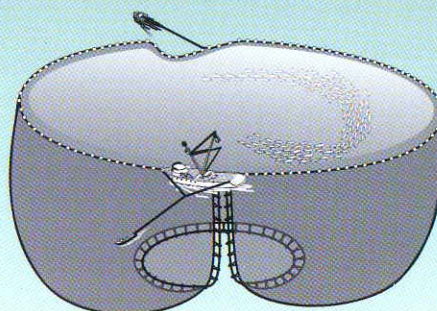
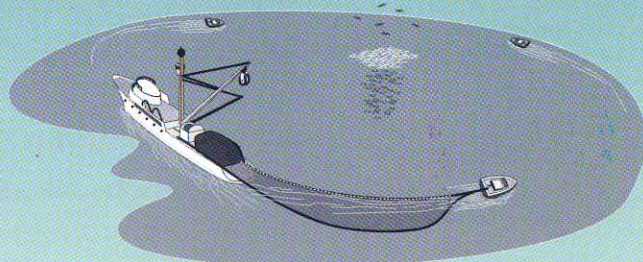
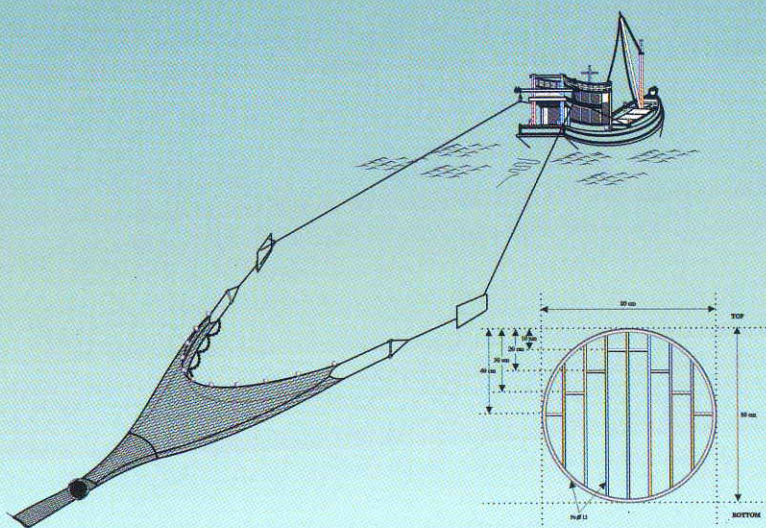
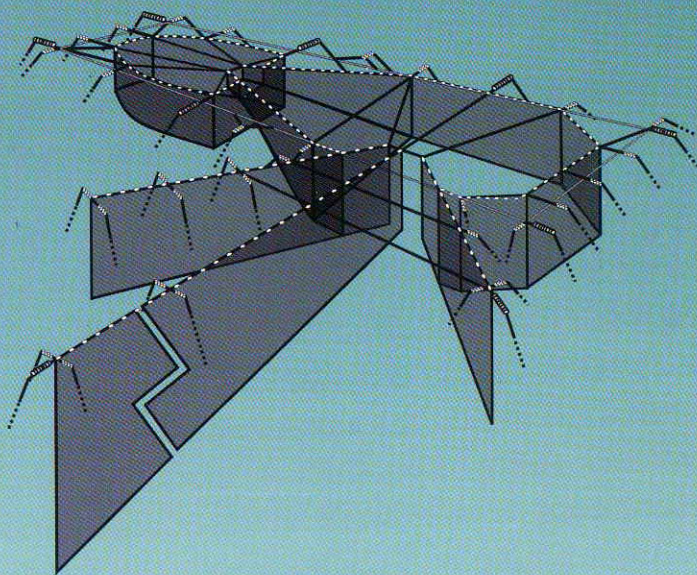
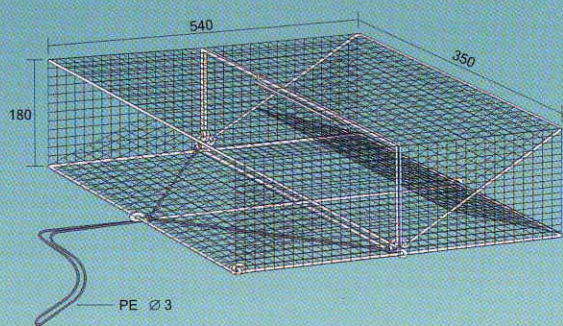


FISHING GEAR AND METHODS IN SOUTHEAST ASIA : I. THAILAND (REVISIONAL EDITION)



SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER



Southeast Asian Fisheries Development Center

What is SEAFDEC?

SEAFDEC is an autonomous intergovernmental body established as a regional treaty organization in 1967 to promote fisheries development in Southeast Asia.

Objectives

SEAFDEC aims specifically to develop fishery potentials in the region through training, research and information services in order to improve food supply through rational utilization of fisheries resources in the region.

Functions

To achieve its objectives the Center has the following functions :

- 1) To offer training courses, and to organize workshops and seminars, in fishing technology, marine engineering, extension methodology, post-harvest technology, and aquaculture;
- 2) To conduct research and development in fishing gear technology, fishing ground surveys, post-harvest technology and aquaculture, to examine problems related to the handling of fish at sea and quality control, and to undertake studies on the fisheries resources in the region; and
- 3) To arrange for the transfer of technology to the countries in the region and to make available the printed and non-printed media, which include the publication of statistical bulletins for the exchange and dissemination related to fisheries and aquaculture development.

Membership

SEAFDEC membership is open to all Southeast Asian Countries. The Member Countries of SEAFDEC at present are Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam.

**FISHING GEAR AND METHODS
IN SOUTHEAST ASIA:
I. THAILAND
(REVISIONAL EDITION)**

Masatake Okawara
Prasert Masthawe
Aussanee Munprasit
Bundit Chokesanguan
Yuttana Theparoonrat

Original Survey Team 1985

Aussanee Munprasit
Isara Chanrachkij
Pratakphol Prajakjitt
Nopporn Manajit
Nakaret Yasook
Raya Petchkham

Revisional Survey Team 2002

Reprinted under The Responsible Fishing Technology and Practices Program
With Cooperation of
Siam Brothers Corporation Limited

Training Department
Southeast Asian Fisheries Development Center

TD/RES/9
Reprinted, October 1994
May 1995
Revised May 2004

April 1986

FOREWORD

Presently, Marine fisheries development is aimed to the Sustainable Fisheries for food security for the people. Responsible fishing is taking into consideration to be implemented under the Regional Guideline Code of Conduct. So that the development is not only to increase the effectiveness of fishing operation but also to make use of fisheries resources as the most highest benefit as possible. However, in most cases, the introduction of foreign or modern fishing gears and technology may not be appropriate owing to its' high cost and its possible effects on the resources and environmental selection, and modification of the existing traditional fishing gears and methods to improve its selective and catch ability is therefore recommended, in particular in the small-scale fishing development for most developing countries around the world.

The study on the traditional fishing gear of Thailand was pioneered in 1949 by two fishery biologists of the Thai Department of Fisheries on their return from study in Japan. Mr. Swang Charearnphol and Mr. Sanan Ruamrak started surveys of the fishing gear employed by Thai fishermen along the coasts of the Gulf of Thailand and the Andaman Sea. The results of their study were published by the Department of Fisheries in 1950. Later, in 1969, the revised edition of the fishing gear used in the marine fisheries of Thailand was published by the Exploratory Fishing Unit of the Thai Department of Fisheries. This publication was recognized as a reference book on Thai fishing gear until recent years.

In Late 1970, the SEAFDEC Training Department initiated a systematic study on the fishing gear and methods employed by fishermen in the region. Fishing gear experts and staff of the Training Department had carried out the Marine Fishing Gear and methods survey through the Gulf of Thailand and Andaman Sea in 1985, and the results had been published in April 1986 by The Training Department of SEAFDEC.

In the past sixteen years, marine fisheries of Thailand has great development, more fishing efforts were put on the same limited fishing ground. Many conflicts were occurred among fishermen due to the declination of fisheries resources and fishing ground environment. So the first volume of Fishing gears and methods in Southeast Asia : Thailand was needed to be revised. The literature review was started in June 2002, then the reconfirmation survey had been carried out in August 2002 by spot checked to the high significant area, interesting fishing gears has been investigated and compiled into this revision.

The original concept of this book was to compile information on the fishing gears used in the small-scale fisheries of various countries of Southeast Asia and compare the efficiency of the gears in order to effect low cost improvements. Then the concept has created a lot of fishing gears development in the region for more than fifteen years. In the new millennium, world fisheries a resource is declined while the demand of food for the people is more needed. So the revision of this book is emphasized on responsible fishing in order to promote sustainable fisheries in the region. Four fishing gear experts and researcher of the Training Department had carried out the survey for collecting information and data of the improved and developed fishing gears.

The revised volume contains descriptions of 185 marine fishing gears presently employed by the marine fisheries of Thailand, 35 were just developed during the passed 16 years. It is hoped that this revision volume can serve as a useful reference for those who are interested in Thai fisheries.



.....
Secretary-General
and
Chief of the Training Department

CONTENTS

	Page
FOREWORD	i
INTRODUCTION	1
Marine Fishing in Thailand	2
Explanatory notes	6
Appendices	9
FISHING GEAR AND METHODS IN THAILAND	
1. Surrounding nets	21
2. Seine nets	63
3. Trawls	73
4. Liftnets	175
5. Falling gear	197
6. Gill nets	217
7. Traps	289
8. Hooks and lines	333
9. Scoop nets	361
10. Drive in nets	381
11. Dredges	389
12. Miscellaneous	403
REFERENCES	413

INTRODUCTION

Sea is one of the biggest food suppliers of the world, most of marine organism usually are used, for human's food. Biodiversity of marine organism is quite large in kinds and numbers, their habitat and behavior are big different. However, a great demand for food of human is still inadequate, so it was directed towards ever-increasing exploitation of marine organism. New fishing gears were devised all the time, while the old ones were getting bigger and more efficient. At the same times, with modern equipment, larger and increasingly mechanized vessel, fishing ground become to small even in the high seas.

Today, we know that all food resources including those in the seas are not inexhaustible. The concept of conservation of resources has affected our approach to fisheries. The first aim is no longer simply to catch a lot of fish but rather to maintain good catch without depleting the stocks. In other words, it as become necessary to introduce strict management of fisheries and promote responsible fishing at all levels.

In order to respond to the management requirements, it is first necessary to grasp the complexities of the current situation in fisheries. The first step could be to examine the "tools of trade" the fishing gears. We should know how they are built and used, their relative effectiveness, what the target species are, and so on. It would allow us to compare their marits and demerits from the conservationist point of view, and would provide a basis for a rational fishery management policy for the future.

This revised volume contains descriptions of 150 marine fishing gears from the first volume and 35 samples from the reconfirmation survey in August 2002 which are at present widely used in Thailand. We have not been able to include all the surveyed gears, even though some of them are very interesting and perhaps unique. Our choice had to be governed only by the constrains of space and time, but by the purpose of the publication.

We wish to express our sincere thanks to the Secretary General of SEAFDEC, who allowed us to carried out the reconfirmation survey, and gave a strong support to this work.

We are grateful to many persons who helped us to collect data, particularly to fishermen and district fisheries officers. Without them, this project would not have been possible. Our thanks are also due to the former fishing gear survey team of SEAFDEC Training Department who completed the first volume, most of their work still appear in this revision volume.

We thank Ms. Porntipa Kerdsin, a staff of the Office of the Training Department Chief, the SEAFDEC Training Department for her assistance in preparation of description. Finally, we thank Mrs. Panitnard Taladon, Fishery Extension Section Head of the Training Department, who edited the descriptions in this volume.

