

FEB 26 1987 #136



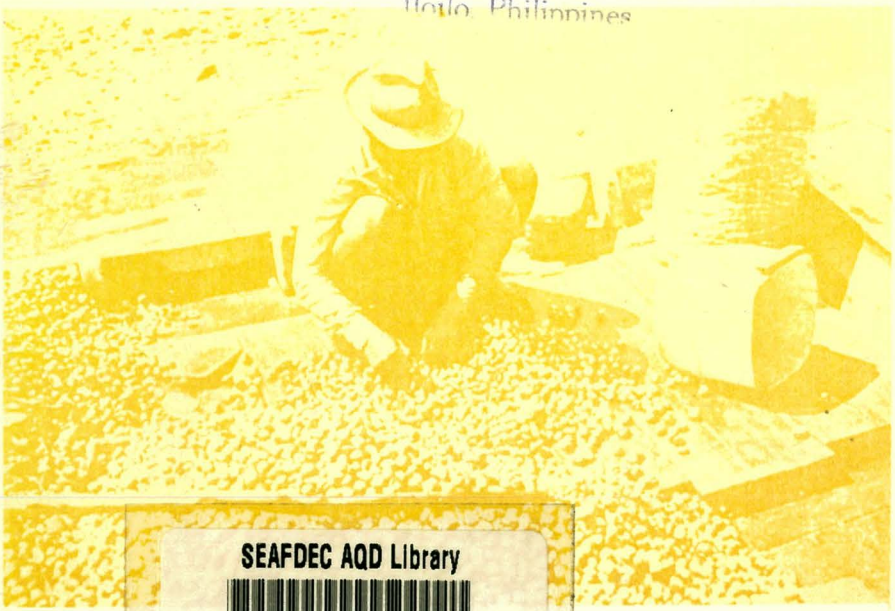
Southeast Asian Fisheries Development Center
in cooperation with the
International Development Research Centre

SEAFDEC
SH
370
H4


SAFIS Extension Manual Series No.13, 1984

COCKLE CULTURE

SEAFDEC LIBRARY
AQUACULTURE DEPARTMENT
Iloilo, Philippines



SEAFDEC AQD Library



33TMS00007331D

by

NG FONG OON

SEC/SM/13

SAFIS Manual No.13

COCKLE CULTURE

by

NG FONG OON

Fisheries Research Institute

Glugor, Penang, Malaysia

The Secretariat

Southeast Asian Fisheries Development Center

August 1984

This manual on cockle culture is a new publication prepared for the SAFIS Project by Mr. Ng Fong Oon, a Senior Fisheries Officer affiliated with the Fisheries Research Institute at Glugor, Penang, Malaysia

COCKLE CULTURE

by

NG FONG OON

Fisheries Research Institute
Glugor, Penang, Malaysia

INTRODUCTION

Cockles of the genus *Anadara* have a wide distribution in Asia. In China, *Anadara* began to be cultured some time before the 17th century, while in Japan, culture of *A. granosa besenensis* was successfully started in 1859 (Cahn, 1951). Cockle culture in Peninsular Malaysia, however, has a recent history. It was first experimented by a village headman, Lee Ah Tee, at Bagan Panchor, State of Perak, in 1948. The experiment was a great success and subsequently the culture of cockles spread rapidly throughout the mangrove areas of the west coast of Peninsular Malaysia (Pathansali, 1958).

At present, about 3.0×10^3 ha of mud flats along the west coast are being used for cockle culture. It is estimated that the potential area is probably at least double this amount. *Anadara granosa* L. is one of several species of this genus found in Peninsular Malaysia. Cockle culture is at present of considerable economic importance in Malaysia. Total production of molluscs in Peninsular Malaysia in 1981 was about 71,000 tons, which constituted approximately 11 per cent of the overall fishery production of that year. Of this total mollusc production, about 69,000 tons were cockles (*A. granosa*).

The biology, culture aspects and economics of *A. granosa* have been dealt with substantially by Pathansali (1958, 1961-63) and more recently by Wong (1976) and Bloom (1983). Whereas cockle culture spread rapidly, it is only recently, in 1981, that research on artificial propagation of spats was initiated by the Fisheries Research Institute. Studies are also now in progress at the Institute to determine the level of heavy metals and coliform count in bivalves from areas surrounding Penang as well as from selected areas along the west coast of Peninsular Malaysia, where cockles are cultured. The results of these studies will assist the authorities in pressing for legislation in Parliament for more stringent regulations on the conservation of cockles and other molluscs.

