of barriers- one being upstream and another downstream.

The barriers may be of following types :

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- **Site Material-Dependent Barriers:** The barriers ( or dams) may be constructed with stones , sand, soil or concrete ,depending upon the availability of material at the sites. Such kind of barriers are usually provided with “ **SCREENS**” ,which are made of vertical aluminium or galvanized metal bars with about 01 cm spacing. These “screens’ prevent the escape of the fish stock ( **Figure 01**) .
- **Nylon-Net Barriers:** Some enclosures are used to partition off areas of an open water body e.g. intertidal areas of the sea or foreshore areas of lakes and reservoirs. Generally, the enclosure is formed on one side by the shore and the other 3 sides by a wall of nylon netting hung from the ropes. Sometimes, concrete or stone walls ( about 3 m wide) are built on each side where it joins the shore , to provide adequate support for the net. Net barriers may be hung from steel cables tied between the poles or the concrete or steel piles. The latter are anchored to large anchored blocks through steel cables , to prevent any lateral movements of the piles.

Figure 1. Diagrammatic view of a 'PEN' or enclosure in a 'Fjord' showing barriers and screens



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- **The Wire-Mesh Barriers:** Though quite movement , galvanized wire mesh or chain links are also being used as barriers. At the bottom of the poles or pilings under water, such net barrier is fixed by a rope along the sea bed for about 1 m , until it terminates in a lead line. Normally , the net is embedded in the sand or silt at the bottom , sealing it properly , so as to prevent the entry of predators or escape of cultivable organisms.
- ❖ **TYPES of ENCLOSURES:** Enclosures may be various types
  - **Bamboo Scaffolding Enclosures:** In the shallow eutrophic Bays in the Philippines and in the lakes of China , bamboo scaffolding enclosures of various sizes ( approx. 2.5 m high and 5-10 cm wide ) have been built . An interspace of about 1 cm between 2 bamboo splits is essential for free exchange for free exchange of water in pens.

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- **Floating Net Enclosures:** In this type of improved net enclosures, the enclosure is held in place by concrete block sinkers of heavy weight . There is a series of small weights on the foot rope which is secured to a chain link between the sinkers. The net is kept floating by floats attached to the headrope. A horizontal net is stretched at the top of the enclosure to prevent fish from jumping. The floating –net-enclosures have been found useful for culture of **Tilapia** and **Milk fish** in the lakes.
- **Single layered Pens of Nylon Webbing:** Such enclosures are supported by **Palmyra** ( Palmyra = a tropical Asian palm; *Borassus flabellifer* ) **poles** ( 3 m length, 15 cm wide and 5 cm thick) which are pointed at one end. These poles are actually driven into the mud at 50 cm and 1.5 m apart.

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These poles are actually driven into the mud at 50 cm and are 1.5 m apart . A 20 mm polythene rope serves as a head rope and foot rope. The head rope is attached to a nail driven at the top of the poles, so that , webbing is firmly held to the poles. The laterite stones are attached to the foot rope at an interval of 1.5 m. The stones along with the foot rope and webbing are anchored about 40 cm in the mud. The mesh size of the knotless nylon webbing is about 10-20 mm, and the approx. area enclosed by such nets is 0.1-1.0 ha. A scare –line made of tender leaves of *Polymyra* is attached to a polyethylene twine at an interval of 1 m inside the enclosure about 50 cm above the bed of the pen so that the fingerlings would not dash against the webbing and get themselves injured.



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In another type of nylon webbing enclosure, the foot rope is tucked into the bottom soil about 0.5 m deep, along with the netting. This keeps the pen walls in position against wind and wave and prevent the predators such as eels, catfish, crab etc. from entering into the pens and also preventing the fishes from escaping out. The head rope of the pen is attached to a series of horizontal bars supported by Casuarina poles about 4 m apart.

- **Double –layered Pens:** Double-layered pens are suitably used as **NURSERIES** for fish or prawn seeds. These pens have an inner nylon enclosure of less than 1.0 cm mesh size and an outer enclosure of split bamboo mats.

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❖ **Species Suitable for Pens:** Fishes or prawns or both can be cultured in the pens. Generally, the species which are herbivores or detritivores, fast growing and tolerant to fluctuating salinities (in coastal areas) are preferred the most. *Chanos chanos*, *Mugil* sp. and *Etroplus suratensis* are highly suitable fish species for mon- or polyculture. However, some carnivorous fishes viz. *Lates calcarifer*, *Polynemus(=Eleutheronema) tetradactylum*, *Elops* sp. are suggested for stocking in separate pens. Apart from fishes certain species of prawns and edible clams can also be cultured in pens. The stocking density of fish or shell fish for pens may range from 10-100 individuals/m<sup>2</sup>.

# Merits of Pen Culture

- a. Pen culture is continuous process due to continuous water supply.
- b. Greater production is assured in a limited time space with rich food and oxygen supply.
- c. Greater growth is possible as energy is saved towards locomotion and feeding etc.
- d. Pen culture generates alternate employment opportunities, for the coastal-fisher folk.
- e. As toxic metabolites (like ammonia) are flushed regularly, there is no danger for mass mortality of fish.

## Demerits of Cage Culture

- Unfavourable weather conditions and unexpected typhoons or monsoon rains may damage the pen or flood the culture sites.
- During summer or southwest monsoon ,pen culture site may be polluted with the occasional abundance of red tide causing organisms ,such as ‘Dinoflagellates’.
- The organisms like Baranclles and the algae ( Enteromorpha sp. ; Ectocarpus sp. etc.) adhere to the bamboo poles, palmyra poles, nets or material of the pens and causing biofouling.
- The shipworms ( Teredo) , terrestrial insects may cause damage exposed portions of pens

## Demerits of Cage Culture

- Certain species of crabs may cut and damage nylon-welding enclosures.
- Predator fishes , if not eradicated periodically by netting operations, may cause considerable damage to seed and growing fishes or prawns.
- The abundance of sea weeds in the surroundings of pens also disturb the environment by bringing down the oxygen level through release of hydrogen sulphide on death and decay.

# References

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Thanks