MARINE FISHING IN THAILAND

The marine fishing in Thailand has mainly been operated in the Thai territorial waters of the Gulf of Thailand and Andaman Sea. In recent years, however, larger Thai trawlers and purse-seines have extended their fishing grounds to off shore of neighboring countries under the joint-venture projects.

Thailand has a coastline of 1,784 km facing the Gulf of Thailand. The waters along this coast are on the whole shallow to a good distance from the shore. The waters are rich in nutrient salts brought in by many rivers. The bottom in shallow waters is either muddy or sandy, suitable for fishing by gill net, push net, and similar gear operated by small boats. Above all, those waters had proved to be ideal for trawling.

The Thai waters in the Andaman Sea are very different from the Gulf of Thailand. The coastline is only 740 km long and the rather narrow continental shelf descends into a steep continental slope. The sea bottom is quite rough, with scattered coral and rocks. Those relatively unfavorable conditions are reflected in the fishery production which is only about one-fifth of that from the Gulf.

In the past until the Second World War, the marine fishing in Thailand was carried out mainly in shallow coastal waters, with traditional gears such as bamboo stake trap, set bag net, castnet and hooks. The situation change drastically in the early 1960s. The government started to promote fisheries development, particularly deep-sea fishing, in order to increase marine production destined for the fast growing domestic market and for export. Among the newly introduced gears, the most far-reaching effect was created by otter-board trawl. The annual marine production, which had been only 150,000 tons in the 1950s, increased sharply to 1,000,000 mts. in 1968 and reached to 2,827,447 mts in 1994. Then fisheries its was declined a little bit to 2,679,500 mts. in 1997.

In 1997, the marine fisheries production in terms of quantity was 79 per cent of the total fishery production in Thailand¹. The quantity and value of marine fishery production for each year from 1990 to 1997 is show in the table below.

	1990	1991	1992	1993	1994	1995	1996	1997
Quantity (mt)	2,362,218	2,478,607	2,736,352	2,754,486	2,804,426	2,827,4475	2,786,125	2,679,500
Value (US\$1,000)	808.830	1,032,609	1,286.560	1,427,833	1,433,986	1,792,984	1,883,917	1,497,274

¹ Fishery Statistical Bulletin, 1997 (SEAFDEC, 2001)

The production has been declined in 1979 and 1980 was due to the neighboring countries declared their 200-miles exclusive economic zones (EEZ). However, the production recovered again in 1981 and growing up until 1994, mainly due to successfully implemented join-venture projects. Then it was stop growing up after 1994 and started fluctuated. The table below shows the volume of marine fishery production in 1997, by typed of fishing gear.

<i>Type of Fishing Gear</i>	Production (mt)		Per cent (%)	
	1982	1997	1982	1997
1. Trawl				
- Otter trawl	1,093,878	1,575,408	56	58.7
- Pair trawl				
- Beam trawl				
2. Surrounding net				
- Thai purse seine	332,835	802,623	17	30.0
- Anchovy purse seine				
- Luring purse seine				
- Chinese purse seine				
3. Gill net				
- Spanish mackerel gill net	107,728	104,572	5.5	3.9
- Mackerel gill net				
- Pomfret gill net				
- Shrimp gill net				
- Other gill net				
4. Push net				
- Purse push net	85,560	38,573	4	1.4
- Acetes scoop net				
- Scoop				
5. Trap				
- Stationary gear	34,127	28,057	1.5	1.1
- Bamboo stake trap				
- Fyke net (Set bag net)				
- Crab trap				
- Squid trap				
6. Falling gear				
- Squid luring light	23,763	25,949	1	1.0
- Squid cast net				
- Other cast				
7. Hook and line				
- Longline	8,040	5,847	0.5	0.2
- Handline				
- Squid jig				
8. Others	268,750	98,467	13.5	3.7

(Source : Fishery Statistical Bulletin, 1997 (SEAFDEC 2001))

In 1997 catches of the most popular commercial fishing gears trawlers and purse-seines contributed more than 90 per cent of total marine production (58.7 per cent from trawlers, 30 per cent from purse-seines).

Marine Fisheries Development from 1982 to 1997 was developed so fast, especially the most popular commercial fishing gears like trawl, surrounding etc. Their catches were shown at the highest per cent for trawlers and 30 per cent for surrounding net, others was about 10 per cent. However, in spite of the rising figures for total trawl catches in the Gulf of Thailand, the catch per unite effort (CPUE) has actually been declining since 1963, indicating over-fishing in recent years According to a report of surveys conducted by the research vessels of the department of Fishes, the CPUE in 1963 was 232 kilogram per hours, then reduced to 53 kilogram per hour in 1982 and down to 16.2 kilogram per hour in 1997.

Another serious problem of trawl fishing is that two-third of the total catch is consists of low priced trash-fish, which is not used for direct human consumption, but is processed into fishmeal, or used for feeding in fish farm. It is know, however that this also includes a significant enough proportion of juvenile high-value fish, which is thus destroyed prematurely. A decrease in demersal resources, which began to be felt in the mid-1970s, caused a renewed interest in pelagic fish and purse seine fishing. In 1972, purse seine catches amounted only 65,282 tons, but by 1976 the amount in creased to 293,402 tons, then 332,835 tons in 1982 and became 802,623 tons in 1997. These are cause from light fishing too.

The catch by gill net in 1997 was only 3.9 per cent of total marine catch, it was reduced from 5.5 per cent in 1982 become 3.9 per cent in 1997. The production value, however, was considerably higher than this percentage would suggest, because the gill net catches included shrimp, pomfret, crab, and other high-priced species. There fore, gill net is important, even though it is considered to be mainly a small-scale gear. Its could observed that catches by commercial fishing gear. (Trawler & Purse-Seine) was increate while the catches from small-scale fishing gear was decreased this may cause by band of Drift gill net for bonito and Spanish mackerel. Also, Total Marine production by commercial fishing gear were increased due to the promotion of joint-venture to the neighboring countries.

The total numbers of registered fishing boats in Thailand in 1995 was 54,538, 2,826 were non-powered boats, 36,430 were powered boats with outboard engine and 15,282 were inboard-powered boats. The inboard-powered boats in Thailand are usually classified by length as follows:

	Less than 14 m	14-18 m	19-25 m	25 m and over	Total
Number of boats	9,331	4,254	4,391	206	18,182

(Source : Thai Fishing Vessels Statistics 1997, Department of Fisheries 1999)

The table below shows the number of fishing units in 1982 and 1997 by type of fishing, it must be noted that in Thailand the number of fishing units means, in fact, the number of inboard powered boats.

Type of fishing	Number of Fishing Units		Per cent (%)	
	1982	1997	1982	1997
Trawler	11,475	8,885	58	49
Purse Seiner	840	1,502	4	8
Gill netter	4,760	4,881	24	27
Push net	1,899	901	10	5
Falling Gear	637	1,945	3	10.6
Trap	-	-	-	-
Hook and line	34	47	0.2	0.3
Others	111	20	0.8	0.1

(Source : Thai Fishing Vessel Statistics 1997, DOF 1999, SEAFDEC, 1982)

During the past fifteen year from 1982 to 1997 many trawler had changed to be others type of fishing such as squid fishing by luring light, squid trap, anchovy fishing etc. However, trawler is still the major group of Thai fishing boats at present. Push net fishing was reduced due to the government policy to ban push net in the near future. While purse seine was increased because anchovy fishing become a popular at the moment. And trap fishing has no record because it was considered as a kind of small scale fishing gear, so it need not to get the license for fishing.

Gill net fishing on the other hand contributed 3.9 per cent to the total amount of catch, while being represented by as much as 27 per cent in the number of fishing units. But a relatively low amount of catch was compensated by its high value. A great number gill net boats are usually engaged in shrimp fishing, and a substantial proportion of their catch is exported. There are also many non-powered or outboard-powered boats, which are also engaged in hook and line fishing has always been very small. However, this kind of fishing is carried out by many non-powered and outboard powered boats.

Thailand has become one of the largest fishery producers in the world. At the sometime, Thailand has encountered problems such as over-fishing, decline of fish stock, and a low standard of living of small-scale fishermen. In order to keep pace with the overall economic development of the country and to maintain fishery production as a significant part of the national food supply, the marine fishery resources have to be utilized nationally and effectively under a coherent fishery management policy. Controlling fishing gear and methods, for example, regulating the mesh size and the amount of fishing effort, will play a significant role in attaining the purpose of fisheries management.

Explanatory Note

This revised volume is the completion between the first volume and the report of a reconfirmation survey on marine fishing gear and methods, conducted in August 2002. We tried to cover the present fishing gears as much as possible and to include all the latest developed gears, important port and villages along the coast of Thailand. Figure 1 shows the map of all the survey station 3, the name of each province, which is often also the name of the provincial capital, is underlined.

The data were collected mostly by interviewing fishermen, with the help of questionnaire prepared in advance for each type of fishing gear, as well as by direct observation in the locations where the gears were made and used. The background information on the current status of different fisheries was mainly base on data contained in the annual "Fishery Statistical Bulletin for the South China Sea Area", starting from 1990, up to the most recent available one for 1997.

In the classification of fishing gear, drawings and explanations in this volume, we have on the whole followed the system used in the "FAO Catalogue of Small-Scale Fishing Gear". The mode of presentation is summarized below.

Illustrations

1) The horizontal length of surrounding nets, purse seines and gill nets is drawn according to the length of the floatline, and the vertical depth according to the fully stretched netting. In the case of gill nets with sidelines, the depth is drawn according to their length. The width of netting panels or sections of trawl gear is drawn according to half the stretched netting, and the depth or length according partly perspective overall sketches, with dimensions indicated where applicable.

2) General outline drawings, such as of the rig of a complete gear, and detail drawings of components, are mostly not to scale, but the main dimensions are given.

3) Dimensions are given only in meters (m) and millimeters (mm). The units are not indicated but can easily be recognized, as follows:

Metre : Length of footropes, headlings, floatlines etc., used with two decimals (e.g., 5.25, 90.20).

Mellimetre: Mesh size (stretched), diameters of ropes, floats, etc. used without a point or with one decimal only (e.g., 12; 527 or 1.2; 20.5).

4) Mass and weight are indicated in the units of kilogram (kg) and gram (g). Buoyancies of floats and breaking load of netting yarns or ropes are shown by kilogram-force (kgf) or gram-force (gf).

- 5) Materials are indicated by abbreviations listed in Appendix 1.
- 6) The size of netting yarns is shown in the denier system.
- 7) The mesh size, given in millimeters (mm) is understood to be the distance between the centers of the two opposite knots in the same mesh when fully stretched..
- 8) The number of meshes in a straight row along the edges indicates the width and length or depth of net panels or sections.
- 9) The shape of a netting section is indicated by the cutting rate at its edge. A tabulation of common cutting rates for a practical range of taper ratios is given in Appendix 2, together with a diagram of different cutting rates.
- 10) The term hanging ratio (E) designates the ratio between the length of a given portion of the mounting rope and the length of the stretched netting hung on this portion of the rope.
- 11) When there are two or more variants in construction of gear or manner of use, this is indicated in the title and opposite the drawings by Roman numerals (I, II,). Where these variants refer to only one component part of gear, other possible ways of making this part are shown with the abbreviation ALT.
- 12) Sequence in fishing operation is shown by sketches with circled Arabic numerals (① , ②...) which indicate the sequence of operation stages.
- 13) Parts of gear drawn in detail are indicated by circled capital letters (A , B ...).