NATURAL DISTRIBUTION

The natural distribution of *A. granosa* is largely limited to areas along the west coast of Peninsular Malaysia extending from the State of Kedah in the north to the State of Johore in the south (Fig. 2).

These areas are as follows:

- Kedah - Kuala Sanglang
- Penang - Between Sungei Pinang and Pantai Aceh;
and also between Kuala Juru and Sungei Aceh.

- Perak - Kuala Sangga, Kuala)
Terong, Sungai Hantu/)
Tanjung)
Pasir Ringgit, Muara) Larut and
Sungai Tiram) Matang
Kuala Jarum Mas and) Districts
Sungei Siakap)
- Lekir Manjung
District
- Teluk Ropiah, Kuala) Kerian
Kurau to Sungei Chenaam) District
- Sungei Che Maja to) Hilir
S. Rungkup) Perak
- Selangor - Sungei Assam Jawa to Sungei Dungan
(Kuala Selangor)
- Teluk Rhu to Sungei Pasir Panjang
(Sabak Bernam)
- Johore - Kesang to Sungei Kelicap

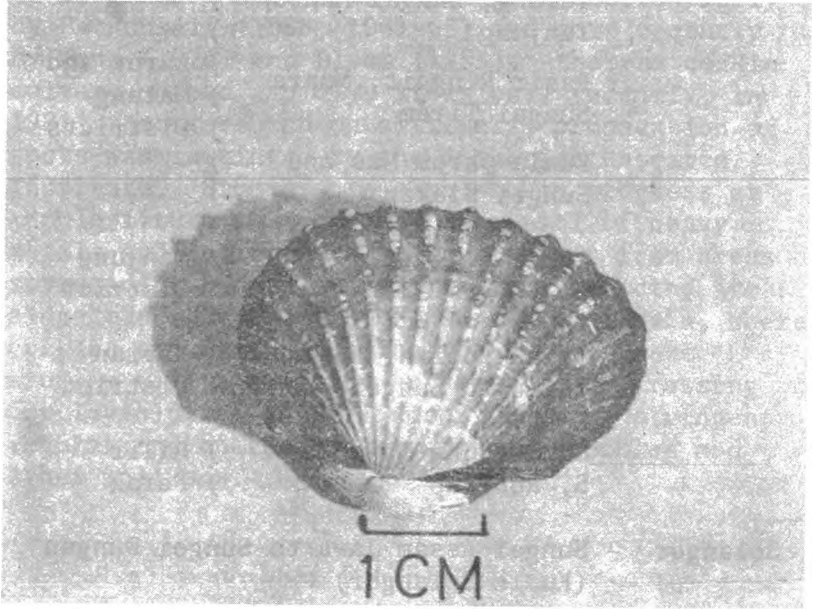


Fig. 1. Cockle (*Anadara Gronosa L.*)

