



TECHNO GUIDE SERIES

AUGUST 2016

Pearl Culture



Made, Printed and Reproduced by:

Republic of the Philippines

Department of Agriculture

BUREAU OF FISHERIES AND AQUATIC RESOURCES

Regional Office No. 8

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Department of Agriculture

Bureau of Fisheries and Aquatic Resources Regional Office 8

Guiuan Marine Fisheries Development Center and

Information, Education and Communication Section

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Bibliography

Guiuan Marine Fisheries Development Center
pds-pearl-group.com
W-dog.net

Cost and Return

(Blister Pearl Production – 200 kgs wing oysters @ 5pcs/kg)

Income/Benefit

Blister pearls (200 kgs. oysters @ 5 pcs/kg @ 3pcs nuclei/oyster = 3,000@85% recovery 2,550 pcs.:

Grade A (12% of 3,000= 360pcs @ PhP300.00)	108,000.00
Grade B (11% of 3,000= 330pcs @200.00)	66,000.00
Grade C (41% of 3,000= 1,230pcs @ PhP100.00)	123,000.00
Grade D (21% of 3,000= 630pcs @PhP 50.00)	31,500.00
	328,500.00

Fixed Cost

Caretaker's house	50,000.00
Oyster posts, 11pcs, concrete, 4"x12', concrete @PhP500.00	5,500.00
Service boat, 5.5HP, 20footer	50,000.00
Oyster plots	
2 kg Nylon 300mm @ 310/kg	620.00
2 rolls PE rope 5mm, blue color @ 600/roll	1,200.00
	77,020.00

Operating Cost

Wing Oyster (200kgs @ PhP40/kg)	8,000.00
Nuclei, half round (1,000pcs oysters x 3 nuclei/oyster@ PhP2/pc)	6,000.00
Paste (Mighty Bond, 20 tubes x PhP55/tube)	1,100.00
Nylon Monoline 30 lbs test, 1kgs @ PhP310.00/kg	310.00
Gasoline, 200 lits. @ PhP45.00/lit.	9,000.00
Lubricating oil, 4 lits @ PhP200.00	800.00
Installation of Oyster Plots, 4 man-days @ PhP 300.00/ man-day	1,200.00
Labor during nuclei operation, installation of branch lines, harvesting and maintenance activities, 200 man-days @ 300/man-day	60,000.00
Technician/Caretaker's Salary, 1 @6,000.00/month x 24 months	144,000.00
	230,410.00

Depreciation	15,404.00
Net income/Benefit (2 years)	98,090.00

ROI = $\frac{\text{Gross income}}{\text{investment}}$	1.07
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Payback Period = $\frac{\text{Original investment}}{\text{Gross annual Profit}}$	1.9 years
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Introduction

Pearls have been considered as one of the nine precious gems all over the world. It is the only organic gem, produced as an abnormal growth within the shell of a certain bivalve. Pearls are traditional export product and has now grown to be the 8th dollar earner for the fishery sector. As of 2005, the Philippine export data for cultured pearls, raw shells and products is estimated to be US \$15 billion with exporting countries, USA, Switzerland, Japan, Hongkong, China, Australia and others. (Bondad-Reantaso et al 2007).

Pearl culture presents a significant potential for economic development in coastal communities in the Philippines. The industry requires minimal capital input, yet has wide ranging benefits to fisherfolk, coastal communities and national economies. Pearls are ideal export commodity because they are non-perishable, shipping costs are minimal and lucrative markets are already established.

SPECIES OF PEARL OYSTERS

A. *Pinctada sp.*

Characterized by a long straight hinge, with the long axis of the shell at the right angles to the hinge. Left valve a little deeper than the right valve and a byssal notch on each valve at the base of the anterior lobe.

B. *Pteria penguin*

Characterized by a more elongated shape than *Pinctada* spp., being longer anteriorly than wide dorsoventrally.