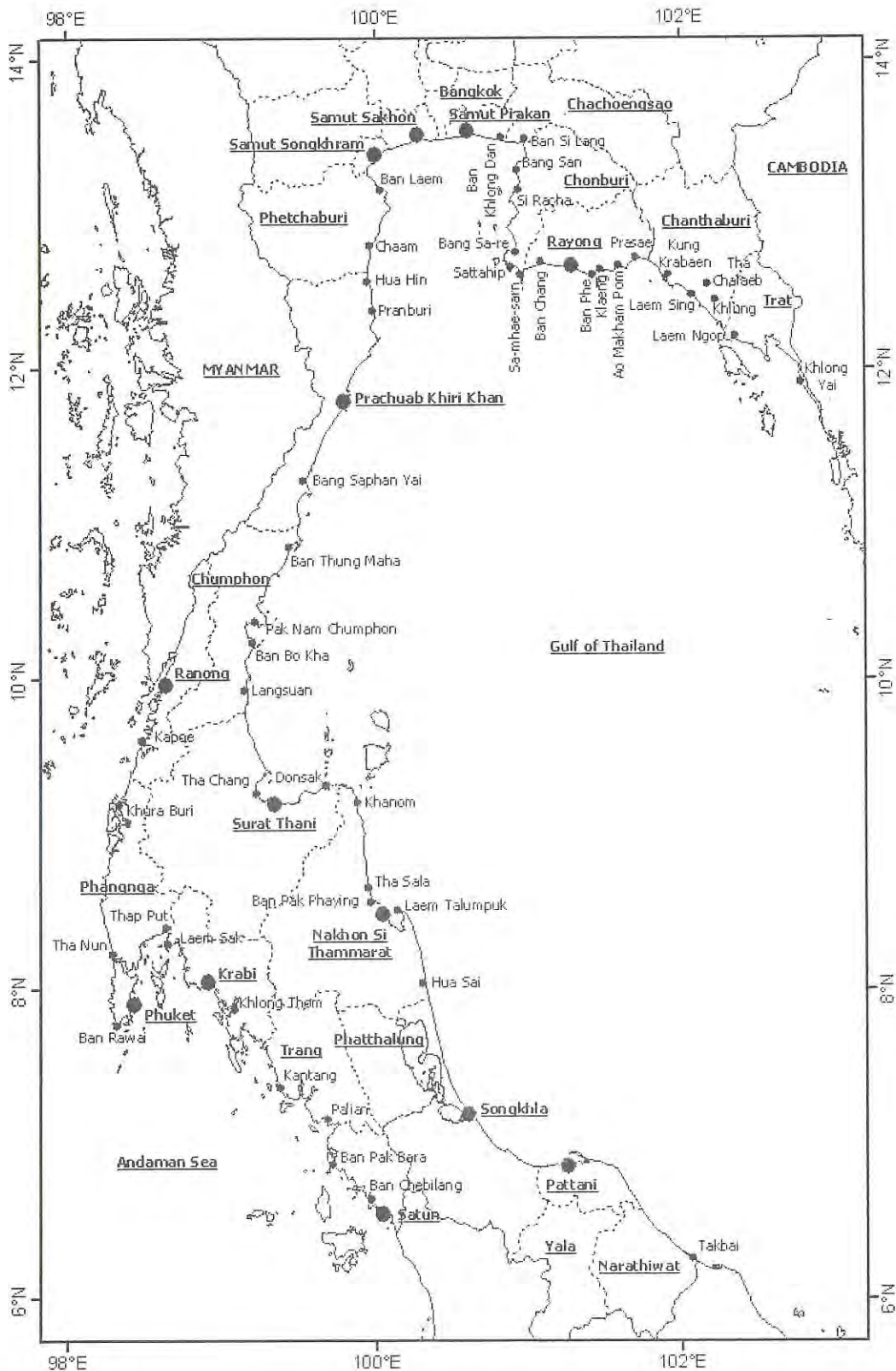















Figure 1. Location (●) where the surveys of fishing gear and methods were carried out. The names of provinces are underlines.

- Village or town
- Provincial capital

Abbreviations and symbols used in illustrations

ALT	= Alternative	Pb	= Lead
BAIT	= Bait	PE	= Polyethylene
BAM	= Bamboo	PES	= Polyester
BR	= Brass	PL	= Plastic
CEM	= Cement	PP	= Polypropylene
CLAY	= Baked clay	PVA	= Polyvinyl alcohol
COMB	= Combination rope	RA	= Rattan
COT	= Cotton	RUB	= Rubber
EG	= Electric generator	S	= S twist
Fe	= Iron	SN	= Saran nylon
LL	= Luring lamp	SST	= Stainless steel
LIVE	= Live bait	ST	= Steel
LT	= Long-tail boat ¹	SW	= Swivel
MAT	= Material	WD	= Wood
MONO	= Monofilament	WIRE	= Steel wire rope
PA	= Polyamide	Z	= Z twist
	= Diameter		= Circumference
	= Upper panel		= Braided
	= Lower panel		= Twisted
	= Side panel		= Current
	= Purse ring		= Wind
	= Thickness		= Fish
	= Approximately	Rv. 2002	= Survey in 2002

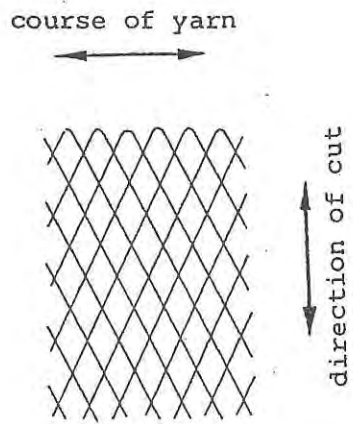
¹ Boat with a long propeller shaft outside the hull
(Source : FAO catalogue of Small-scale Fishing Gear, 1975)

**Common cutting rates and taper ratios
Number of meshes lost (or gained)**

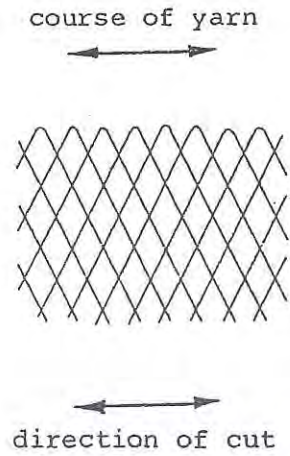
	1	2	3	4	5	6	7	8	9	10
1	AB	1T2B	1T1B	3T2B	2T1B	5T2B	3T1B	7T2B	4T1B	9T2B
2	1N2B	AB	1T4B	1T2B	3T4B	1T1B	5T4B	3T2B	7T4B	2T1B
3	1N1B	1N4B	AB	1T6B	1T3B	1T2B	2T3B	6T6B	1T1B	7T6B
4	3N2B	1N2B	1N6B	AB	1T8B	1T4B	3T8B	1T2B	5T8B	3T4B
5	2N1B	3N4B	1N3B	1N8B	AB	1T10B	1T5B	3T10B	2T5B	1T2B
6	5N2B	1N1B	1N2B	1N4B	1N10B	AB	1B12B	1T6B	1T4B	1T3B
7	3N1B	5N4B	2N3B	3N8B	1N5B	1N12B	AB	1T14B	1T7B	3T14B
8	7N2B	3N2B	5N6B	1N2B	3N10B	1N6B	1N14B	AB	1T16B	1T8B
9	4N1B	7N4B	1N1B	5N8B	2N5B	1N4B	1N7B	1N16B	AB	1T18B
10	9N2B	2N1B	7N6B	3N4B	1N2B	1N3B	3N14B	1N8B	1N18B	AB
11	5N1B	9N4B	4N3B	7N8B	3N5B	5N12B	2N7B	3N16B	1N9B	1N20B
12	11N2B	2N2B	3N2B	1N1B	7N10B	1N2B	5N14B	1N4B	1N6B	1N10B
13	6N1B	11N4B	5N3B	9N8B	4N5B	7N12B	13N7B	5N16B	2N9B	3N20B
14	13N2B	3N1B	11N6B	5N4B	9N10B	2N3B	1N2B	3N8B	5N18B	1N5B
15	7N1B	13N4B	2N1B	11N8B	1N1B	3N4B	4N7B	7N16B	1N3B	1N4B
16	5N2B	7N2B	13N6B	3N2B	11N10B	5N6B	9N14B	1N2B	7N18B	3N10B
17	8N1B	15N4B	7N3B	13N8B	6N5B	11N12B	5N7B	9N16B	4N9B	7N10B
18	17N2B	4N1B	5N2B	7N4B	13N10B	1N1B	11N14B	5N8B	1N2B	2N5B
19	9N1B	17N4B	8N3B	15N8B	7N5B	13N12B	6N7B	11N16B	5N9B	9N20B

(Source: FAO catalogue of Small-scale Fishing Gear, 1975)

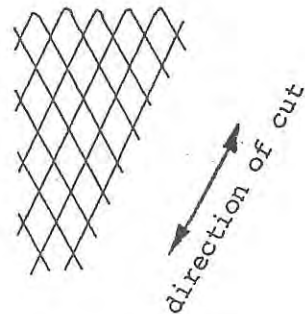
N (normal) cut. The cut is perpendicular to the general course of the yarn in knotted netting.



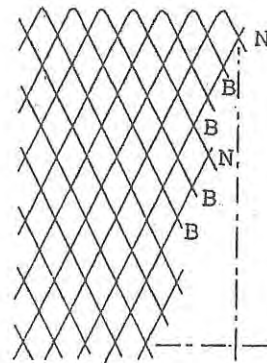
T (transversal) cut. The cut is parallel to the general direction of the yarn in knotted netting.



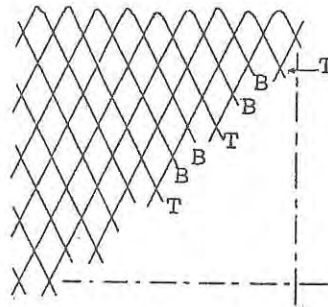
B (bar) cut. The cut is parallel to a line of sequential mesh bars.



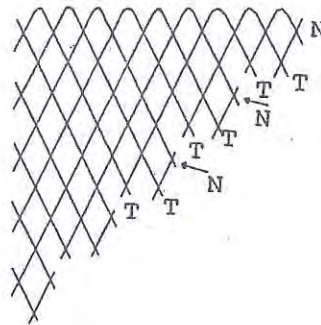
Cutting rate 1N2B.



Cutting rate 1T2B.



Cutting rate 1N2T.



