Write an account on pearl formation and pearl oyster culture – 89 IAS.

Pearl is known to humans since ancient times. It is become the "symbol of position" due to its delicate appearance and shine. It is a white, shining, globular body found within the shell of an oyster. ~~Hindu~~ Hindu believe that it is "the tear of moon". In sanskrit literature it is mentioned that during "swati Nakshtra" when a drop of rain water falls, ~~in between the mouth and~~ inside the open mouth of pearl oyster, converted in to pearl. But ~~reality~~ reality is that; ~~it is~~ pearl is animal origin ~~obtains~~, formed due to defferent activity of pearl oyster against the forgin particle.

History

Mr. Kokichi Mikmoto (1858-1954) first time ~~formally~~ produced a pearl in 1894 by artificially employed technique. He is known as father of pearl industries. In 1896 he got a patent for pearl culture. Tokichi Nishikawa firstly syntesised spherical artifical pearl. Japanese dominating in world market, they are conservative in disclosing the detail technique of the cultured procedure because it their trade secret. Pearl culture for commerical purpose is done very small scale in India.

Pearl producing Molluscs →

The high quality of pearl produced by genus Pinctada (class-Bivalvia, family-Pteriidae). The important species producing pearl are -

- Pinctalda vulgaris (Schemacher)
- P. chemitizi (Linn.)
- P. marig ~~aritifera~~ margaritifera (Philippi)
- P. anamiodus (Reeve)
- P. atropurpurea (Dunker)

} All these are many species & found in India water resources.

~~But~~ The P. vulgaris is the most commonly found in gulf of Mannar, gulf of Kutch and Palk bay.

P. margaritifera & P. maxima produced pearl of bigger size but inferior quality.

* Some other marine and freshwater molluscs are also found to produce pearls of inferior quality - such as -

Haliotis Linn (Ear shell)
Mytilus Linn (Sea mussel)
Placuna placenta Linn (Windowpane)

* European species belonging to the family unionidae have been found to produce superior quality pearls.

Pearl production sites

Pearl oyster are generally found attached to rocks or dead coral reefs. Their accumulation sites are known as pearl banks or pearl beds. The found at the depth of 22-25 metres from 15-20 Km ~~from~~ of shore. The pearl oyster beds of the east coast are more extensive and productive than the west coast in India. "Tingha Pearl" obtained from these pearl beds. Their site of occurance in India is Gulf of Mannar, Gulf of Kutch, Pak bay and Baroda.

Japan is the major production centre of pearl. ~~Besides these~~. Besides these coast of Australia, Shores of Central America (Panama Bay, Gulf of California) and South Pacific are also important productive places.

Pearl formation

Pearl formation is the natural phenomenon. Pearl is formed by the defence mechanism of oyster against the invading ~~foreign~~ ~~foreg~~ foreign particle. So we can say that it is the result of defence activity of oyster. To study the mode of formation of pearl it is essential to know the structure of shell mantle. Shell of pearl oyster is composed of 3 distinct layers —

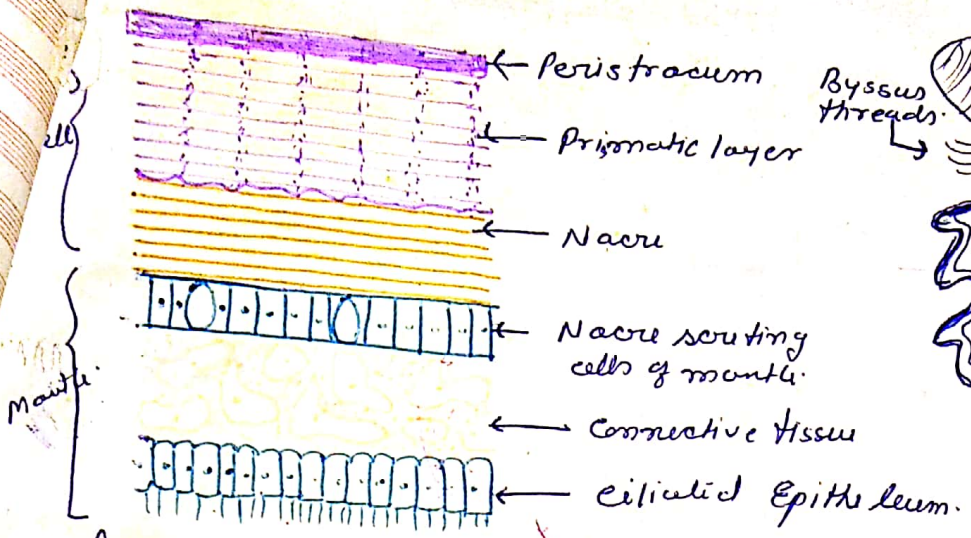

Fig. T.S. shell and mantle of a pearl oyster.