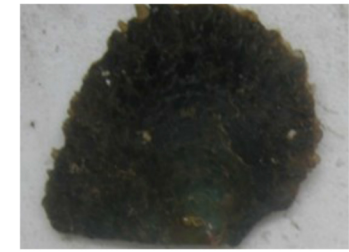
SPECIES COMMONLY CULTURED IN THE PHILIPPINES



Pinctada maxima

(White-lip or Gold-lip oyster)

Pearl Produced: Round & blister pearl



Pinctada margaritifera

(Black-lip oyster)

Pearl Produced: Round & blister pearl



Pteria penguin
(wing Oyster)
Pearl Produced: Blister or Half round Pearl

Site Selection

1. Sheltered bays
2. Presence of pearl oyster
3. Temperature: 25- 32 C

Temperature determines the rate of deposition of nacre both on shells and nuclei. With lower, the quality of lustre is improved although the growth of pearls is reduced.)

4. Optimum depth: 15 m.

At greater depths, the rate of nacre deposition is slower, pearls of high quality are obtained.

5. Salinity: 30- 35 ppt

6. Gravelly substrate

Repeated culture on the same ground leads to some extent of deterioration of pearl quality. The chemical and physical state of the sea bottom is affected by the organic substances discharged from the oysters and fouling organisms)

7. Slight to moderate water current and tide amplitude is sufficient

To allow replenishment of oxygenated water and fresh plankton and flush away waste materials. In strong water currents, the formation of the nacreous layer is faster but the quality of pearls is inferior.)

8. Good water quality

Away from industrial, agricultural and domestic pollution.

9. Availability of labor and materials

Pearl Grading

There is no internationally accepted grading system for pearls. Pearl dealers use their own system. These systems often use the same alphabetical nomenclature.

Grades	Description
AAA	Perfect Quality
AA	Superior Quality
A	Fine Quality
AB	Good Quality
B	Medium Quality
C	Low Quality

In the Philippines, we have the following grading system for blister pearls for blister pearls.

Grade	Description
A	Fine Quality. Perfect half-round shape with thick nacre coating and excellent Luster.
B	Good Quality. Has thick nacre coating excellent luster but its shape is adversely affected by of minor impurities or unbalance nacre coating.
C	Medium Quality. Has thick nacre coating excellent luster but its shape is adversely affected by presence of prominent impurities or unbalance coating of nacre.
D	Low Quality. Thin nacre coating. Shape has unbalanced nacre coating and lacks luster
R	Reject. Cannot be used for jewellery due to deformed shape caused by impurities.

Factors which affect Pearl Quality and Value

- 1. Luster** is a combination of surface brilliance and deep seated glow. The more brilliance and deep seated glow. The more brilliant and reflective the surface of the pearl, the higher its luster and its value. A pearl with very high luster has a sharp contrast between the pearl's brightest area and the shaded area while a pearl with very low luster is dull and the reflection hazy, chalky and non-existent.
- 2. Surface Perfection** refers to the absence of disfiguring spots, bumps or cracks on the surface of the pearl, the more valuable.
- 3. Shape** in pearls is divided into three (3) categories; spherical, symmetrical and baroque. The rarest and most valuable is the spherical or round pearl. These are judged on their degree of sphericity or roundness. Pearls with shapes such as teardrop or pear-shape are symmetrical pearls, and are judged on their outline, proportion and good symmetry. Baroque pearls, which are asymmetrical in shape can be lustrous and appealing, and often cost less than the round and symmetrical pearls.
- 4. Color** - cultured pearls come in a variety of colors from rose to black and just about every color in between. The most valuable color of cultured pearls tends to be rose/white but in general, color is a matter of personal preference. The *body color* refers to the basic color, i.e. white, cream, yellow. The *over-tone* refers to the presence of a secondary color (its *tint*, usually a pinkish, greenish, greenish or blue tint).
- 5. Size** –cultured pearls are measured by their diameter in millimeters and varies depending on its origin. The larger the pearl, the more valuable it will be.