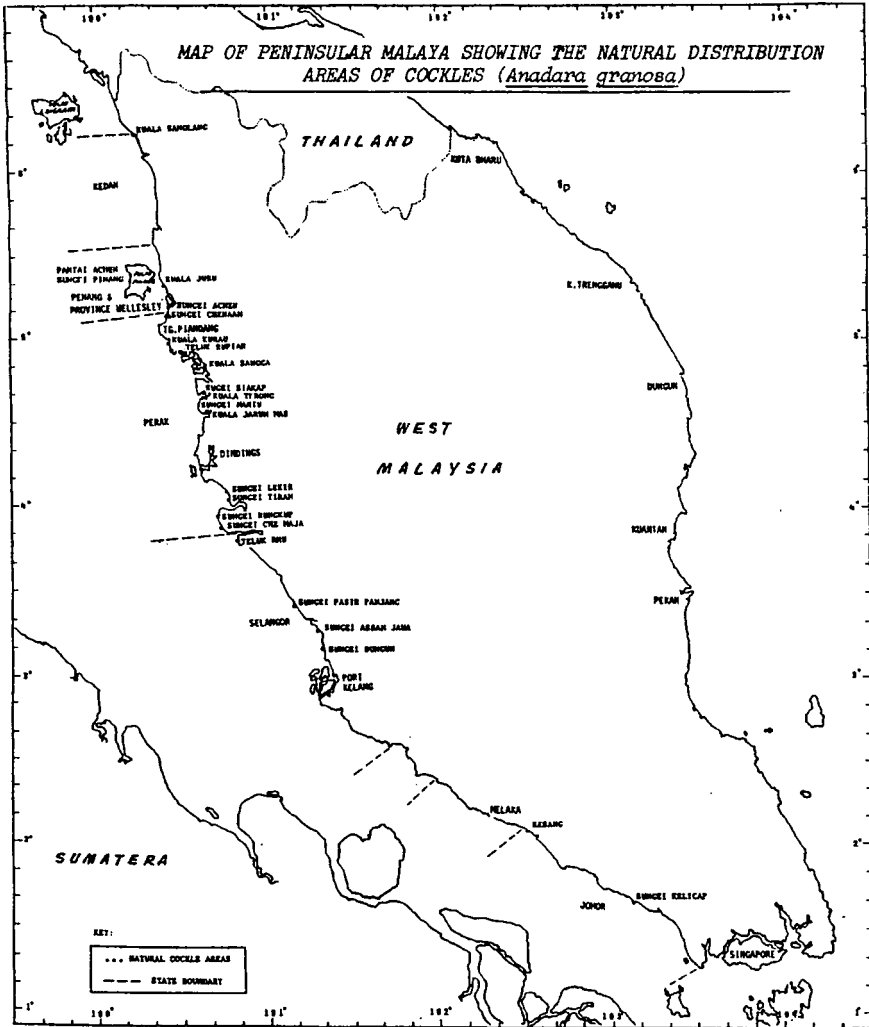


Fig. 2. Natural distribution areas of cockles

Although the natural distribution of *A. granosa* is largely confined to the west coast of Peninsular Malaysia, seeds have occasionally been found along the east coast, especially between Pasir Panjang and Tanjung Agas (Pahang). It should be noted that natural cockle beds are known to shift from year to year. It is believed that these shifts are the result of changes occurring in the natural areas, probably due to the effects of currents or human activities.

HABITAT

A. granosa occurs naturally in extensive estuarine mud flats with fine, soft, brackish muds, in particular off mangrove forests, with salinity ranging from 10 per cent to 30 per cent. *A. granosa* thrives best under comparatively calm conditions, especially in shallow inlets or bays with a substratum of fine, soft, flocculent mud at least 46 cm to 76 cm or more in depth. A good tidal flow is essential for any culture area.

BREEDING SEASON

The breeding cycle of cockles appears to be closely related to salinity. Seasonal rains bring about considerable changes in salinity, which directly or indirectly affect the breeding of the cockles. The gonads of *A. granosa* are first developed when the cockle attains about 18 to 20 mm in diameter (Pathansali, 1958), but first spawning probably occurs at about 24 to 25 mm (Bloom, 1983). Sexes of *A. granosa* are separate.

Data on spatfall indicate that breeding takes place more or less throughout the year in Perak and Selangor. However, two main peaks in spatfall can be distinguished: the first peak between January to March, and the second from May/June to September. In other States, such as Penang and Johore, spatfall occurs occasionally from May to September.

COCKLE SPATS

When spats attain 4 to 10 mm in diameter, collection begins. Collection is normally carried out with a close-knit wire scoop. (Fig. 3).

The price of one kerosene tin (18 litres) varies depending on the size of the spats in each tin and impurities as well as on the demand for spats. When demand is good, spats of approximately 5000/kg can fetch about M \$24.00 to M \$30.00 per tin.

The best quality spats are those caught in the first few weeks of collection.

The survival rate of spats depends largely on size; the larger the size the better the survival rate. A ratio of approximately 5000/kg is considered reasonable for culture purposes.

STOCKING DENSITY OF SPATS

Stocking density of spats per acre depends on the size of the spats. For spats of about 5000/kg, 150 to 200 tins of spats appear to be the best stocking density per acre.