FISHING GEAR CLASSIFICATION

	<u>Local name</u>
	<i>Uan Lom</i>
	<i>Uan Tageang</i>
	<i>Uan Sany</i>
	<i>Uan dum or Uan Lom</i>
	<i>Uan Lom Pla Katak</i>
	<i>Uan Lom Pla Toona</i>
	<i>Uan Tang-ke</i>
	<i>Uan Glud Takhao</i>
	<i>Uan Tub-Taling</i>
	-
	-
	-
	<i>Uan Lark</i>
	<i>Uan Lark Klang Num</i>
	-
	-

1. SURROUNDING NETS	
1.1 With purse line (purse seine)	- Luring purse seine (light)
1.1.1 One boat purse seine	- Luring purse seine (shelter)
	- Ordinary purse seine
	- Anchovy purse seine
	- Tuna purse seine
1.1.2 Two boat purse seine	- Chinese purse seine
1.2 Without purse line	- Surrounding net
2. SEINE NETS	
2.1 Beach seine	
2.2 Boat seine	
2.2.1 One boat seine	- Danish seine
2.2.2 Two boat seine	
3. TRAWL	
3.1 Mid water trawl	
3.1.1 Mid water otter trawl	
3.1.2 Mid water pair trawl	

FISHING GEAR CLASSIFICATION

	<u>Local name</u>
1. SURROUNDING NETS	<i>Uan Lom</i>
1.1 With purse line (purse seine)	<i>Uan Tageang</i>
1.1.1 One boat purse seine	<i>Uan Sany</i>
- Luring purse seine (light)	<i>Uan dum or Uan Lom</i>
- Luring purse seine (shelter)	<i>Uan Lom Pla Katak</i>
- Ordinary purse seine	<i>Uan Lom Pla Toona</i>
- Anchovy purse seine	
- Tuna purse seine	
1.1.2 Two boat purse seine	<i>Uan Tang-ke</i>
- Chinese purse seine	
1.2 Without purse line	<i>Uan Glud Takhao</i>
- Surrounding net	
2. SEINE NETS	
2.1 Beach seine	<i>Uan Tub-Taling</i>
2.2 Boat seine	-
2.2.1 One boat seine	-
2.2.2 Two boat seine	-
- Danish seine	
3. TRAWL	<i>Uan Lark</i>
3.1 Mid water trawl	<i>Uan Lark Klang Num</i>
3.1.1 Mid water otter trawl	-
3.1.2 Mid water pair trawl	-

Local name

Uan Tid or Uan Lory
Uan Lory
Uan Lory
Uan Jom
Uan Sam chan
Uan Lom Tid

Lob
Pong Pang
Po
Po, Po-Charg
Pong Pang Lak Lory
Fueak Rung, Uan Rung
Lob

Bed
Bed Kun
Bed Mau
Bed Rau
Bed Rau
-
-
Bed Rawai
Bed Lark

6. GILL NETS

- 6.1 Surface gill net
- 6.2 Drift gill net
- 6.3 Bottom gill net
- 6.4 Tremmel net
- 6.5 Encircling gill net

7. TRAPS

- 7.1 Stationary traps
 - Fyke net
 - Stake trap
 - Set net (stationary net)
 - Stow net
 - Barrier net
 - Fishes, Squid, Crab (collapsible or none)
- 7.2 Semi-stationary traps
- 7.3 Portable traps (pots)

8. HOOK AND LINE

- 8.1 Pole and line
- 8.2 Hand lines
- 8.3 Longline
 - 8.3.1 Baited longline
 - Drifting
 - Bottom horizontal
 - Bottom vertical
 - 8.3.2 Unbaited longline
- 8.4 Trolling line

	<u>Local name</u>
9. SCOOP NETS	
9.1 Push net	<i>Rawa, Chip</i>
	<i>Uan Roon</i>
9.2 Scoop	<i>Sawing</i>
	- Portable push net
	- Boat push net
10. DRIVE-IN-NET	
10.1 Muro ami	<i>Uan Yee poon</i>
11. DREDGES	
11.1 Boat dredges	<i>Krad</i>
11.2 Hand dredges	-
	-
12. MISCELLANEOUS	
	<i>Sub-Pa-Nok, Ta-Khao</i>
	<i>Leam, Chamauk</i>
	-
	<i>Kra Dan Thiep</i>
	- Oyster hammer
	- Spear, Harpoon
	- Gaff
	- Mud ski

Groups of fishing gear and descriptions

1. SURROUNDING NET

A net roughly rectangular in shape without a distinct bag is set vertically in water: to surround the school of fish, generally of pelagic nature. The nets are subdivided into three major types: One boat purse seine; two boat purse seine; and Surrounding net without a purse line.

2. SEINE NET

A bag shaped net with two wings, normally, the wing are larger than those of trawl nets. The net is pulled towards a stationary boat or onto a beach. A seine of a primitive nature sometimes does not have a bag. However, insofar as the net is pulled towards a stationary boat or beach, it is included herein.

3. TRAWL

A conical bag shaped-net with two or more wings, pulled by one to two boats for a period of time, to catch mainly fish or other aquatic animals that live directly on, or stay near the sea bed. When such a gear is used in mid-water, with the same catching mechanism, the mid-water trawl is included herein.

The trawl is also divided into three major types: Otter trawl; Pair trawl; and Beam trawl.

4. LIFT NET

A sheet of net, usually square, but may sometimes be conical, is stretched either by several rods, ropes, or a frame and is set either at the bottom or in mid-water for some time; and then lifted to trap the fish lying above it.

5. FALLING GEAR

The gear is usually a cone shaped net or other material, which is dropped to cover aquatic animals and enclose them. Generally hand-operated in shallow waters, but some are operated from a boat for example, the stick-held cast net.

6. GILL NET

A net wall, with its lower end weighted by sinkers (or heavy net, as in drift gill net) and the upper end raised by floats, is set transversely to the path of migrating fish. Fish trying to make their way through the net wall are entangled in the mesh. A catching mechanism which is more or less similar to the gill net, is the trammel net with three wall nets, this is also included herein. Although in this case the migrating fish are entangled between two layers of net, and not in the mesh, and a combination of different types of nets are used.

7. TRAP

Gear that is set or stationed in the water for a certain period, regardless of the kind of material used for their construction. The fish are naturally confined in a collecting unit, from which escape is prevented by labyrinths and/or retarding devices, such as gorges, funnels, etc. without any active fishing operation taking place.

8. HOOK AND LINE

This gear generally consists of line(s) and hook(s), to which edible or artificial baits are attached to attract fish or other aquatic animals. Unbaited hooks or jig may also be used.

9. SCOOP NET

A bag net with a fixed or variable opening is operated in shallow waters, or from boats. Some large scale scoop nets are operated from a motorized boat, such as the boat push net.

10. DRIVE-IN-NET

A bag net with two wings, scoop net and wall with a coconut leaf fence are usually set in the water against the current. From one to two hundred fishermen with their frightening ropes and plastic hoses which emit bubbles, drive the fish to enter the bag net and/or scoop net. A lift net is used to catch fish which are circling the net wall.

11. DREDGE

An iron or net basket with a hard rectangular frame at the opening. This gear is dragged or pushed along the sea bed, usually to collect mollusks such as mussels, oysters, scallops, clams, etc. The shellfish are held in an attached bag or sieve which allows the water, sand or mud to run out.

12. MISCELLANEOUS

This group covers a great variety of other fishing gears and methods, not specified elsewhere or that are based on mixed principles. For example hand hooks, harpoons or spears, gaff, etc.

1. SURROUNDING NETS

**Aussanee Munprasit
Prasert Masthawe**

**Revised by
Isara Chanrachakij**

CONTENTS

	Page
Surrounding net fishing	23
Fishing gear and methods	25
1.1 Surrounding nets without a purse line	
1.2 Surrounding nets with a purse line (purse seines)	
<u>Surrounding nets without a purse line</u>	
□ Anchovy	25
□ Rock-fish	25
<u>Surrounding nets with a purse line (purse seines)</u>	
□ Chinese or two-boat purse seine	26
□ Anchovy purse seine	26
□ Thai purse seine	27
□ Luring purse seine	27
□ Tuna purse seine (Super seiner)	28

SURROUNDING NET FISHING

Surrounding nets have been used by Thai fishermen in coastal water for a long time. Initially, they were small-scale gears used for catching planktonic shrimp, anchovies and other species found in shallow waters near the coast. Small cotton net was operated by fishermen with or without a rowing boats. Later, two wooden poles for closing the bottom part of the net were added to the gear. This type of purse seine could be operated in either day or nighttime, to catch Indo-Pacific mackerel and mixed fish schools composed mainly of herrings, croakers, Indo-Pacific mackerel, thread-fin and sting ray.

In 1926, some Chinese fishermen introduced the Chinese purse seine or two-boat purse seine. One large sailing boat and two rowing boats were used in operation. The net was made of cotton yarn treated with liquid from mangrove bark. The main catch was Indo-Pacific mackerel.

With the appearance of Nylon netting material in Thailand, in 1954, the old indigenous surrounding net with wooden purse pole underwent major modification. The poles were no longer used, and the netting was made of black-coloured and later of green-coloured nylon. Since 1956 it is possible to distinguish the so-called Thai purse seine, whose main catch is also Indo-Pacific mackerel.

At present Thai purse seiners are large vessels of over 100 gross tons, with modern equipment on board, such as radar, sonar, echo sounder, fish finder, wireless radio and power block. Chinese purse seine on the other hand have all but disappear from use. In 1991 only 24 set were operate in Andaman sea but form 1992 to 1997 have no record of the Chinese purse seine. In some place in Thailand, it is still possible to find the original type of surrounding net such as anchovy and rock-fish surrounding nets at Ban Ao Makhampom, Rayong Province and Chumporn Province.

At present, we can distinguish two main groups of surrounding net in Thailand; those with and those without purse line. The nets without purse line are small and simple, and do not usually appear as a separate category in fishery records. Surrounding net with a purse line, on the other hand, are large-scale gears whose number has been increased annually. In the fisheries statistic bulletin for south china area from 1990-1997 they were classified into two sub-groups, according to the method of operation (table 1.1).

Table 1.1 Number of registered purse seine fishing boat in Thailand, 1990-1997

Type of purse seiner	Year							
	1990	1991	1992	1993	1994	1995	1996	1997
Anchovy purse seine	367	347	324	336	348	375	422	503
Thai purse seine	1,262	1,243	1,128	1,173	1,163	1,022	905	999
Chinese purse seine	12	24	-	-	-	-	-	-

Source: Fisheries resource bulletin of South China Sea area, 1990-1997

Different from the statistic in 1978 to 1982, the record does not separate into Thai purse seine and luring purse seine. But the method is still same as in 1978 to 1982 that luring light method is more popular than the searching method. Numbers of Thai purse seine boats are decreased gradually from 1990 to 1997. The numbers of anchovy purse seine boats were

fluctuated in the period from 1990-1997. Chinese purse seine boats registered in 1990(12) and 1991 (24) but had not any record in the period from 1992 to 1997 (table 1.1).

In the period from 1990-1997, the annual total catch from purse seine was gradually increased from 1990 to 1993 and highest in 1994 then in the period from 1994 to 1997, the catch by purse seine started to decline. The catch of anchovy was fluctuated in the period from 1990 to 1997. In the period from 1990-1997 no any products from Chinese purse seine were recorded (table 1.2). These fluctuations were cause by factor such as the depletion of resources, the developments in the fishing technology and navigation skills.

Table 1.2 Annual catch by type of purse seine in Thailand, 1990 -1997

Type of purse seine	Year							
	1990	1991	1992	1993	1994	1995	1996	1997
Anchovy purse seine	145,681	120,508	161,544	152,850	155,405	147,034	146,539	143,850
Thai purse seine	611,831	617,303	675,262	701,540	769,509	771,698	709,167	658,733
Chinese purse seine	-	-	-	-	-	-	-	-

Source: Fisheries resource bulletin of South China Sea area, 1990 -1997

Table 1.3 The main species in catches by surrounding net in 1990 to1997

Species	Type of purse seine		Total
	Anchovy purse seine	Thai purse seine	
Sardine	525	195,258	195,783
Anchovies	141,832	4,967	146,799
Round scad	0	78,042	78,042
Eastern little tuna	63	57,550	57,613
Longtail tuna	2	43,312	43,314
Indo-Pacific mackerel	89	97,936	98,025
Trash fish	3	36,192	36,195
Jack, Cavalla, Travellies	40	34,879	34,919
Miscellaneous fish	180	33,912	34,092
Indian mackerel	0	27,816	27,816
Selar-scad	0	21,960	21,960
hard-tail scad	42	19,020	19,062

Source: Fisheries resource bulletin of South China Sea area, 1990 to1997

For the purpose of the review of fishing gear in Thailand, we have found it useful to describe in a little bit different from the 1st edition. Two surrounding nets without purse line are same as the 1st edition but five types of purse seine or surrounding nets with purse line as follow:

Surrounding net without purse line

- 1) Anchovy surrounding net
- 2) Rock fish surrounding net

Surrounding net with purse line

- 1) Chinese two boats purse seine
- 2) Anchovy purse seine
 - 3) Thai purse seine
 - 4) Bonito purse seine
 - 5) Tuna purse seine (Super seiner)

FISHING GEAR AND METHODS

1.1 Surrounding nets without a purse line

The simplest in construction and in the method of operation are the surrounding nets without a purse line. They have traditionally been used on a small-scale in coastal waters, for catching anchovies, rock-fish and other near-shore species.

