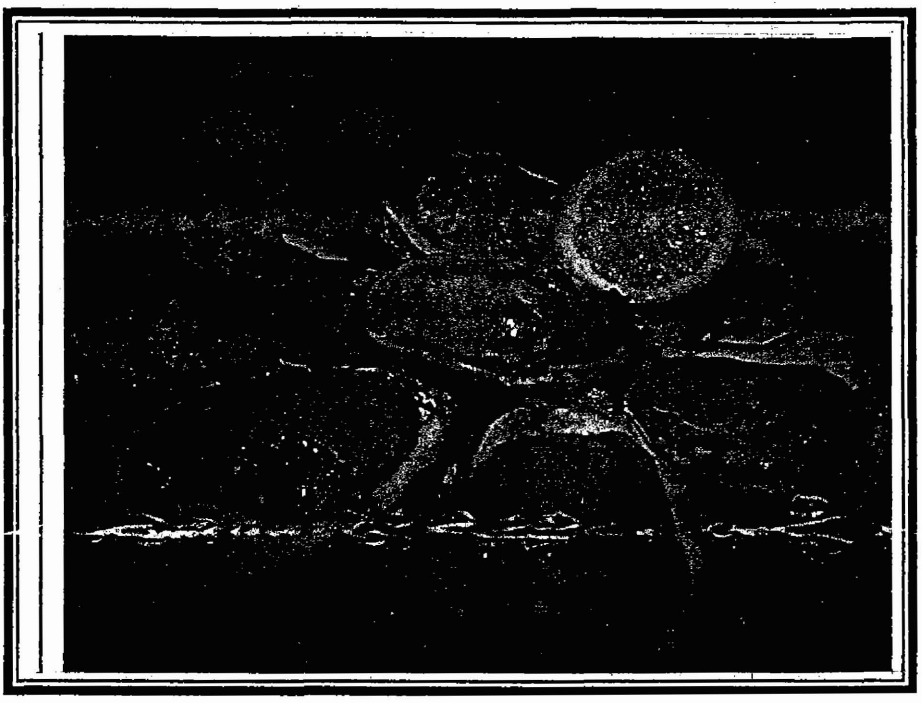
COMPARATIVE GROWTH AND SURVIVAL OF HATCHERY-PRODUCED OYSTER SEEDS BETWEEN TWO CULTURE SITES LOCATED IN WEST AND EAST MALAYSIA



by

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CONTENT

1.0 INTRODUCTION

Oysters have been consumed traditionally in Malaysia. The small oysters harvested from the wild stocks served as omelets are favourite local food, especially among the chines community. The production from wild sources was estimated approximately 150 MT per year by the Bay of Bengal Programme of the FAO. Oysters are perceived to be an expensive food and not an everyday dish by most consumers. Singapore market offers tremendous growth potential. However, export to Singapore is possible only when it met the stringent sanitation requirements imposed by the government. This can be achieved by introducing the depuration system to purify the oysters.

With Vision 2020, the standard living in Malaysia is rising year by year, and this has been accompanied by increased consumption of luxury seafood. Half shell oysters are served in the finest seafood restaurants and hotels of the country. There are two Malaysian species, which are suitable for the half shell trade. The Department of Fisheries has conducted several promotion campaigns in 1993 - 1994 to promote local oysters with collaboration with leading hotels and restaurants. The response has been overwhelming and has generated more demand than the present numbers of farmers are able to supply.

Under the auspices of the Bay of Bengal Programme (1998 - 1993), the Department of Fisheries undertook the introduction of oysters farming in Kedah, Perak, Langkawi, Johore, Kelantan and Terengganu. Not much attention was given to Sabah or Sarawak during that time. Expansion of oyster farming industry in Malaysia could much be faster if not because of limited seed supply. Only hatchery production can provide the required supply of seed both in term of quantity and quality, for the expansion of the farming industry.

The current oyster trade in Malaysia is valued at RM 21 million (Malaysia' s Trade Statistics) in 2000. This represents only 14% of the demand. This demand is imposed by the limitation in oyster seed supply and long culture cycles. Universiti Sains Malaysia has made a breakthrough by being able to produce seeds using improved hatchery

technology. Oyster farming is a newly emerging seafood industry in Malaysia. It has enormous potential for growth, in both local and international market.

