

AQUACULTURE OF SHELLFISH IN VIETNAM

Ha Duc Thang

Research Institute of Marine Products
Ministry of Fisheries, Vietnam

I. Introduction

Vietnam has a long stretched of sea shore which is about 3260 km from Mong Cai to Ca Mau. The coastal area available for culture of marine species is about 660,000 ha tidal area and 300,000 ha of pond and closed areas.

Coastal aquaculture in Vietnam is still underdeveloped compared to its neighbors in Southeast Asia. While countries most advance in coastal aquaculture (i.e., Republic of Korea and China) produce several hundreds of tons of commodities on every kilometer of coastline, Vietnam produces 8.4 ton/km, Malaysia 11.5 ton/ha and the Philippines 27.1 tons/km. Coastal aquaculture in Vietnam is still dominated by crustaceans and marine shrimp culture.

The Vietnamese are consumers of bivalves and gastropods. However, aquaculture of shellfishes is not a traditional industry in Vietnam. The people used to collect the bivalves from the wild for food, resulting in the continuous decreasing of the mollusc resources, year after year. The increased production from mollusc culture in the coastal areas is therefore important and necessary for the Vietnamese.

In order to conserve the mollusc resources in Vietnam, basic studies on biology, physiology and ecology of some shellfishes are therefore very important. In addition, the artificial production of bivalve seeds is also equally necessary, and this has become an important mission for fishery scientists.

Recently, mollusc culture was introduced in Vietnam. Some of the commercially important bivalve species in Vietnam (Table 1) are presently cultured in a large-scale (e.g., pearl oyster, ark shell clam) while about half is done at a low and very manageable level. In these cases, the source of the seeds is still dependent on the wild.

Production from mollusc culture in Vietnam, is fast increasing from 1996 to the present. Clams, cockle, ark shell, and scallops are the important species contributing to the total mollusc production.

However, the Vietnamese also consume gastropods and bivalves, as traditional sources of their daily high protein food. The prices of shells such as oysters, ark shell, clam, and snails are now rapidly increasing because these have become important export products in the country's fisheries trade.

Table 1. Commercially important gastropods and bivalve species of Vietnam

Scientific Name	English Name	Distribution area
<i>Crassostrea rivularis</i>	Oyster	Quang Ninh (QN)-Thanh Hoa
<i>Anadara broughtonii</i>	Arkshell	Hai Phong - Nam Dinh
<i>A. granosa</i>	Arkshell	Thanh hoa, Thai binh, Minh Hai
<i>Meretrix lyrata</i>	Clam	Bentre, QN, Thanh hoa
<i>M. venerupis</i>	Clam	Bentre, QN, Thanh hoa
<i>M. meretrix</i>	Clam	Bentre, QN, Thanh hoa
<i>M. lusoria</i>	Clam	Bentre, QN, Thanh hoa
<i>Luthlaria philippinarum</i>	Snail	Haiphong (HP)
<i>Pinctada maxima</i>	Pearl oyster	QN, HP, Khanh hoa
<i>Pteria penguin</i>	Black wing pearl oyster	QN, HP, Khanh hoa
<i>Pinctada martensii</i>	Black wing pearl oyster	QN, HP, Khanh hoa
<i>P. margaritifera</i>	Black wing pearl oyster	QN, HP, Khanh hoa
<i>Haliotis diversicolor</i>	Abalone	QN, HP, Thuan hai
<i>H. asinina</i>	Abalone	QN, HP, Thuan hai
<i>H. ovina</i>	Abalone	QN, HP, Thuan hai
<i>H. varina</i>	Abalone	QN, HP, Thuan hai
<i>Mytilus smaragdinus</i>	Blue mussel	HP, T. hoa, K. hoa
<i>Chlamys nobilis</i>	Scallop	
<i>Amusium pleuronectes</i>	Raditel scallop	Thuan hai, Vung tau
<i>Babylonia aerolata</i>	periwinkle in Freshwater	Vung tau
<i>Shinohyriopsis cunmiggii</i>	Freshwater oyster	Thanh hoa

II. Oyster Culture

A. *Crassostrea rivularis*

The river mouth oyster is one of the most important molluscs in Vietnam. From 1967 to 1968, the off-bottom hanging method of oyster culture including spat collection, was proven to be successful, although this is not yet very efficient due to inadequate technology.

1. Biological characteristics

River mouth oyster is one of large species of oysters, which includes the *Crassostrea gigas*. The meat of the oyster has a high protein content, that is why the Vietnamese consume oyster as a protein food for their every day meals.

The most common, *C. rivularis* lives in river mouth which has low salinity from 10 to 25‰ and its distribution is from central tidal to 5-6 m depth of water. Adult oyster reaches 20-25 cm in length, and it is distributed in Quang Ninh - Thanh Hoa province. Bach Dang river mouth is famous for the production of the river mouth oyster. Spawning season is from April to September, concentrating from May and June to September and October. The river mouth oyster can be harvested after two years of culture.