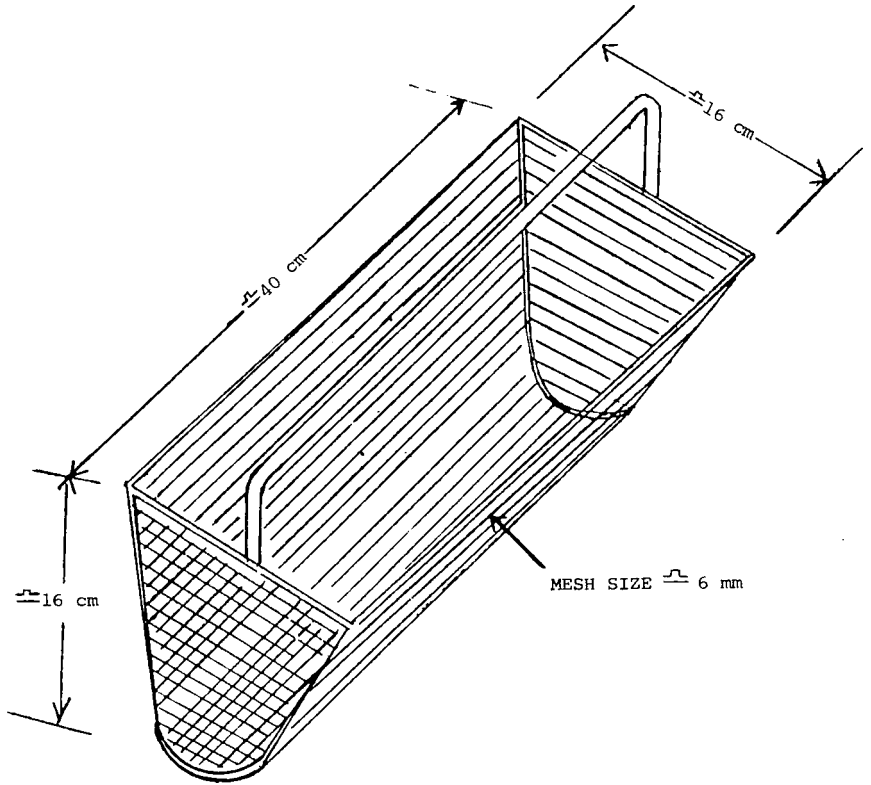
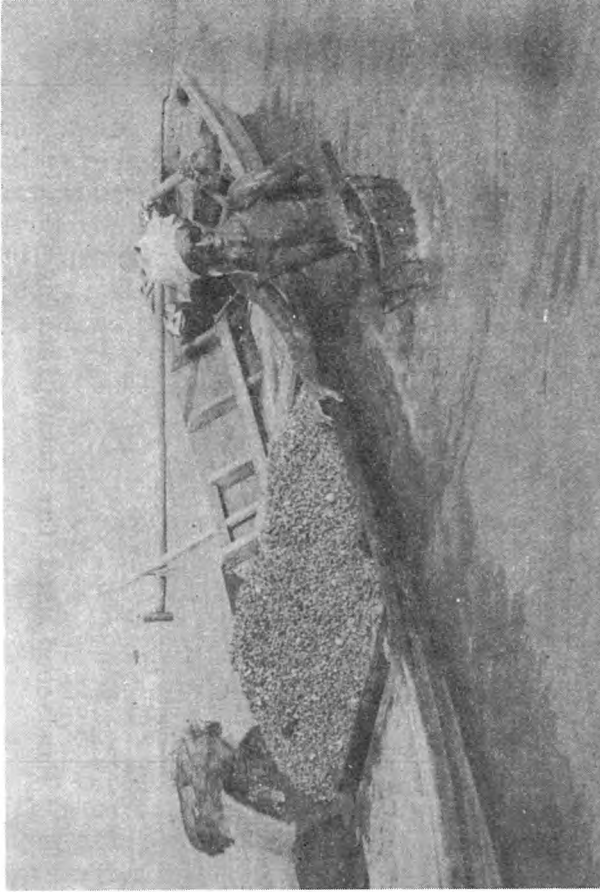
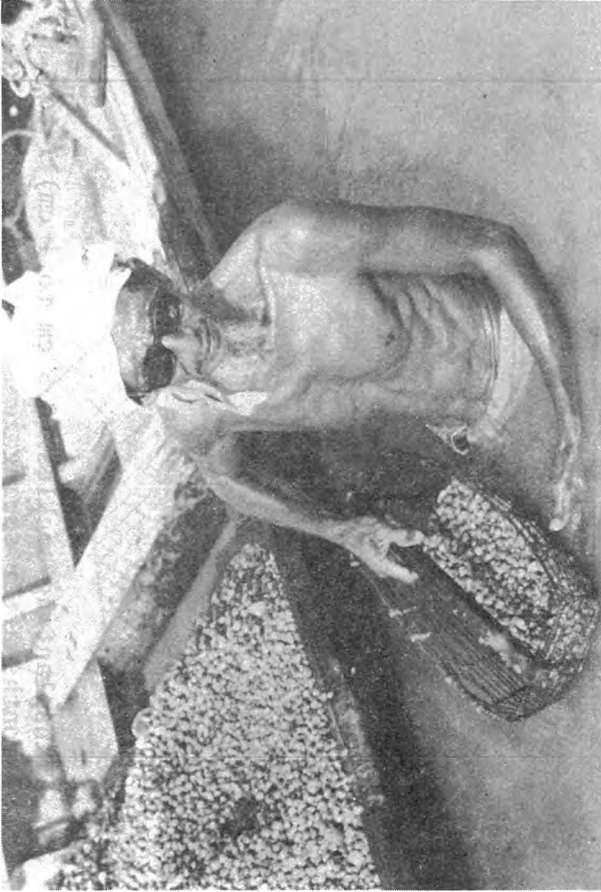