A feasibility study for oyster culture in Semporna, Sabah, was undertaken by Universiti Sains Malaysia with the support from the universiti as well as from the State of Perlis (Datuk Seri Shahidan Kassim, Menteri Besar Perlis) and the Ministry of Defense (Datuk Hj. Mohd Shafie bin Hj. Apdal, Deputy Defense Minister) on 18 December until 22 December 2002. This report presents the results from the feasibility study undertaken.

2.0 TEAM MEMBERS

The team members involved in the feasibility study is as below :

- Prof. Ahyauddin Ali
  (Programme Head)

- Assoc. Prof. Dr. Zulfigar Yasin
  (Team leader / aquaculturist)

- Prof. Abdul Wahab Abdul Rahman
  (Parasitologist)

- Dr. Aileen Tan Shau-Hwai
  (Marine Biologist / Aquaculturist)

- Mr. K. Balasubramaniam
  (Technical assistant)

3.0 PROGRAMME

Table 1 shows the programme undertaken during the feasibility study.

Table 1. Feasibility study programme

Date	Activities
18 December 2002	▪ Penang to Semporna
19 December 2002	▪ Surveyed a few sites around Semporna and Pulau Bumbun
20 December 2002	▪ Surveyed Pulau Batik Kulambu and Pulau Timbun Mata
21 December 2002	▪ Surveyed sites near Sungai Kalumpang
22 December 2002	▪ Semporna to Penang

4.0 STUDY AREAS

Table 2 and Figure 1 shows the locations of the study sites in Semporna, Sabah.

Table 2. The study locations for oyster culture in Semporna, Sabah.

Area	Location
Sempoma	▪ Tampi-tampi ▪ Sumsum ▪ Salimbangan
Pulau Bumbun	▪ Balimbang ▪ Lok Butun ▪ Seloka Empat ▪ Lok Sisara
Pulau Batik Kulambu	
Pulau Timbun Mata	
Sungai Kalumpang	

5.0 RESULTS

Table 3 shows the results from the water quality analysis of the study locations. In general, all the study locations showed water quality, which is suitable for oyster culture, in terms of chemical analysis. However, in terms of the physical and biological parameters, these sites need to be further studied. Recommendations of further survey are shown in Section 8.0.