2. Seed production

Seed production is one of the major problems in gastropod and bivalve culture, including the collection of oyster spat from the wild and collection of artificial spat reared from eggs in hatchery tanks. However, the use of artificially produced seeds in oyster culture was also found not economical at this stage because of the difficulty in handling and rearing the seeds to larvae due to inadequate modern technologies. Thus, spat collection from the wild is still widely practiced by the Vietnamese fishermen.

In the spawning season, female and male of oysters release eggs and sperm to the sea water. The fertilized egg develops through some state of larvae and becoming umbro state which sets on a settlement medium. This is summarized in the following illustration:

Mother of oyster → Spawning → Fertilization and development → Spat setting

a) Larvae sampling

Phytoplankton net is used in the daily larvae sampling of the collecting areas. Counting of the larvae is done under a microscope, and when the number of umbro state increased, spat collecting from such area may be set out. During the following larvae sampling season, sample spat collection of oysters or scallop shells are set out daily to check for the appearance and number of newly settled spat.

b) Spat collector

Spat collector may be made of shells of oysters and scallops, bamboo, and other materials. In preparing a spat collector, holes are bored through the center of the shells of oysters and scallops and connected by means of a string which is about two meters long with 50-60 shells per string.

c) Spat growth and transporting

Newly settled spat should be about 0.3 mm in size several days after settling with an average growth rate of about 0.3 - 0.4 mm per day. After 10-15 days, spat must have grown from 5 to 10 mm with a survival after setting of 10 to 15%. A problem usually encountered in spat collection is the presence of the larvae of "balauns." This organism also settle at the same time as the oysters in great number, making it difficult for the collection of the oyster spat.

In Korea or Japan after the spat are collected, these are transported immediately for stocking. In Vietnam, this is not done because of the temperature and the presence of some fouling organisms. Spat are usually cleaned first of the fouling organisms and transported when the temperature is low.

3. Rearing seed oyster to marketable size

Three culture methods are practiced in Vietnam. These are the floating culture or raft culture method; rack culture; and bottom culture. After one or two months during the spat collection, the cultches are taken out and the main string is made longer than the original string used in collecting the spat. A small pipe is placed between two cultches.

The culture of oysters is dependent on the condition of the area. The culture environment is of utmost importance. It has been observed that after one or two culture months, the oyster may die if the culture area is not good.

4. Harvesting

Harvesting of oysters is usually from October to March. A major problem encountered in the oyster culture industry is the processing and sanitation of oysters.

III. **Clam Culture**

A. *Culture of ark shell*

The ark shell belongs to the Genus: *Anadara*, and the two most economical species are *Anadara broughtonii* and *Anadara granosa* which are found in the tidal waters of North Vietnam. Since the price of ark shell (*A. granosa*) has rapidly increased some years back, the area for its culture in the tidal waters of Quang Ninh-Thai Binh province, also increased. However, mollusc farming in Vietnam is still at an infant stage of development.

Clam and ark shell culture take place only in Quang Ninh, Thai Binh, Nam Dinh province of North Vietnam. An estimated 12,520 mt of ark shells are produced mainly in Kien Giang and Quang Ninh. On the whole, about 100,000 mt of fresh clams are processed annually for export. Starting in 1995 frozen clam meat was exported to Thailand, Singapore, and Japan, while cockles are exported to China.

1. Ark shell culture sites

Ark shell is one of the bivalves found in the tidal areas, specifically in the muddy bottom where salinity of the water is from 15 to 20‰. In waters where the salinity is lower than 5‰, the ark shell can die after some days of culture. The spawning season of the ark shell is from May to September at water temperature of 28-30°C

2. Seed collecting and culture seed

Collection of the natural seeds is done during the spawning season by setting spat collectors. The collecting method used is the same as those for scallops. Since the larvae of ark shell after setting fall to the bottom, the spat are then collected from the muddy bottom.

3. Culturing method

The most important factor in the culture of ark shell is choosing the most suitable culture site in the tidal area. The bottom of the culture area should be 70%-80% muddy and sand should only be 20-30%. The proper management of their growth is another important factor to be considered in the culture of marketable size ark shells.

IV. Culture of *Meretrix lusoria*

The clam species *Meretrix lusoria* and *M. meretrix* inhabit the clean sandy beaches of the shore in which the rivers flow. The site for the culture of this clam is therefore possible in the tidal areas where freshwater flows.

The spawning season of these clam species is from July to October. The production of the seed clams for this species in hatcheries has not been successful, so that the seeds are still collected from the wild. The culture method for this clam is the same as the culture of the ark shell.