Fig. 3. Wire Scoop for Spat Collection



Transplanting cockles (0.5 cm to 1 cm) 1 to
2 months after sowing



Handscoop used for transplanting cockles

Expected yield per acre from 200 tins of 5000/kg spats from an acre is about 1,200-1,400 gunny sacks. Each sack contains about 73 kg (120 katis) of cockles and fetches about M \$18.40, which was the wholesale price at Penang in 1983.

Mortality of spats is generally between 25-35 per cent, but this depends on the size of the spats as well as the suitability of the culture bed. However, mortality can also be attributed to the time taken to transport spats from the areas where they occur naturally to the culture sites, as well as to predation by fish (e.g., skates) or boring gastropods (*Natica maculosa* and *Thais carinifera*).

SELECTION OF CULTURE BEDS

Three important factors to be considered in the selection of new culture beds are:

- (a) Nature of bottom substratum
- (b) Salinity
- (c) Slope of bed

The best areas for culture beds are tidal flats of fine, soft mud, protected from strong wave action, and situated outside the mouth of estuaries and tidal creeks, with a salinity range between 18 and 30 per thousand.

CONSTRAINTS

Constraints affecting the culture of cockles are:

- (a) Periodic shortage of spats for culture;
- (b) Disputes regarding ownership when culture beds revert to natural beds;
- (c) Problem of poaching;
- (d) Consumer preference for undersized cockles.

CONSERVATION OF COCKLE FISHERY IN MALAYSIA

The Fisheries Regulation 1964 on Cockle Conservation was introduced to protect the cockle fishery, and two sections in particular (sections 6 (1) and 6 (2) were designed for conservation purposes.

Section 6 (1) provides that no cockle which is less than 6 mm ($\frac{1}{4}$ ") measured in a straight line across the widest part of the shell shall be taken for the purpose of transplanting to a culture bed.

Section 6 (2) states that no cockle which is less than 32 mm ($1\frac{1}{4}$ ") measured in a straight line across the widest part of the shell shall be taken for consumption.



A worker sorting cockles on board a 5 gross tonne boat



Women sorting cockles at landing shed

CULTURE METHODOLOGY

Collection of Spats

When spats have attained 4-10 mm in diameter, collection begins. All collectors must obtain a licence, which costs M\$1.00, before they can start collecting spats. In addition, under the fisheries regulation on cockles, collection may be carried out between 6 a.m. and 6 p.m. only.

The traditional equipment needed for spat collection is a close-meshed wire scoop (Fig. 3), a wooden tray and a board. The collectors normally set out in their sampans for the spatfall areas when the tide is receding and return just before high tide. The board enables the collector to move through the mud uncovered by the tide, while the wooden tray is used for holding the collected spats. The collector sieves the mud with the scoop, and then washes off the remaining mud to expose the spats. Collection can be carried out for two to three hours. Skillful collectors can get about 7-8 tins (1 tin = 18 litres) during the two to three hours of work.