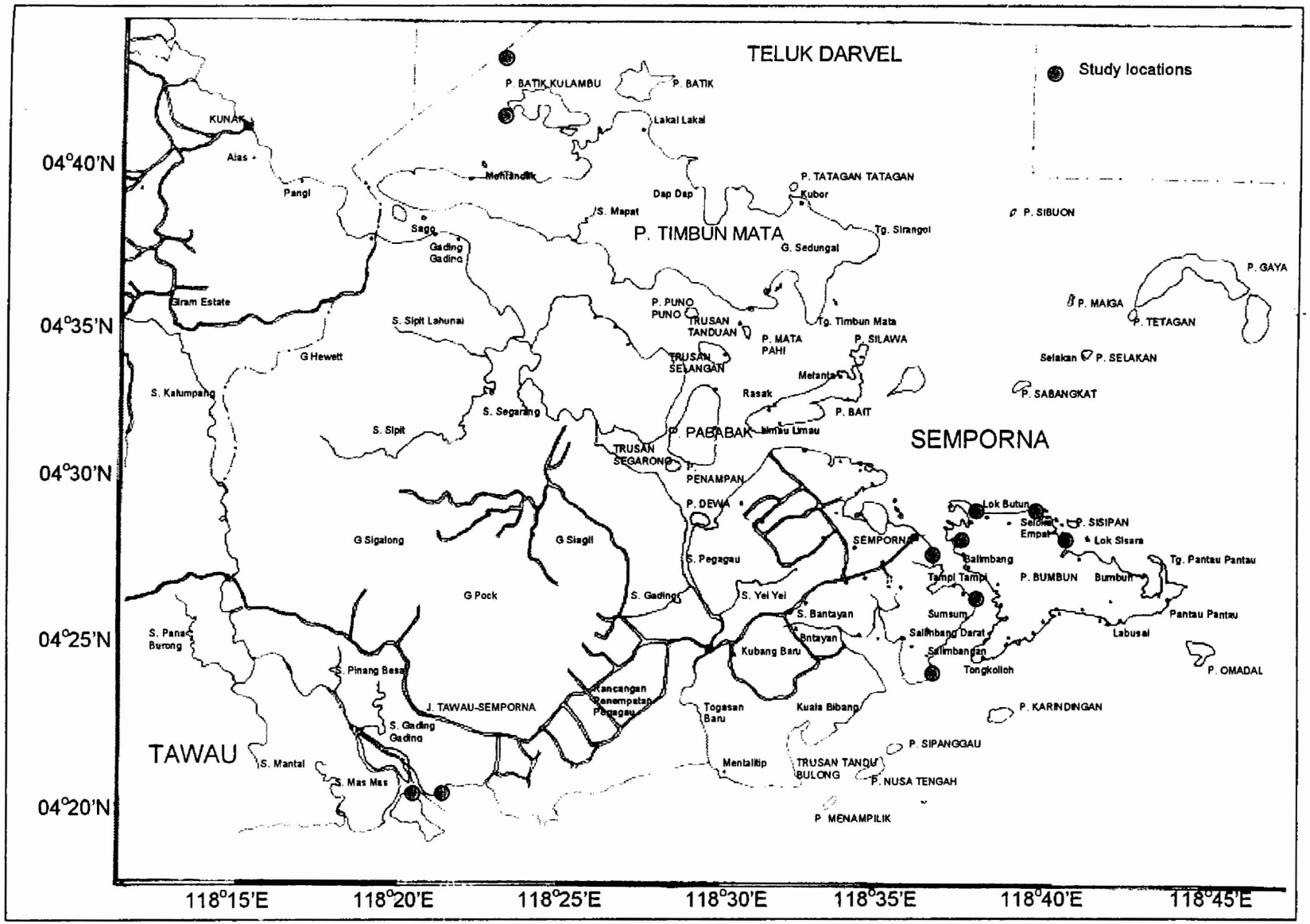


Figure 1. The locations of study areas during the feasibility study for oyster culture in Semporna, Sabah.

Table 3. The water quality analysis of the study areas in Semporna, Sabah.

Location	Temperature (°C)	Salinity (ppm)	Dissolved Oxygen (mg/L)	Depth (m)	Turbidity (FTU)	pH	Phosphate (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
Sumsum	30.0	32.0	6.3	5 - 8	23	7.51	0.04	0.01	0
Seloka Empat	29.8	32.0	6.1	7 - 9	25	7.38	0.04	0.01	0
Pulau Timbun Mata	30.5	33.0	6.8	8 - 20	2	7.63	0.02	0.02	0
Pulau Batik Kalambu	31.0	33.0	6.9	6 - 30	2	7.61	0.03	0.02	0
Sungai Kalumpang 1	30.1	32.0	6.1	6 - 9	31	7.58	0.04	0.02	0
Sungai Kalumpang 2	30.0	32.0	6.3	5 - 11	29	7.47	0.03	0.02	0
Sungai Kalumpang 3	30.0	32.0	6.2	6 - 15	25	7.34	0.02	0.02	0

6.0 DISCUSSIONS

All the sites showed high salinity, which ranged between 32 - 33 ppt. However, the salinity of the study sites needs to be determined during both the dry and wet season to ensure the fluctuation of the salinity in the selected system. Salinity plays an important role in oyster culture because optimal salinity will enhance the growth or the oysters as well as ensuring the meat quality of the oysters.

All the sites surveyed showed relatively shallow areas, which is between 5 - 15 m depth except for Pulau Timbun Mata and Pulau Batik Kalumbu, which depth able to reach until 30 m. However, the depth of the potential sites is not critical as long as the area is not too shallow if the floating culture system were to be used in the oyster culture activities.

The nutrient analysis indicated that the nutrient levels detected at the study areas are well within the permissible limited for oyster culture. There is no indication of human contamination in the study area although some floating villages were noted in the study areas.

In general, the turbidity levels detected at the study sites are high except for the two sites in Pulau Timbun Mata and Pulau Batik Kalambu. However, the turbidity levels need to be further investigated during the dry and wet season to determine the fluctuation. Areas with high turbidity may require more attention in terms of maintaining the oyster culture and thus, areas with high turbidity will be more labour intensive. Usually the turbidity of the water will be higher during the wet season, and therefore it is important to monitor the area once during the wet season to determine the maximum level of turbidity in the specific area.

The dissolved oxygen and pH levels determined in all the study areas had indicated that all the selected study areas are healthy areas with active flushing of water and current is moving constantly. This indirectly indicates continuous flow of food to the system.