Anchovy surrounding net (*Uan Glud Takhao*)

It is usually operated from a small boat, (8-14 meters long, 6-20 h.p. engine), by 6-10 fishermen. The net is rectangular, 200-400 meters long and 10-15 meters deep. The main net consists of 6.4 x 6.4 – 7.4 x 7.4 mm nylon minnor netting, or 6.3 – 8.3 mm rachel net. Polyethylene 250 d/12 netting is used for lower selvedge. Float line is longer than sinker line, buoyancy force is about double of the sinking force. C-shaped steel hooks are used for closing the bottom part of net.

Fishing operations are conducted in the early morning and evening, in 2-10 meters of water depth near the shore. A fish school is located by a simple visual search. The only piece of equipment apart from the net is an air compressor on board, to supply air to the fisherman who dives when the bottom of the net has to be closed.

Fishing grounds are sandy or mud and sand, mostly in Rayong, Chantaburi and Trat province.

Rock-fish surrounding net (*Uan lom lung hin*)

It was developed from anchovy surrounding net, therefore the fishing method is the same. There are, however, some differences in net materials and fishing grounds. In this case, 25 mm mesh size, nylon 210 d/6 is used for the main net, and 30 mm, polyethylene 380 d/12 is used for selvedge.

Fishing grounds are where the bottom is rocky, or around a reef. The principal target species are yellow-tail fusiliers, rabbit fish, cavalla, barracuda and other coral fishes. The gear is found in the eastern Gulf of Thailand, A. Makhampom, in Rayong province.

1.2 Surrounding nets with a purse line (purse seines)

According to fisheries statistical record for 1982, there were 840 registered purse seiners. Most of them were in the 10-100 gross ton category, and used luring devices. Some had modern equipment on board, such as wireless set radio communication, echosounder, sonar, and radar. In 1985, some boats even had satellite navigation. Many auxiliary fishing gears were used on board; capstan winch (mechanical or hydraulic), davit pulley, boom crane, electric generator, fish luring lamps and power block. There were no freezers on board; instead, wet or dry ice was used. A characteristic of this method of fishing is a rather large manpower requirement, which may, in time, become a disadvantage.

Chinese or two-boat purse seine (*Uan tang-ke*)

This kind of purse seine has been known to Thai fishermen for nearly 60 years. It has not changed much during that time, except that cotton netting has been replaced by nylon, and fishermen no longer sail around looking for fish but rather use fish luring lamps. This old-fashioned gear still remains in use on the Andaman Sea coast (Phuket, Trang, Satun), because of its special advantages, such as low operating cost, effectiveness in difficult fishing grounds and good commercial value of catch.

Several vessels are required for an operation. The mother boat is a 16-20 m long wooden vessel with a 100-250 h.p. main engine. To rowing-boats (8 x 2x 0.8 m) are used as net boats, and another rowing-participate in an operation.

The net is rectangular, 350 x 60 m, made of black-colour 25 mm nylon 210 d/9-12. Polyethylene, 25 mm, 380 d/15, is used for selvedge. Two purse lines, polyethylene cross-rope, 28-32 mm, are fixed to the middle of the net. The net is spread out by two rowing-boats, in areas around islands or banks, where the bottom is rocky or sandy hills. The catch includes scad, barracuda, cavalla, trevally Spanish mackerel, mackerel and bonito.

Anchovy purse seine (*Uan lom chub pla katak*)

This gear is similar to anchovy surrounding net, except that a purse ring is attached to the sinker line, and the bottom of the net can be closed with the purse line. A 10-20 m wooden vessel with a 20-150 h.p. engine, and 10-30 fishermen are needed for fishing operation.

The net is rectangular, 250-400 meters long and 15-50 meters deep. Float line is shorter than sinker line ($E=0.83/E=0.93$). Main net is blue polyethylene minnow net 2 x 2 mm and/or green nylon rachel net 6.5 – 8.3 mm 110 d – 210 d/5. Polyethylene 380 d/12-15, 25 mm, is used for selvedge at sinker line. Iron purse rings are attached on sinker line at

intervals of 1.5-2 meters. A 26-32 mm polyethylene cross-rope is used for purse line. Buoyancy force is about twice the sinking power.

A fishing operation is usually conducted in the early morning and evening time. Fish schools are saught by eye, but sometimes fish luring lights are operate at night. Anchovy purse seine can be found on the east coast of the Gulf of Thailand (Rayong, Chantaburi, and Trat), the southern east coast (Surat Thani) and the southern part of the west coast of Thailand, in Phuket, Krabi and Satun.

Thai purse seine (*Uan daum*)

Before 1960, most purse seines in Thailand were of this type. The difference between this and any other purse seine lies not so much in construction, but in the manner of operation. Nowadays, large vessels have sonar equipment for fish detection, but in the past and even today in the case of small vessels, a fish school has to be spotted by eye, in the twilight. Sometimes, however, Thai purse seines are operated with the fish luring lights and fish shelters, which causes some confusion in fishery statistical records (see Table 1.4).

The fishing vessel is 14-14 m long, with a 20-200 h.p. engine, and 10-30 fishermen on board.

The net is rectangular, 400-600 m long, 70-110 m deep, cod-end is in the middle of the net. The main net is 25-43.8 mm nylon 210 d/6-12, float line is shorter than sinker line ($E = 0.6-0.7/E=9.65-0.75$). The buoyancy force is 1.3-2 times higher than the sinking power. The colour of the net is black or green.

Fishing operation is conducted from a single boat. The net is hauled by hand on both sides of the boat, whereas the purse line is pulled by a capstan winch which is driven by the main engine. The catch consists largely of Indo-Pacific mackerel and scad. The fishing grounds are in the eastern and western Gulf of Thailand, inner Gulf, and the southern part of the Andaman Sea; the main ports are Samut Sakhon, Chonburi, Langsuan (Chumporn province) and Kantant (Trang Province).

Luring purse seine (*Uan Sung* and *Uan Tageang*)

Most purse seines in Thailand are used in conjunction with one of the two luring methods; fish shelter and fish luring lights. A fish shelter (*Sung*) is constructed of bamboo poles, wire and coconut leaves, and fastened to a concrete block. This luring method is used in day-time fishing. Fish luring lamps (*Tageang*), which can be either electric or gass lamps, are used in night-time fishing.

A luring purse seine is 400-800 m long, 80-100 m deep. The main net has 20-25 mm mesh-size, the material is black nylon 210 d/4-12 and polyethylene 380 d/12-15 at the

cod-end. The float line is shorter than the sinker line ($E=0.7-0.8/E=0.75-0.85$). The ratio between the depth and the length of net is $1/5 - 1/7$. The fishing boat is 18-24 m long (20-80 gross tons), with a 100-400 h.p. engine. Thirty to forty fishermen are needed for an operation.

The main catch are sardine, round-scad, selar-scad, and Indian mackerel. Fishing grounds of fish shelter purse seine are in the central Gulf of Thailand (40-60 meters depth), while fish luring lights are used both in the Gulf of Thailand and the Andaman sea (20-40 meters depth). Main fishing port for fish shelter purse seine are Pattani and Samut Prakan, whereas Chumporn, Prachuap Khirikhan, Phuket, Trang and Satun are the main fishing port for fish luring lamp purse seine.

Fish schools are detected by sonar. Fishing is done at night, usually in the central Gulf of Thailand, and sometimes in the South China Sea. The catch comprises long-tail tuna, eastern little tuna, jack, trevallies, cavalla and others. The fishing ports are in Rayong, Songkhla and Pattani.

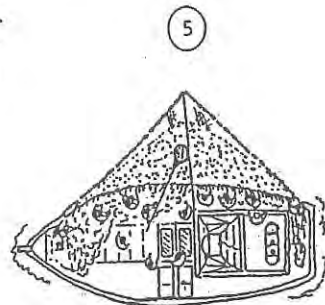
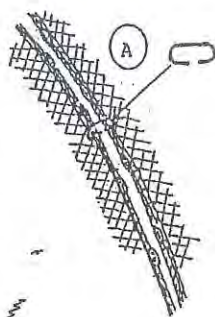
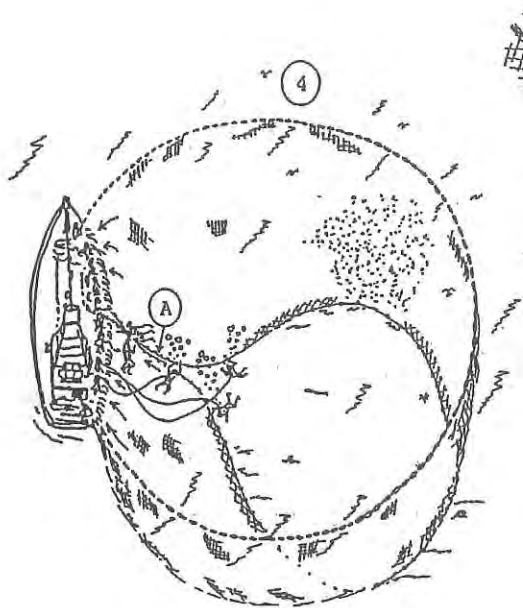
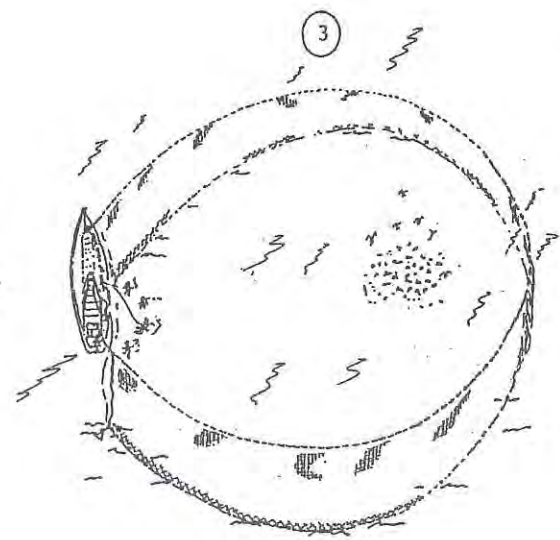
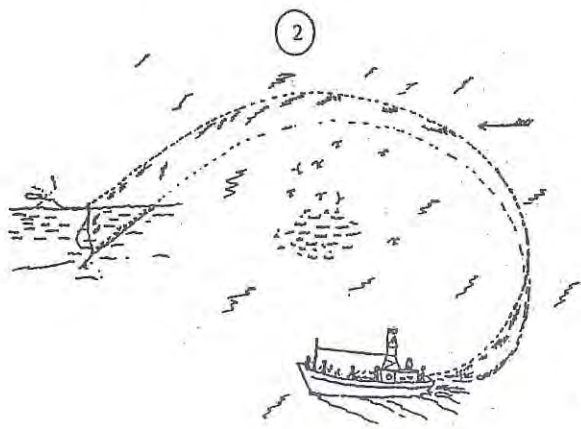
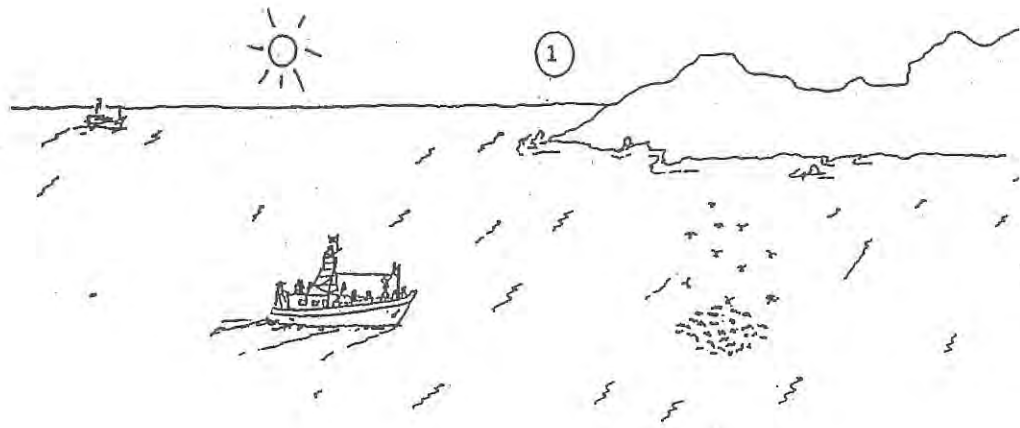
Tuna purse seine (Super seiner)