Pearl Luster, Shape, Size, Color and Surface Perfection

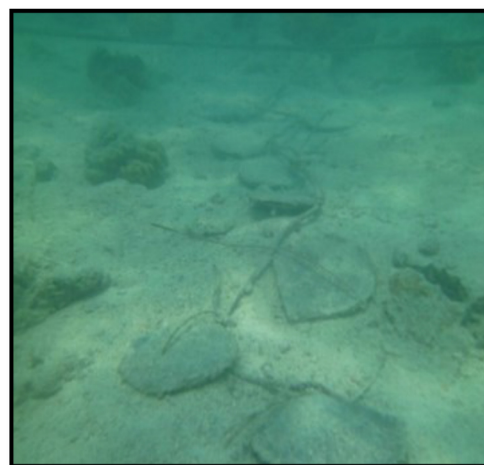
Pearl Culture Methods

A. Bottom Culture Method

This culture method is applied when white-lip or black-lip oysters are used for pearl production. This is to simulate the natural position of these oysters. These oysters are naturally found lying flat on sea bottom or sometimes slightly attached to any form of substrate through their byssus.

Materials:

- Polyethylene rope, 12mmØ (10 meters long for mainline with 10 loops for attachment of branch lines spaced at 75 to 100 cm per loop.)
- Polyethylene rope, 8mm Ø (3 meters long for branch line)
- Nylon monoline, 30 lbs test.
- Hand/electric drill
- Buoys, 12mm Ø
- Pearl oyster



Samples of oysters cultured using the Bottom Culture Method



B. Hanging Culture Method

This method is applied when wing oyster is used for pearl production. This is done to simulate the natural position of wing oyster. This oyster is naturally found attached to gorgonian corals through its strong byssus.

Materials:

- Polyethylene rope, 12mmØ (10 meters long for mainline with 10 loops for attachment of branch lines spaced at 75 to 100 cm per loop, 2 mainlines)
- Polyethylene rope, 8mm Ø (3.5 meters long for branch line with a capacity of 10 wing oysters)
- Nylon monoline, 30 lbs test
- Plastic tags
- Buoys
- Hand/electric drill
- Posts
- Pearl oysters



C. Raft Culture Method

This method is considered to be one of the most suitable farming on sheltered bays. Raft must be set parallel to the prevailing wind direction.

Raft Size: 5 x 6 meters

Materials:

- GI pipes or lumber (for frame)
- Empty drums, 200 lts capacity (for floats)
- Polyethylene rope, 12mm Ø (for anchor)
- Oyster cages (10 oyster capacity)

Pearl Farm Management

A. Health Management

The control of fouling and boring organisms is critical for promoting good growth and quality of both the pearl and pearl oyster. Regularity in cleaning depends on the degree of fouling. This is done by manual or mechanical scrubbing of oyster with stiff brushes or high pressure water jets.

Pest/Diseases/Predators	Control Measures
Polychaetes and sponges	Submerge in saturated salt solution for 15 to 40
	Submerge oyster in freshwater for 6 to 10 hours
Boring organism	Brush with 1% formalin, dip in freshwater and return to sea.
Predatory organism	Periodic monitoring of culture facilities
	Manual removal of predators

B. Stock Inspection, Inventory and Recordkeeping

Oyster stock both operated for pearl production and unoperated should be inspected daily, if possible. This enables the recovery of dead shells without being beach rolled and will therefore give higher market value for shell and will also give an earlier detection of disease and predation. Setting pearl oyster by tens (10) in oyster plots and cages and providing individual tag in every branch line or cage will make inventory easier.

A record of stock for both operated and unoperated pearl oysters is necessary for proper farm inventory. If possible, separate each source and batch of oysters received since they differ in handling stress. A safe practice is to pay for the oysters 5 to 7 days after it had been delivered to assure you of higher survival rate.

Multiple implantation can be done depending on the size of oyster and nucleus.