The mangrove areas surrounding the study sites in Sempoma (Tampi-tampi, Sumsum, Salimbangan dan Sungai Kalumpang) indicates a rich area where there may be possible settlement areas for oysters if the oyster rafts were to be placed in the study areas.

More detail study need to be conducted in the study areas to determine the type of culture method to be used at different sites to ensure optimal growth and survival, which leads to better profit and better income for the villagefolks involved.

7.0 CRITERIA FACTORS

Physical parameters are the most crucial factors in choosing a site. The physical selection parameters are as follows :

1. Intertidal brackish- or seawater for at least 7 - 8 months of the year. No influx of freshwater sufficient to reduce salinity for long periods during the rainy season - therefore it is important to obtain data or information of the site during the wet season.
2. Natural seed supply present or in a nearby area for acquisition of seed to keep seed costs low and for convenience in stocking-therefore it is important to monitor the mangrove areas during the dry and wet season to determine spatfall (natural seeds) of the oysters.
3. Limited effects of current and strong winds. Substrate for culture will be difficult to maintain. Suitable areas would be enclosed bays or shorelines.
4. No external sources of pollution that can release substances harmful to the oysters or to humans who consume the oysters. Turbidity reduces growth rate because of low natural nutrients and can cause mortality in spat. Therefore it is important to monitor the water quality during the flooding and ebbing tide to ensure the nutrients movement around the selected areas.
5. An ideal current speed in the area, which should contain ample nutrients for plankton growth. The water should be moderately clear with low turbidity and good light penetration - therefore it is important to determine the turbidity level during both the dry season and wet season. Usually the

turbidity would increase during the wet season because of the runoff from land but it is important for the culturists to know the extent of increased turbidity during the wet season before placing the culture at any particular site.

6. The depth of the water is dependent on the culture method use. The bottom culture can be used for shallow areas while the floating culture can be used for deeper waters.
7. Limited number of oyster predators.
8. Area that can be guarded with a minimum cost - security.
9. Developed infrastructure with roads for ease of transport and sale of oysters.

8.0 FOLLOW-UP PROGRAMMES

Folow-up programmes are needed to determine the feasibility of the selected areas for oyster culture. A more detail programme will be carried out at the selected sites. Hatchery-produced oyster seeds will be sent to the selected sites for growth and survival monitoring study. Figure 2 shows a flow-chart of the follow-up activities to be carried out before any major investment is placed on the oyster culture project.

The feasibility study during the dry season, which is expected from January - April should be carried out soon. Concurrently, the monitoring of hatchery-produced oyster seeds can be initiated during the 2nd feasibility study (during the dry season). The monitoring of the growth and survival of the oyster seeds from the dry season through the wet season can be carried out by one of the selected local participant at each selected area. The information will then be analysed and then the oyster culture industry can be initiated once the feasibility study has been completed.

However, the funding for the follow-up programmes need to be seek and an estimate of approximately RM280,000.00 is required for the whole of the feasibility study (minimum two more trips to Semporna, Sabah), which includes the expenses for travelling, accommodation, scientific analysis (chemicals), floating rafts to place the oysters seeds from USM, which may cost at least RM 25,000 per raft of 20 feet x 20 feet.