In the past spats could be sold only to registered buyers. However, this requirement was abolished in 1983. Transport of spats, packed in gunny bags or sacks of synthetic material to far-away places is normally carried out in the evening to ensure better survival of the spats.

Preparation of Culture Sites

A Temporary Occupational Lease (T.O.L.) must be obtained prior to starting cockle culture.

Fees for a T.O.L. vary: the charge in Perak is M\$100 per acre, whereas in Penang it is M\$25 per acre.

Prior to the sowing of spats at the culture site, empty shells, including shells from previous cultures, and predators of cockles such as skates and boring gastropods should be removed.

Sowing of Cockle Spats at Culture Sites

Spats are sown immediately after arrival at the culture sites. Boats loaded with spats are manned by at least two persons, one of whom steers the boat slowly over the culture site while the other sows the spats as evenly as possible. There is no specific gear for sowing the spats, but a plastic scoop is normally used by small-scale culturists and, in larger operations, shovels may be used. A day or two after sowing the spats, the culture sites are inspected for any uneven distribution of the spats so that this can be rectified.

Transplanting of Cockles and Removal of Predators

Transplanting fast-growing cockles is carried out throughout the culture period but even more so during the first three to four months of culture. Transplanting may result in more rapid growth of the cockles. Predators of cockles may also be removed at this time.

Harvesting of Marketable Cockles

Harvesting of marketable size cockles takes place about 10 to 12 months after the spats have been sown. The traditional gear used for

harvesting marketable size cockles resembles the scoop for collecting spats except that the mesh is larger. This type of hand scoop can be used only during low tide when the collectors wade in the mud to harvest the cockles. There is now a more advanced gear (Fig. 4), which is operated on board motorized boats. Its size depends on the capacity of the boat used. The gear is secured with a rope to the front of the boat. As the boat moves over the culture site, the gear is lowered by the operator into the bottom mud (about 25 cm deep), pushed forward for a few minutes, and then raised together with the catch. The cockles are washed so as to remove the mud and brought aboard the boat. Two persons working five to six hours can harvest on an average 12 to 15 bags (70 kg) of cockles at the beginning of the harvesting period. Fewer bags (about 6 to 7) will be filled towards the later part of the period, as the number of cockles diminishes. Thus, the casual workers who are employed to harvest the cockles are paid about M\$3.00 to M\$4.00 per bag at the start of the harvesting season and about M\$6.00 to M\$7.00 towards the end of the season.

It takes about three to six months to complete the harvesting of a culture bed of about 20 hectares. The duration of harvesting is influenced by the demand and marketing trends. When the demand is good more cockles will be harvested.

Manpower Requirements

About three to four persons are required full time to run a culture plot of about 20 hectares, i.e., a manager/supervisor and two or three other workers. Casual workers are recruited

during the sowing and harvesting periods. Among the full-time workers, one will have to perform watchman duties at night to prevent pilferage of cockles.