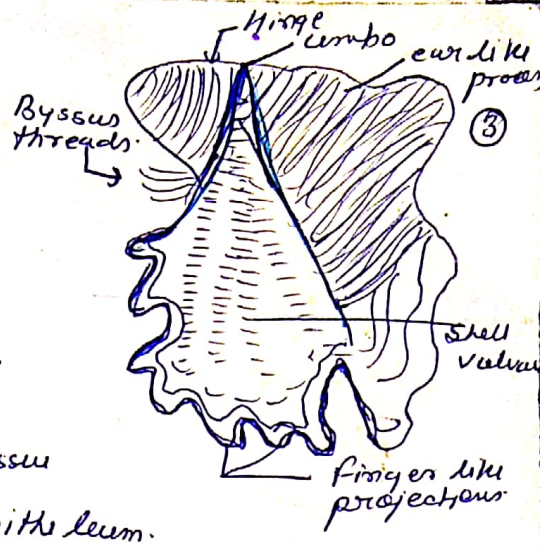

Fig- External features of a pearl oyster

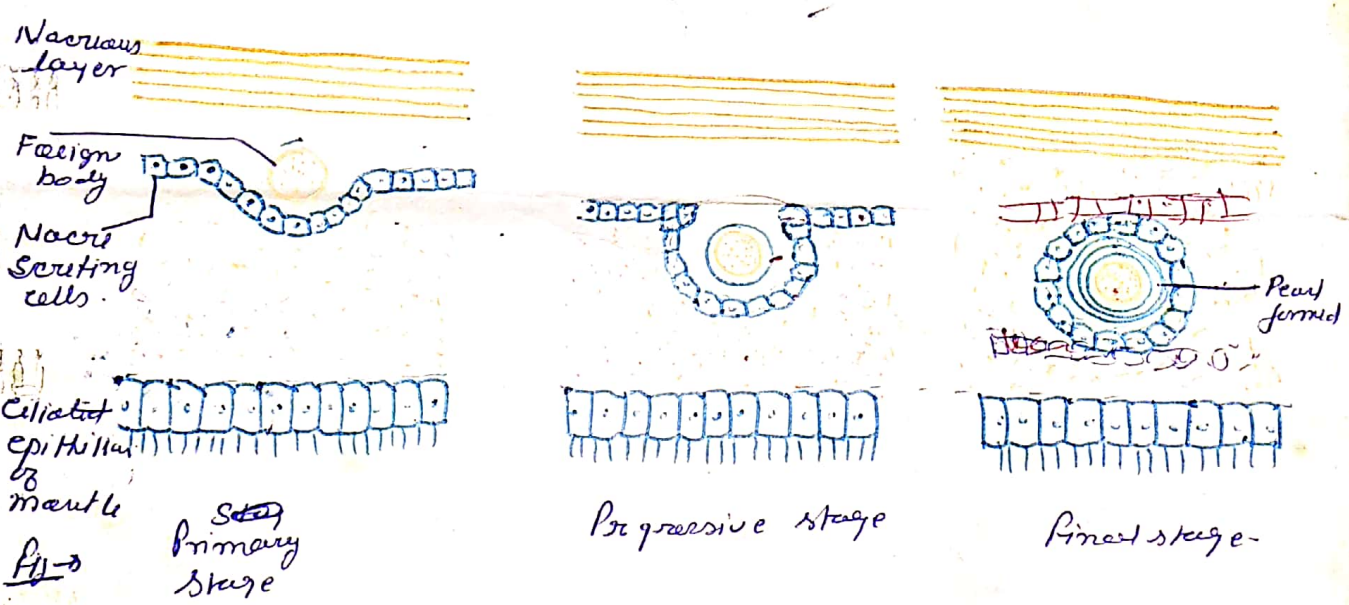

Fig → Stages of pearl formation.

They are as follows→

① Periostracum → It is the outermost, greenish-brown, thin, translucent layer made up of an organic substance "Conchiolin", secreted by mantle. It protect the underlying layers from harmful effects.

② Prismatic layer → It is middle layer made up of prism like crystal of calcium carbonate called "calcite" (Burnt ash) separated by layer of conchiolin. It provide strength and rigidity to the shell.

③ Nacreous layer → It is the innermost layer made up of alternate layers of $CaCO_3$ and conchiolin, which lie parallel to the surface of the shell. It is also ~~sec~~ secreted by mantle. Called "mother of pearl"

Mantle is also made up of 3 layers, which are as follows—

① Columnar epithelium — contain nacre secrating unicellular glands.