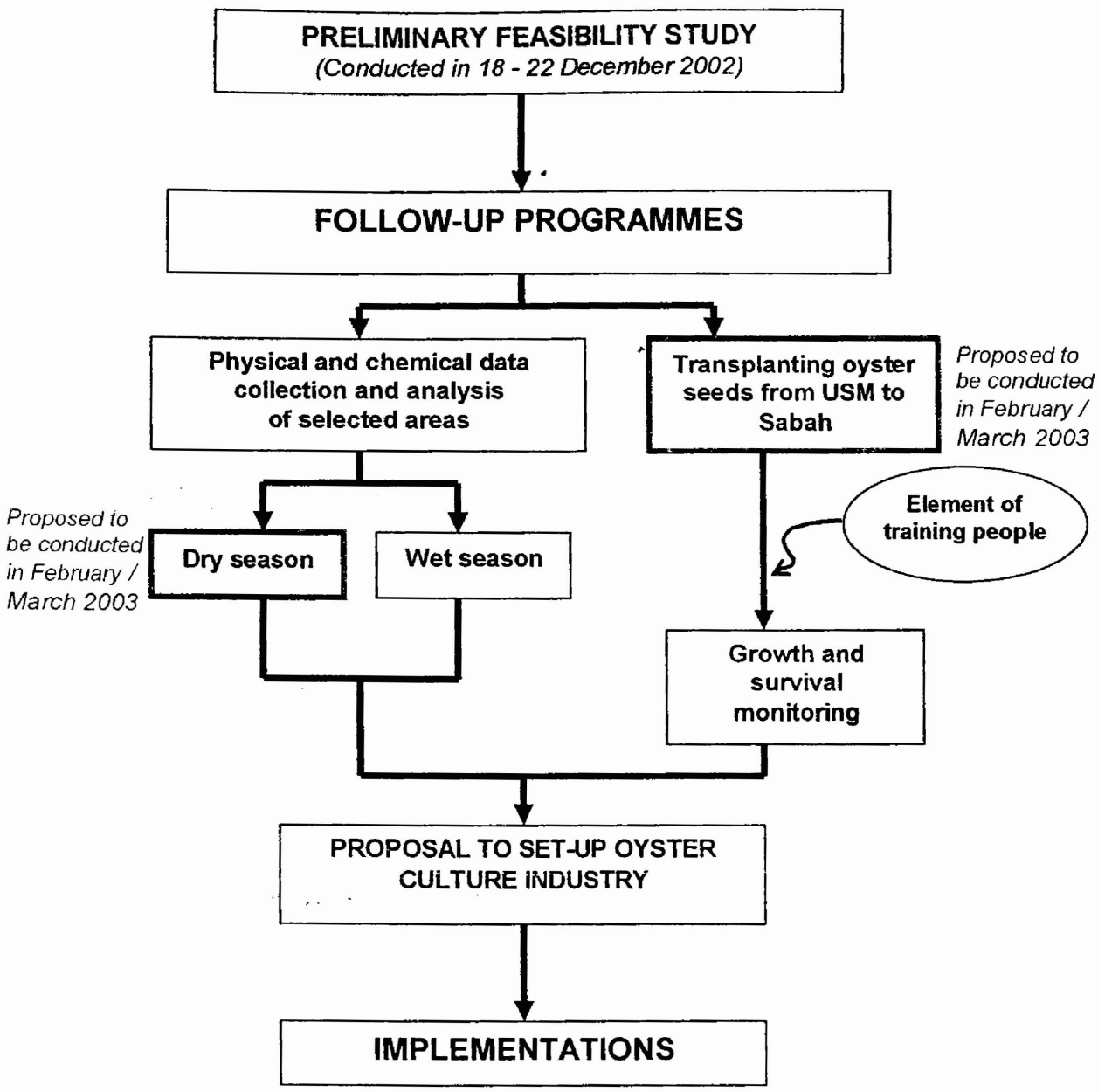
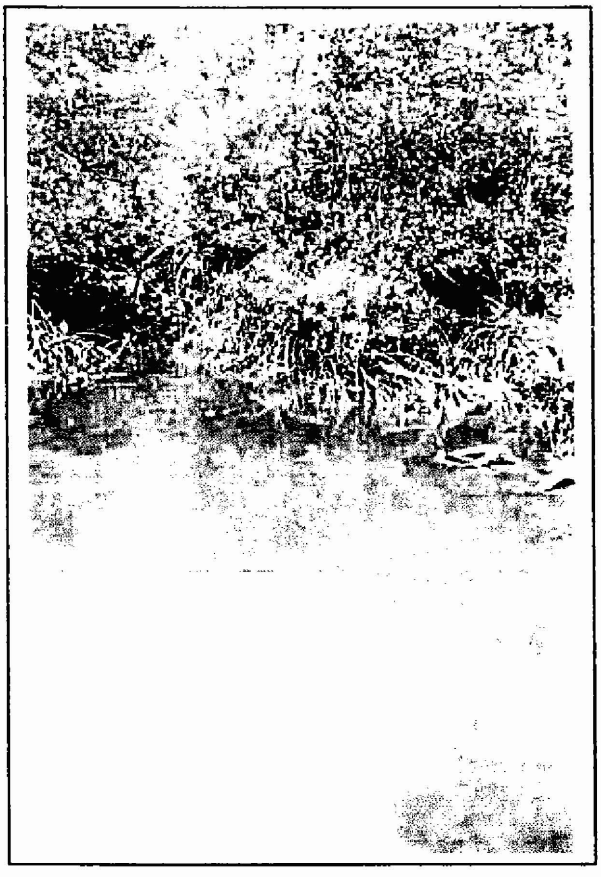