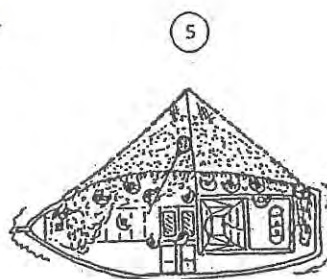
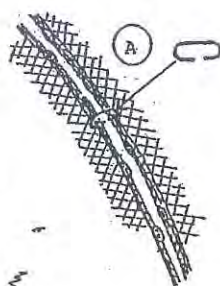
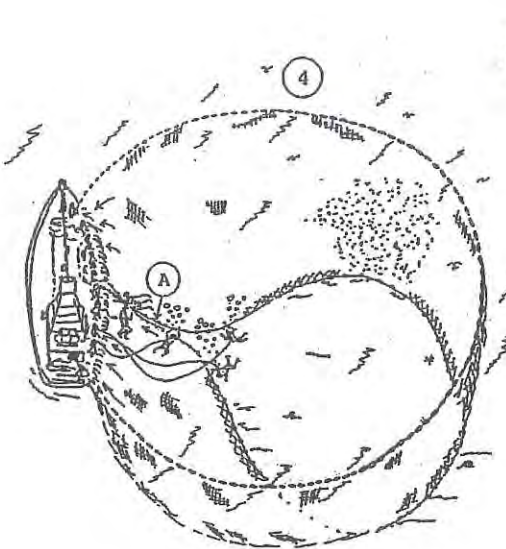
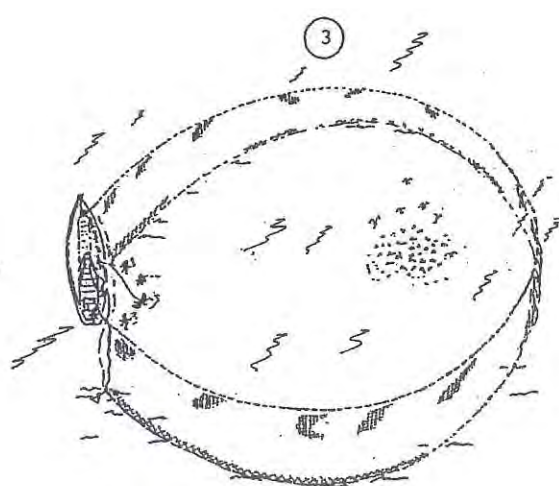
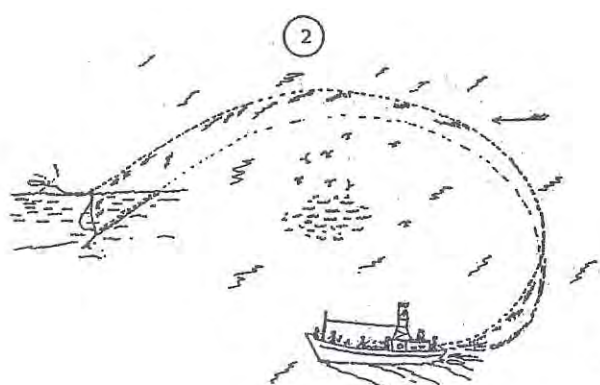
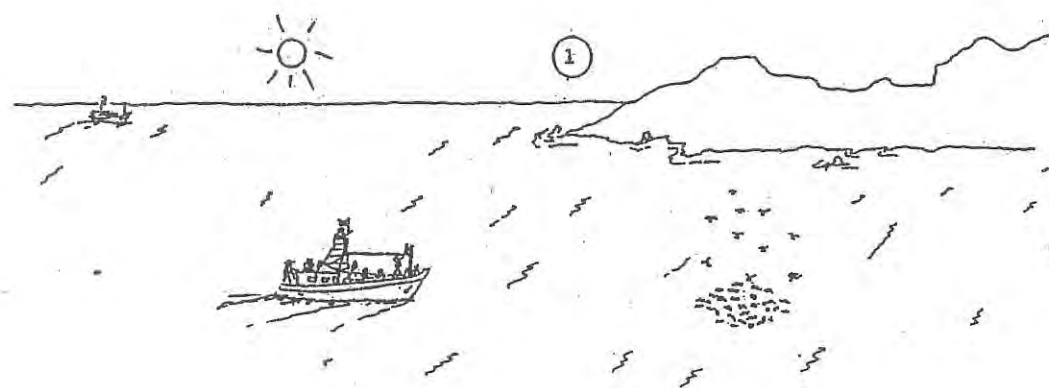
During the past fifteen years (1982-1997) the most advance Thai fishing gear and methods is Tuna purse seine on the Super seiner. In 1987, the Department of Fisheries of Thailand has employed one large fisheries research vessel, name R.V.Chulaporn. Her basic construction is trawler, then she was designed to be multipurpose of fishing with composed of stern trawler, longliner, gill netter and purse seiner. In 1994, The Southeast Asian Fisheries Development Center, Training Department has employed a multipurpose fishery research and training vessel, name M.V.SEAFDEC. Her basic construction is Tuna Purse Seiner (Super Seiner) then longliner, gill netter and pot fishing were designed to work on for some cruise and some period. Then in 1995, Department of Fisheries, Thailand employed a new Tuna Fisheries Research Vessel name R.V.Mahidol, she is a 1,270 gross tonnage super seiner, a typical type tuna purse seiner. Then, in 1998 Thai Off shore fisheries Association has employed a used tuna purse seiner about 1,800 gross tonnage, she was also a typical tuna purse seiner, All most of them are operated in the Indian Ocean and Andaman Sea.

Their fishing nets vary from 1,000 to 2,000 meters in length and 250 to 300 meters in depth and mesh size are 90 millimeters at bunt part and 210 millimeters at the body and wing, and all of them operate by fish aggregating devices, FADs or paayao. The target catch are skipjack, yellow fin and big eye tuna while their by-catch are rainbow runner, horse mackerel, leather jacket and dolphin fish.

Table 1.4 Specific characteristics of purse seiners in Thailand

Type of purse seine	Vessels	Net			Detection/Attraction method	Equipment on board	Auxiliary Fishing gear
		Material	Construction	Purse line			
Chinese	One mother boat (12-20 m),	25 mm, black nylon 210d/6-12	Cod-end in the middle (30 x 60 m)	Two purse lines (PE cross-rope)	Luring light, sighting	Wireless set, echo-sounder	Capstan winch, grass lamp.
Anchovy	One boat (10-24 m)	2x2 mm, blue PE minnow, 6-8 mm. Green rachel nylon net 110-210d/d	Cod-end in the middle (400 x 50 m)	One purse line (PE cross-rope)	Sighting, luring light	Wireless set, echo-sounder	Capstan winch, boom crane
Thai	One boat (10-24 m)	25-43.7 mm black & green nylon 210 d/4-12	" (600 x 110 m)	"	Sighting, sonar	Wireless set, echo-sounder, sonar	"
Luring	One boat (18-24 m) and a small boat	20-25 mm, black nylon 210 d/4-12	" (800 x 100 m)	"	Fish shelter, Luring light	Wireless set echo-sounder, radar	Capstan winch, boom crane electric luring lamp, grass lamp
Bonito	One boat (22-32 m)	50-98 mm, black & green nylon 210 d/12-36, 210 d/18-SN	" (1800 x 120 m)	"	Sighting, sonar	Wireless set, echo-sounder sonar, radar, satellite	" (Hg-lamp)
Tuna purse seine (Super seiner)	One boat (60-80 m), a skiff (8 m) and two work boats (6 m)	90-120 mm black nylon 210 d/60-300	Cod-end at the end of net (1200-2000 m x 250-300 m)	One purse line (iron wire)	Sighting, fish shelter (FADs or Payao), luring light, sonar	"	Capstan, winch boom crane electric luring lamps, purse line winch, power block





SURROUNDING NET

Rocky fish surrounding net
Uan Lom Hin

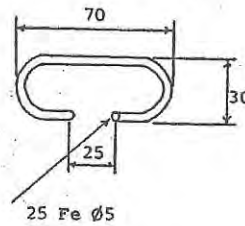
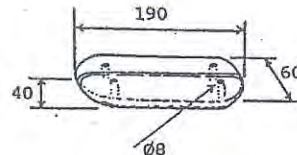
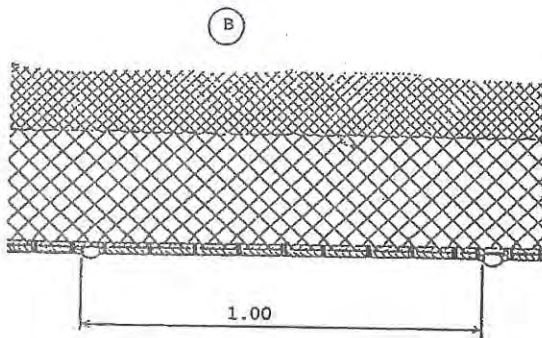
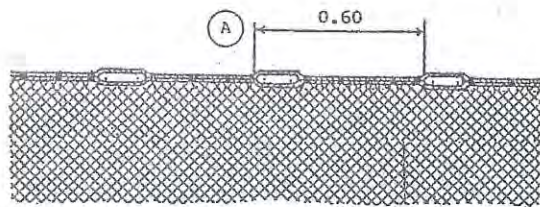
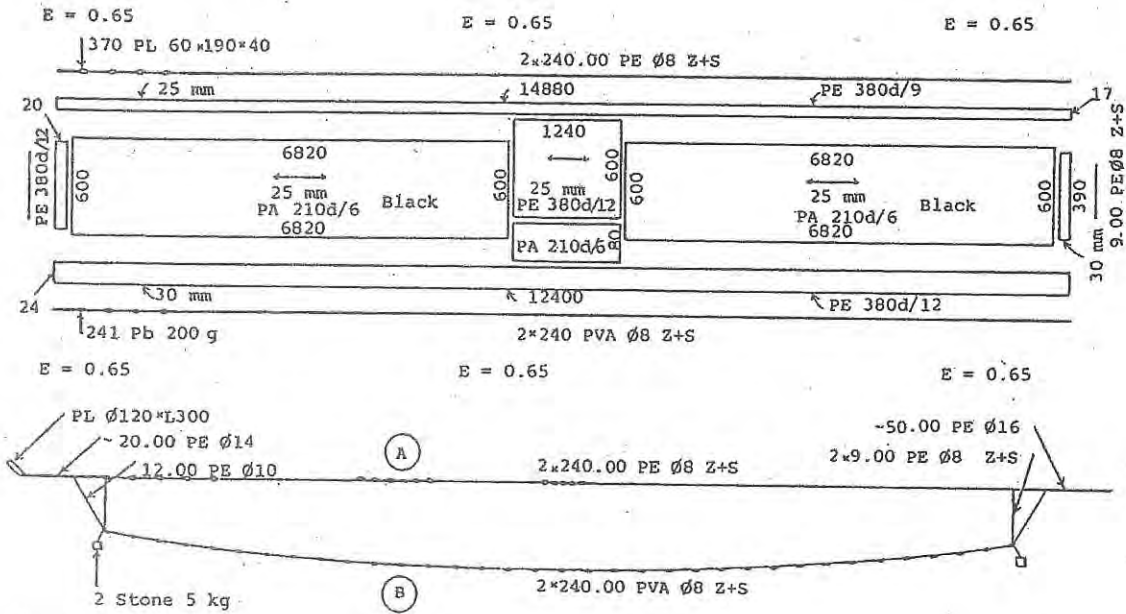
Cavalla, barracuda
Yellow-tail fusilier