- 5-6 mmØ nucleus = single implantation
- 4-5 mmØ nucleus = double implantation
- 2-3 mmØ nucleus = multiple implantation



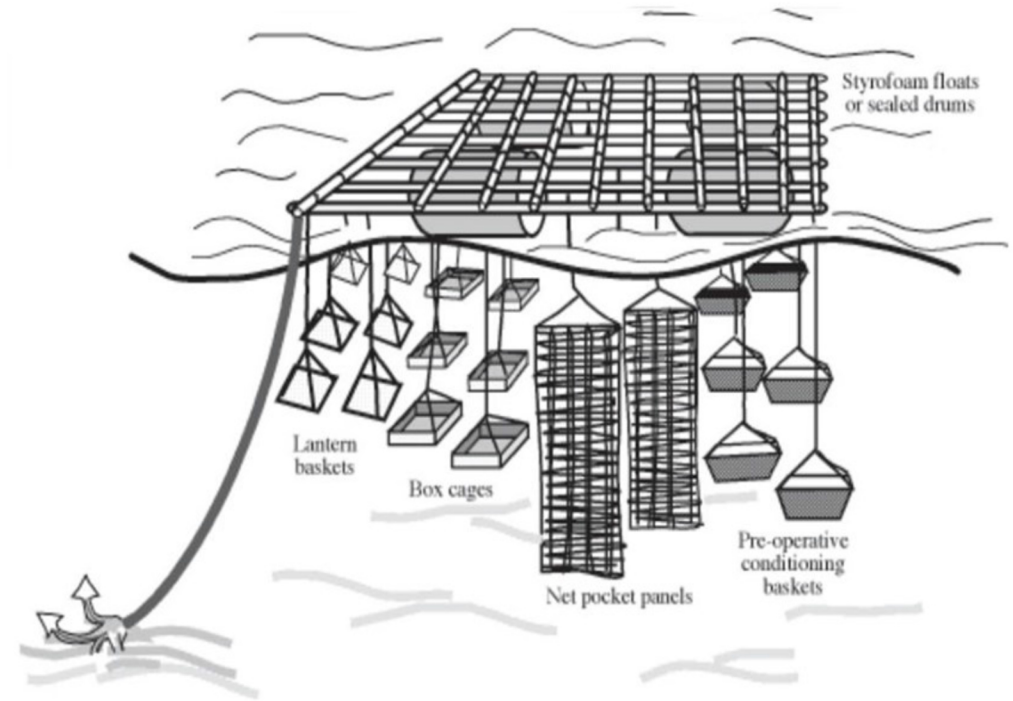
BLISTER PEARL Operation

Wing oyster (*Pteria penguin*) is used solely for blister or half round production. Half pearl nucleus are most often hemispherical but maybe irregular in shape (teardrop, heart, oblong, etc.)



Steps in Blister Pearl Operation

- ⇒ Slowly open the oyster by using wooden wedge in between the shell to prevent from closing.
- ⇒ Place the oyster in shell holder /clamp to hold it firmly.
- ⇒ Lift the mantle from the shell using spatula and paste the nucleus with super glue. The number to be pasted depend on the size of nucleus and the size of the oyster. Up to 5 nuclei can be planted as long as it will not prevent the oyster from closing its valve.
- ⇒ Use only a small amount of glue to paste the nucleus. Press firmly and hold for 10 seconds.
- ⇒ Paste the nucleus as close to the front of the shell so that it is located on the most colourful section of the nacre.
- ⇒ Take out the wooden wedge after the operation and return the oysters to the sea with great care until harvest.
- ⇒ Culture period of blister/half round Pearl is 1 year to 1.5 years