Figure 2. **Flow-chart of the follow-up programme for the site selection study in Semporna, Sabah.**

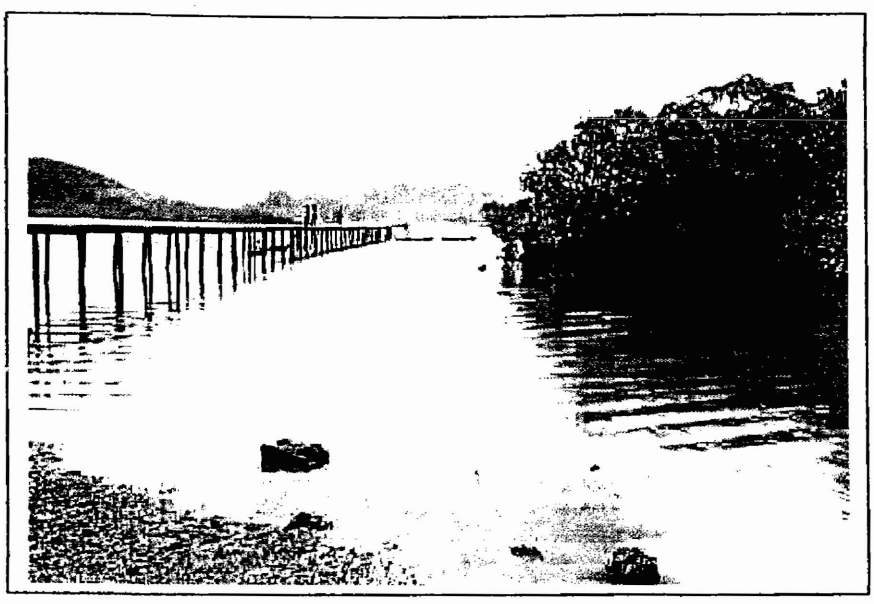
9.0 ACKNOWLEDGEMENTS

This research has been made possible due to the support of Universiti Sains Malaysia's Short Term Grant. We are very grateful to Datuk Seri Shahidan Kassim, Menteri Besar Perlis, and Y.B. Datuk Hj. Mohd Shafie Bin Hj. Apdal, Deputy Defense Minister for initiating this feasibility study. We wish to thank En. Jaujan Bin Hj. Sambakong for the great hospitality provided during our study in Semporna, Sabah. Our gratitude also goes to Mr. Gan Hok Kee, general manager of Dragon Inn and the villagers in Semporna and Pulau Bumbum for their assistance in showing us around the study sites.

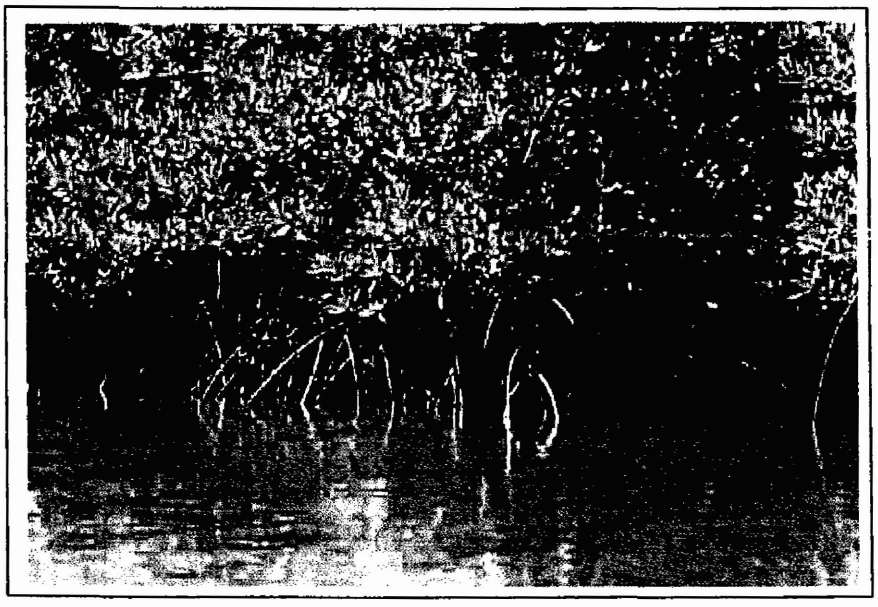
The study site at Sumsum - a view around the jetty leading to the floating village.