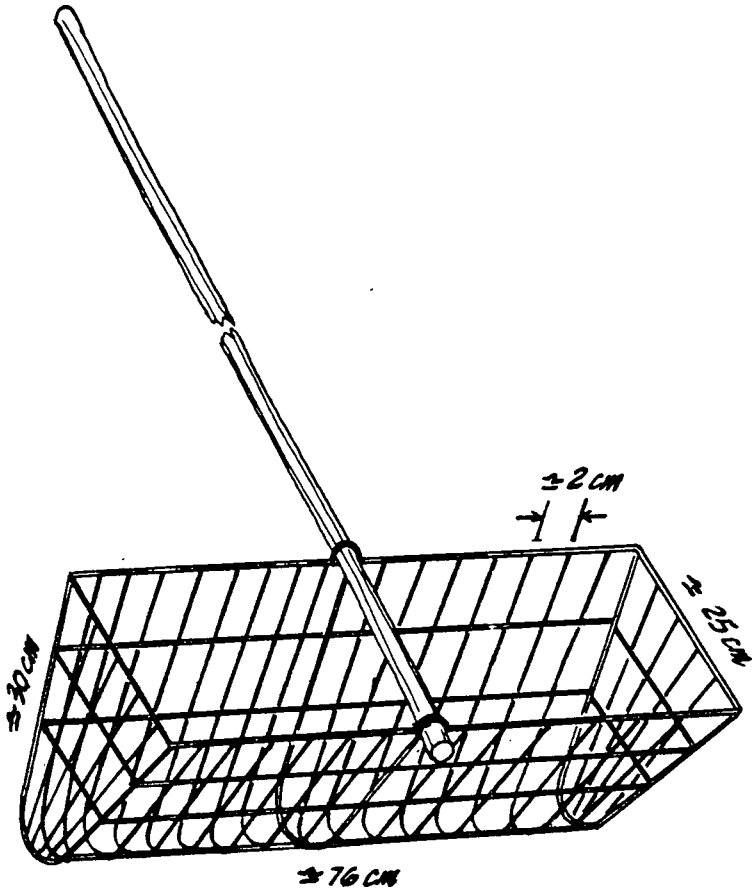


Fig. 4. The gear used for Harvesting Cockles

REFERENCES

Bloom, M.J. (1983). Gonad Development and Spawning in *Anadara granosa* L. (BIVALVIA: ARCIDAE). *Aquaculture* 30: 211-219.

Pathansali, D., and M.K. Soong, (1958). Some Aspects of Cockle (*Anadara granosa* L.) Culture in Malaysia. *Proc. Indo. Pacific Fish. Coun.*, 8(11): 26-31.

Pathansali, D. (1963). Notes on the Biology of the Cockle, *Anadara granosa* L. *Proc. Indo. Pacific Fish. Coun.*, 11(11): 84-98.

Wong, W.S. (1976). A report on the Majuikan Cockle Culture Project, Seberang Perai, Penang. (unpublished).

LIST OF SAFIS EXTENSION MANUALS

- SEC/SM/1 Khumua liang pla namcheut (Freshwater Fish Farming: How to Begin)-- in Thai
- SEC/SM/2 Oyster Culture
- SEC/SM/3 Mussel Culture
- SEC/SM/4 Ang pagpuna ug pagtapak sa pukot (Net Mending and Patching)-- in Cebuano-Bisaya
- SEC/SM/5 Mussel Farming
- SEC/SM/6 Menternak Ikan Airtawar (Freshwater Fish Farming: How to Begin)-- in Bahasa Malaysia
- SEC/SM/7 Makanan dan Pemakanan Udang Harimau, *Penaeus monodon* (Nutrition and Feeding of Sugpo, *Penaeus monodon*) -- in Bahasa Malaysia
- SEC/SM/8 Macrobrachium Culture
- SEC/SM/9 Selection of Marine Shrimp for Culture
- SEC/SM/10 Induced Breeding of Thai Silver Carp
- SEC/SM/11 Culture of Sea Bass
- SEC/SM/12 Smoke-Curing of Fish
- SEC/SM/13 Cockle Culture

SAFIS

0 What is SAFIS?

SAFIS is the Southeast Asian
Fisheries Information Service.
It is a project of the SEAFDEC
Secretariat set up to provide
extension materials for small-
scale fishermen and fish
farmers in the region.

0 What are its objectives?

The immediate objectives are
to collect and compile fisheries
extension manuals, brochures,
pamphlets and related aids for
small-scale fisheries develop-
ment, and to translate selected
literature into local languages
for distribution to fisheries
extension workers in Southeast
Asia.

0 What services will SAFIS provide?

SAFIS will attempt to provide information and publications such as:

- lists of available texts in fisheries extension services,
- translation of suitable manuals,
- manuals of appropriate technologies,
- photocopies of appropriate fisheries extension literature,
- a current awareness service of regional fisheries.

0 How much will these services cost?

A nominal cost of US \$0.15 per page will be charged for photocopying, handling, and surface mail. Airmail costs will be extra. The publication cost per manual will vary according to the book.

SEAFDEC LIBRARY
AQUACULTURE DEPARTMENT
Iloilo, Philippines

SAFIS is the Southeast Asian Fisheries Information Service. It is a project of the SEAFDEC Secretariat set up to provide extension materials for small - scale fishermen and fish farmers in the region. For additional information, contact the Project Leader of SAFIS

SEAFDEC Liaison Office
956 Rama IV Road
Olympia Building, 4th floor
Bangkok 10500, Thailand