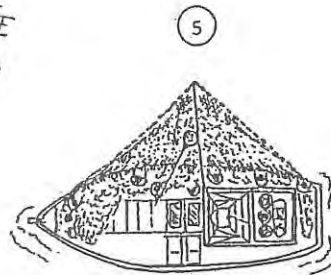
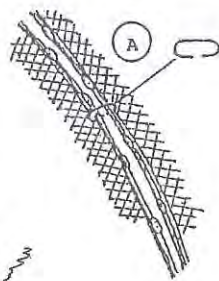
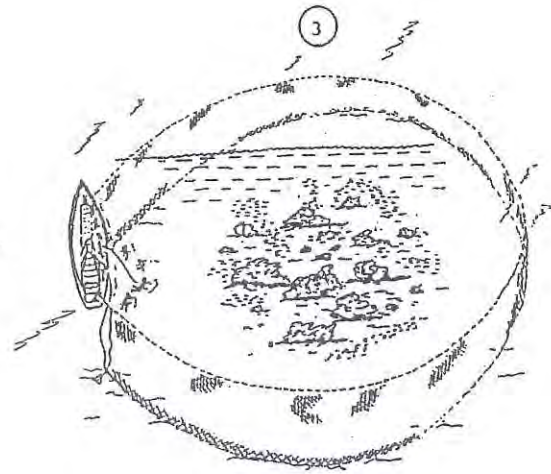
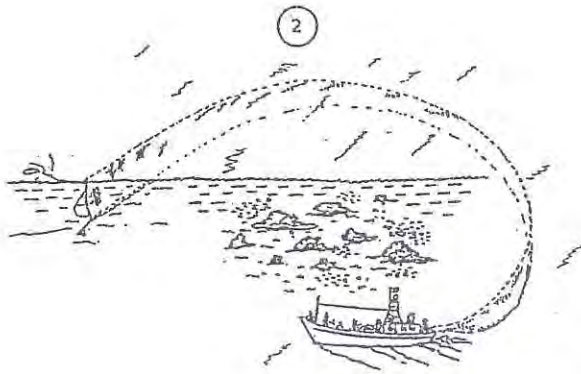
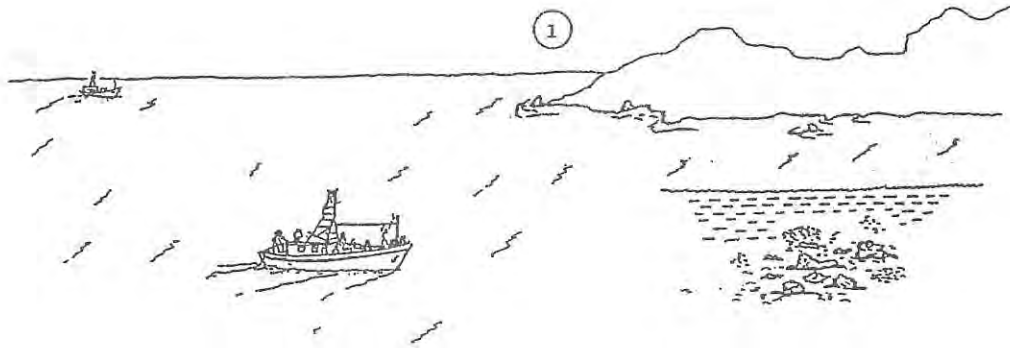
VESSEL

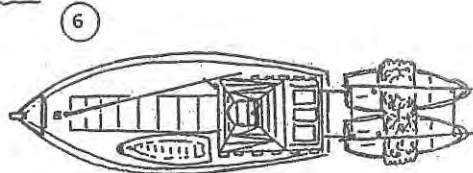
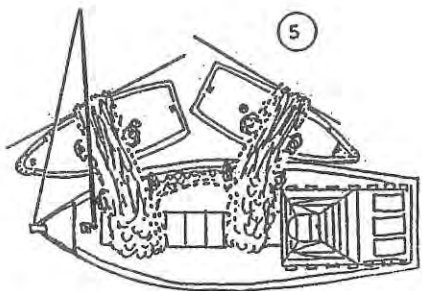
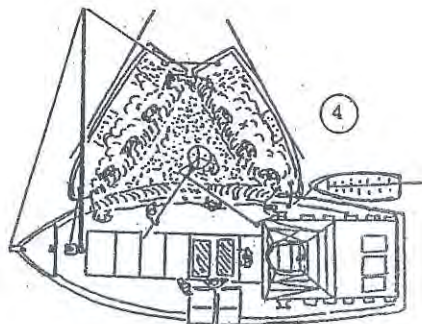
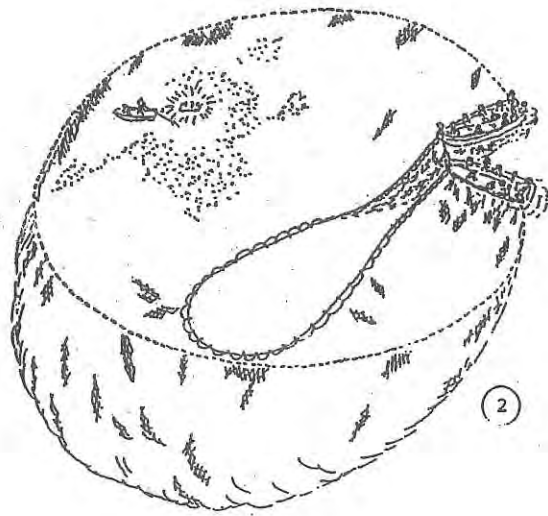
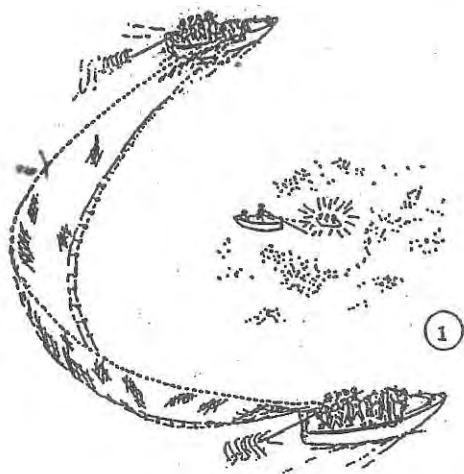
Loa 10 m
hp 10
AG Air compressor

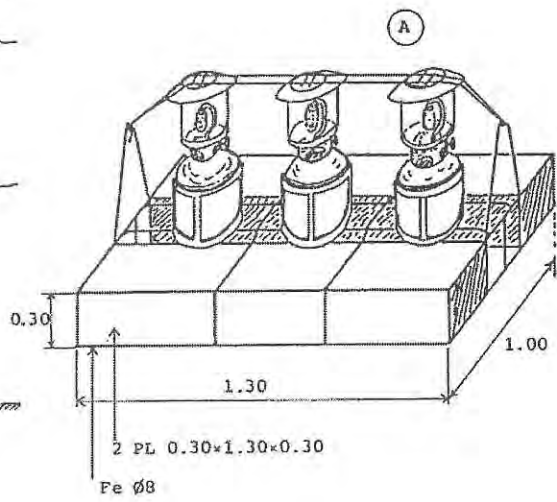
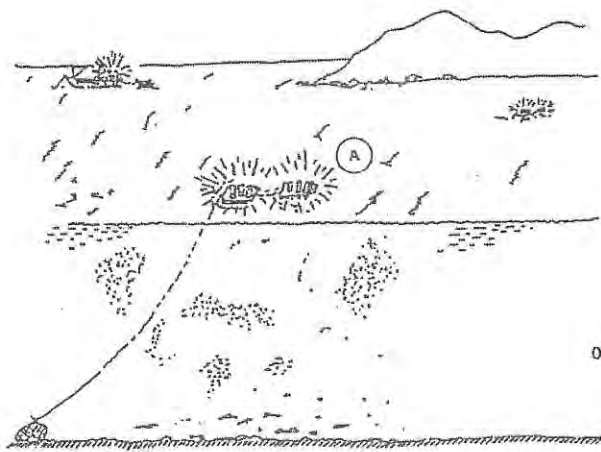
LOCATION