② Connective tissue layer → Fibrous layer mainly compared of connective tissues.

③ Ciliated epithelium → Innermost layer containing mucous secreating cells.

* Pearl formation

The pearl is formed due to irritation caused ~~by~~ to the mantle by the entry of foreign bodies. Whenever any sort of foreign body enters and gets established between the mantle and shell, it become enclosed in a sac of mantle epithelium. This foreign body now acts as an irritant and stimulates the mantle epithelium to secreate ~~concentric~~ concentric layers of nacre around this foreign body. These layers when harden become pearl. Size of pearl is directly proportional to the degree of irritation caused by foreign agents. Time taken for pearl formations about 3-5 years. A beautiful and a fair quality pearl is that in which the layers are accurately and symmetrically laid. It is also free from any sort of adhesion. Such a pearl is, however, rare and if it occurs, it ~~fetches~~ holds a good market.

3- Insertation of nucleus → the insertion of nucleus as foreign particles is very much technical process and is of great importance for pearl industry. Nishikawas methods is best for this purpose. Following steps are taken for the insertion of nucleus—

(a) Fitness of oyster for operation → Healthy and strong oysters ~~which are able~~ are selected which can overcome the shocks of experiment. ~~It is suggested that if the ovary and testis of oysters are got rid off they would be more resistant to the shocks of operation.~~ Before operation, oysters are kept under stress of suffocation as a result they start to open their shells and at once a bamboo peg (piece) is inserted between the gap of two shells due to which shells may not be closed again

(b) Preparation of a graft tissue → A piece of tissue used for insertion of nucleus in mantle is called "GRAFT". A strip of about 7X0.75 cm cut from the edge of mantle of healthy oyster. This piece is smoothed, cleaned and washed by wet sponges. Now this piece is cut into squares according to size of nucleus. These grafts are kept at 22°C in sea water, where they can survive for 48 hours. The outer edges of these graft square must be known because more secreating cells are found only on the outer surface of the mantle so it is essential to keep the outer surface in contact with the insertion nucleus.

(c) Preparation of nucleus → Although any small piece particle may function as nucleus to initiate the pearl formation, the best nucleus is formed by the calcareous shell of molluscs. The nucleus must be spherical for best quality pearl.

(d) Insertation of nucleus → For this oysters are fixed in a desk clamp in the position of right valve facing upward. Mantle folds are smoothly ~~tour~~ touched to expose the foot and main body mass, ~~is~~ followed by an incision into the epithelium of the foot and a slender channel into the main mass. Suddenly one

graft tissue together with nucleus is placed into the channel. Now the bamboo peg is removed and ~~oy~~ oyster shells are closed automatically. For insertion of second nucleus same operation is performed from the left side in the gonadial tissue ~~and third insertion~~. The whole operation should be completed within 30 minute because ~~the~~ oyster may die after this.

(e) Post operational care — Nucleated oysters are placed into cages and suspended into seawater ~~to~~ a depth of 2-3 meters for 6-7 days to recover from the shocks; ~~calle~~ this periode called "Recovery periode". Now dead ~~oo~~ oysters are seprated from cages. Oyster examined by x-ray to check ~~that they~~ ~~eat~~ the presence of inserted nucleus. Now 3000-3600 nucleated oysters are kept in different cages suspended at 2-3 meters for 3-6 years in sea water. The pearl oyster grow best in warm shallow waters at ~~usually~~ 14 meters.

(f)

4- Harvesting of pearl — After 3-6 year the pearl are harvested in Dec-Feb. Pearl ~~are~~ from the sea and the pearl are taken from the oyster.

5- clearing of pearls → Pearl taken out from oysters are washed, cleared with soap solution, but pearl should not be rubbed much

★ Composition of pearl —

water ~~24%~~	2-4%
Organic matter	— 3.5-6%
$CaCO_3$	— 90%
Residue	— 0.1-0.8%

Quality of Pearl →

* Colour - white, cream, Pink, rainbow
* The spherical pearls of rainbow colour are rare.
* Linghapearl is best quality pearl.
* Pearls obtained from freshwater molluscs are of inferior quality.

* Problems of Pearl Industry →

- Enemies like eel, octopus, devil fishes etc destroy oysters.
- Coldwaters, low salinity of water, turbidity of water and high range of temp. variation are the chief ~~causes which harmes the~~ factors which can harm the pearl industry.

* Suggestions →

- ~~Seni~~ Suitable sized nets are used for oyster culture, due to this smaller sized oysters are remain in sea.
- Fishing during breeding season of oyster should be banned.