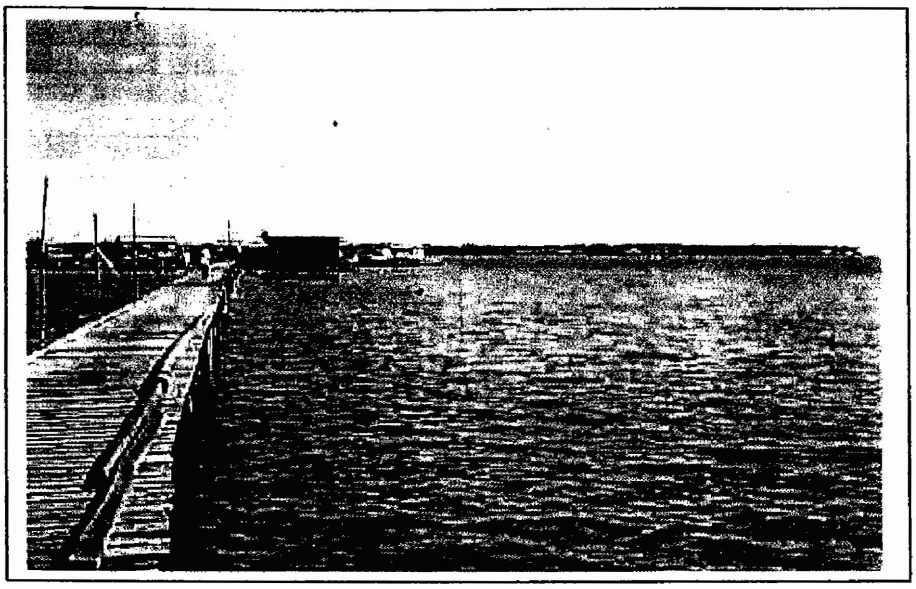
The study site at Sumsum - the mangrove roots, a suitable substrate for the settlement of oyster spats.



The study site at Salimbangan - a view of the jetty.



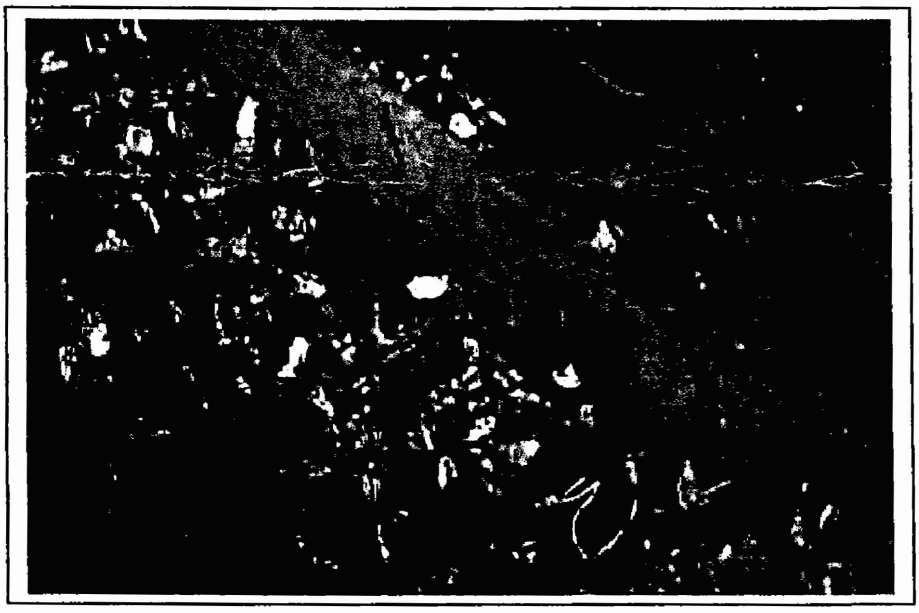
The study site at Salimbangan - the mangrove surrounding the area. However, no oyster spats were detected on the mangrove roots.



The study site at Tampi-tampi - a view of the jetty leading to the floating village. This area is more exposed and with strong water current compared to Sumsum or Salimbangan.

The floating village in Tampi-tampi - the villagers may become potential oyster growers in Semporna, Sabah.

The wild oysters settled on the stilts around the floating villages. This species is suitable for its shucked meat but not for the half shell trade.



The wild oysters settled onto the nets on the fish rafts around Semporna area. This species is suitable for the shucked meat trade.