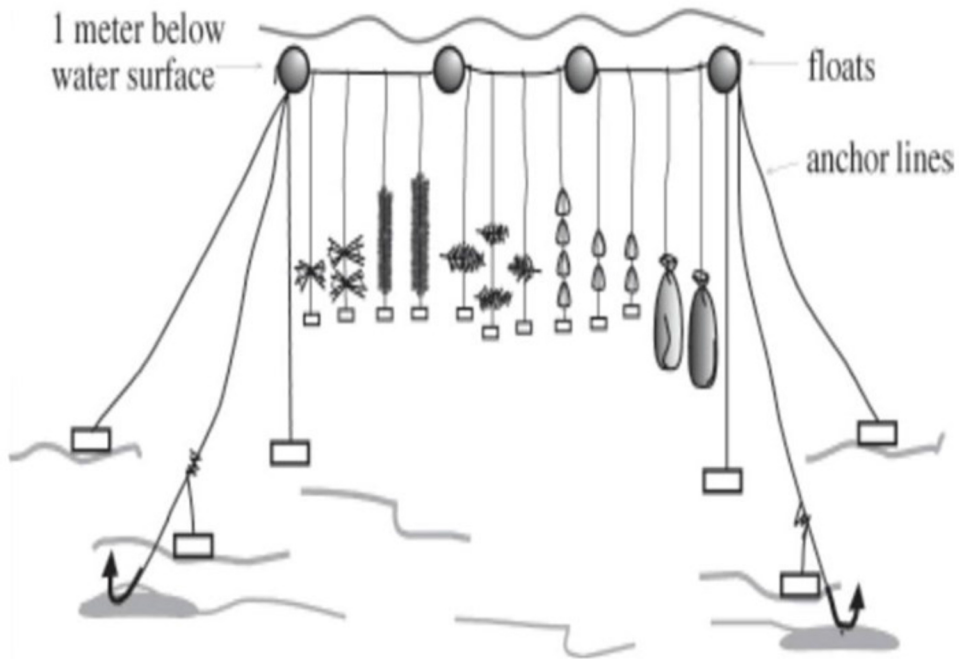
Rafts can be used in calm waters to hang a variety of pearl oyster containers. Modified from Gervis and Sims (1992) by Nakashima.

C. Long Line Culture Method

This method is good for open sea areas that uses spherical or cylindrical floats. Setting the long line is made parallel to the prevailing water current.

Materials:

- Polyethylene rope, 12mmØ (for anchor line)
- Concrete blocks (for anchor)
- Floats
- Polyethylene rope, 8mmØ (for branch line)
- Nylon monoline, 80 lbs test
- Pearl Oyster



“Tahitian” long line. A mainline is hung from a series of anchor lines kept suspended by floats interspersed along the line. Longlines can be used to hang chaplets spat collectors or pocket panels. Modified from Gervis and Sims (1992).

Pearl Operation Techniques

ROUND PEARL OPERATION

Performed best during cooler months. White lip and black lip are used for round pearl operation but can also be operated for blister pearl. Prior to operation, oysters should be conditioned for at least two weeks in oyster trays. Discard oysters with parasite infestation.



A. Graft Tissue Preparation

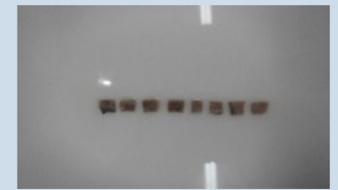
- ⇒ Hold the donor oyster with dorsal side downward and posterior side upward. Insert the knife and press on unto the anterior end to cut the adductor muscle.
- ⇒ Open the shell and remove the mantle tissue with care.
- ⇒ Clean the mantle tissue with clean wet sponge
- ⇒ Trim the tissue with the epithelial portion faces up. Do not interchange the orientation of the graft tissue for it is important in pearl formation. Make sure the tissue is always moist all throughout the process.
- ⇒ Cut the tissue into tiny square about 2 x 3 mm long or almost same size of the nucleus. It should cover the 1/3 of the nucleus surface. Graft tissue should be used within 30 minutes time to obtain good result.



Mantle tissue



Marginal mantle



Graft bits

B. Graft Tissue and Nucleus Insertion

- ⇒ Open slightly the oyster by inserting bamboo wedge. Care should be taken not to damage the shell and mantle lobe.
- ⇒ Place the oyster in the shell or clamp holder.
- ⇒ Prepare and disinfect the graft tissue by using betadine solution.
- ⇒ Make a small cut in the gonad of the pearl oyster. Insert the nucleus using nuclei carrier then insert the graft tissue using graft lifter. The inner epithelium must face the nucleus. The graft will grow covering the nucleus with tissue called “pearl sac” which secretes nacre to the nucleus.
- ⇒ Smoothen the incision with nuclei carrier so that the air inside will come out and the two margin of the incision will come in contact.
- ⇒ Remove the oyster from the shell holder, get the bamboo wedge and return the oyster to the water. Place in a nuclei catcher basket or catch bag for 3 weeks to 1 month to monitor rejected nuclei.
- ⇒ Oyster need up to six weeks recovery
- ⇒ Culture period for round pearl is 1.5 years to 2 years.