Ao Makhampon
Rayong









SURROUNDING NET

Anchovy purse seine
 Uan Lom Pla Ching Chung

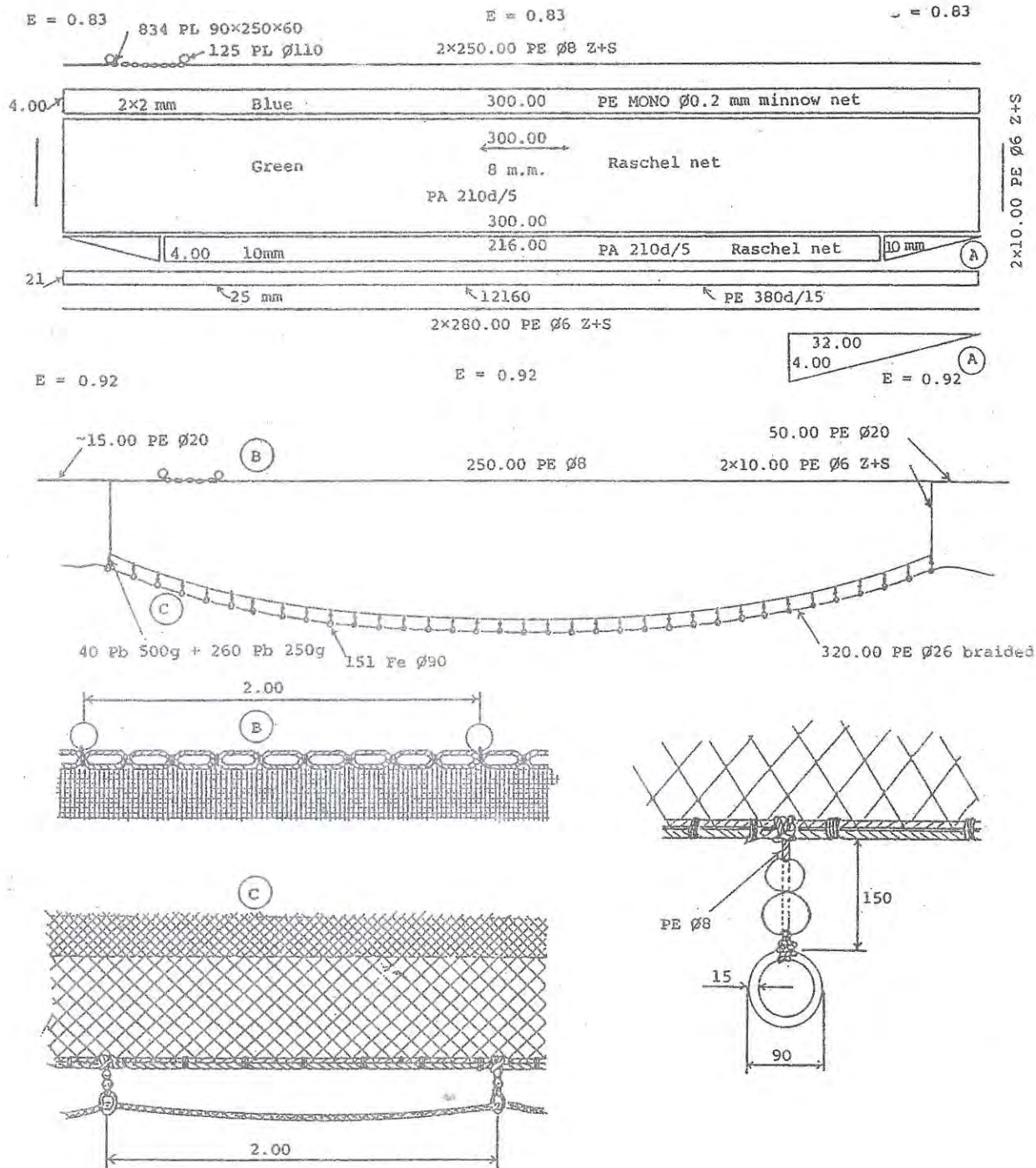
Anchovy, sardine

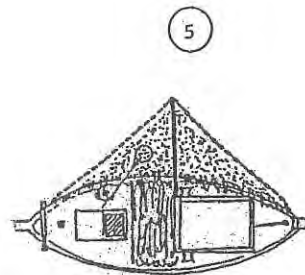
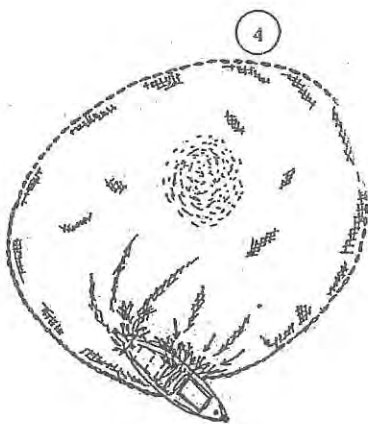
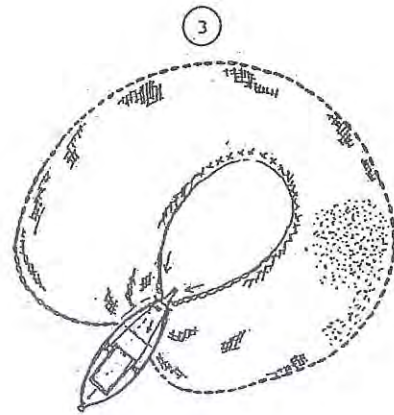
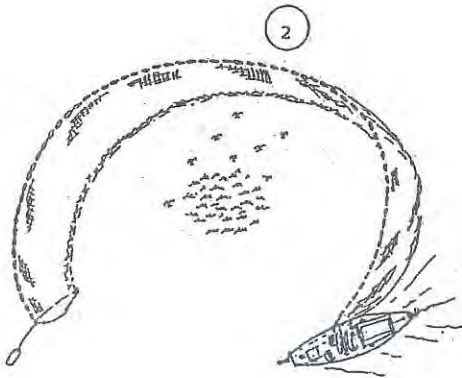
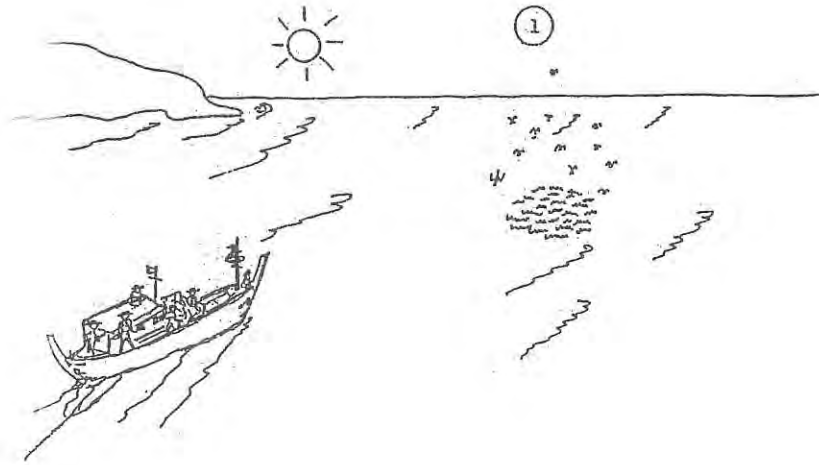
VESSEL

Loa 16 m
 hp 24

LOCATION

Ko Yao
Krabi





SURROUNDING NET

Anchovy purse seine
 Uan Lom Pla Katak

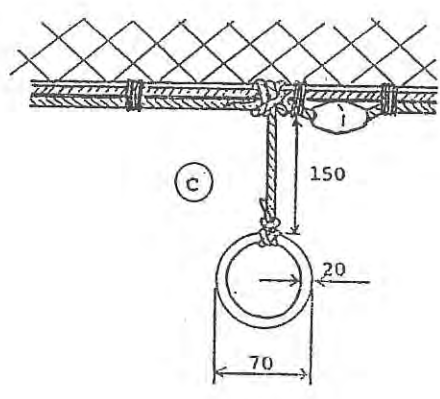
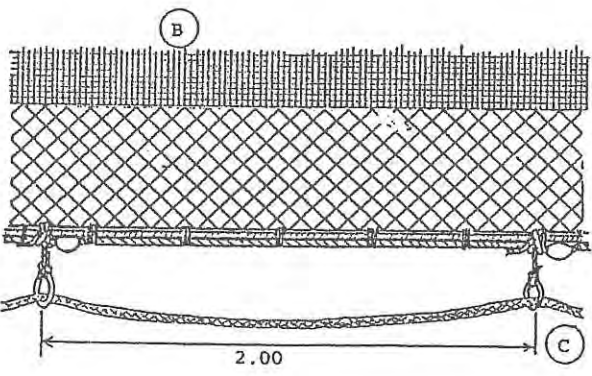
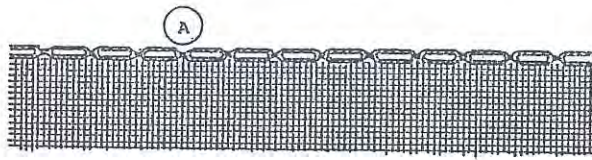
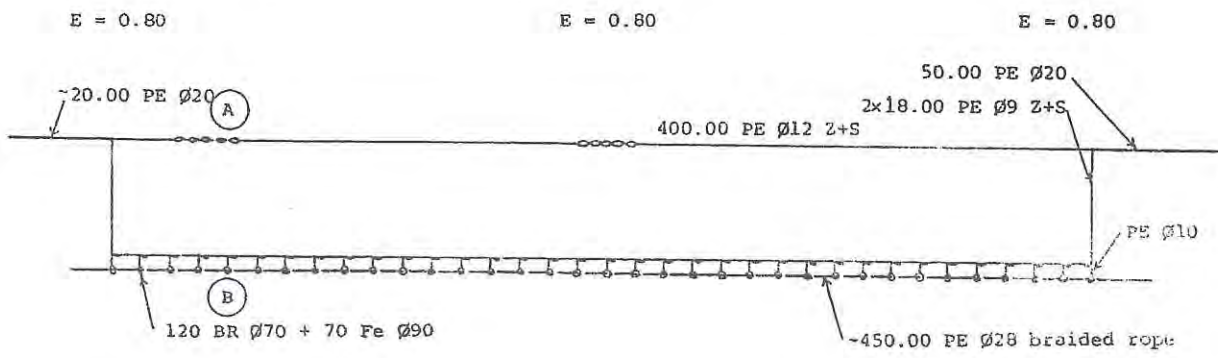
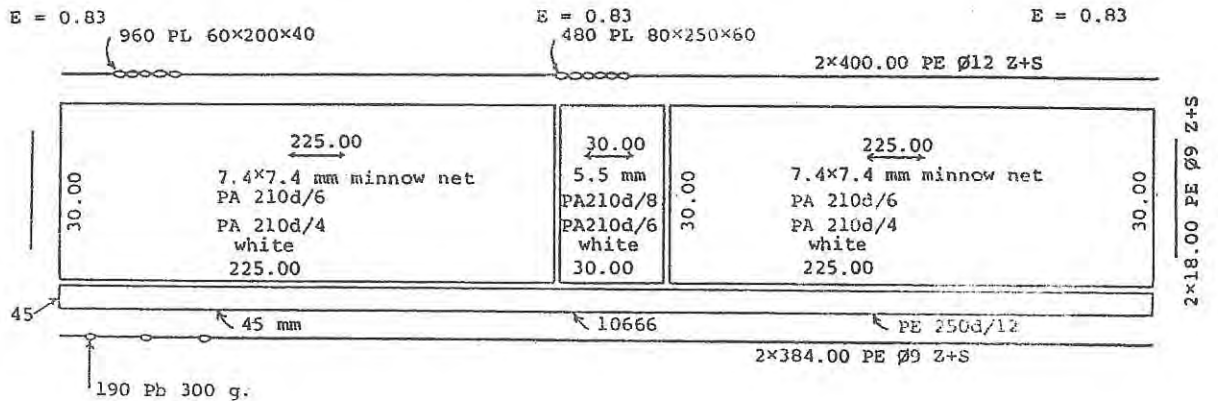
VESSEL

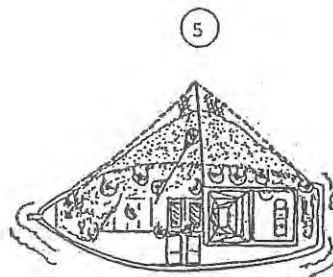
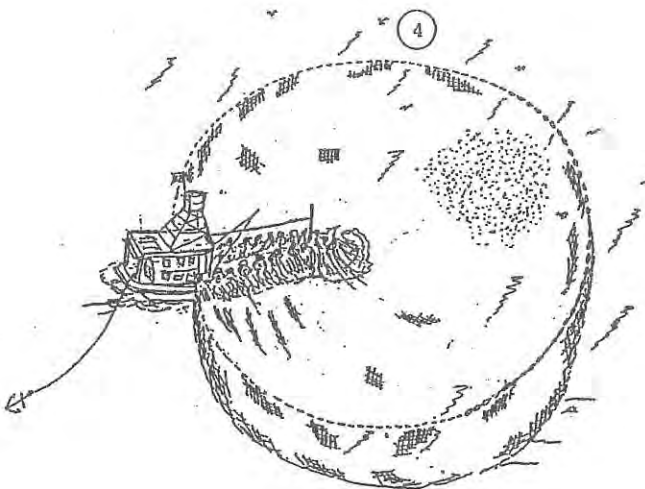
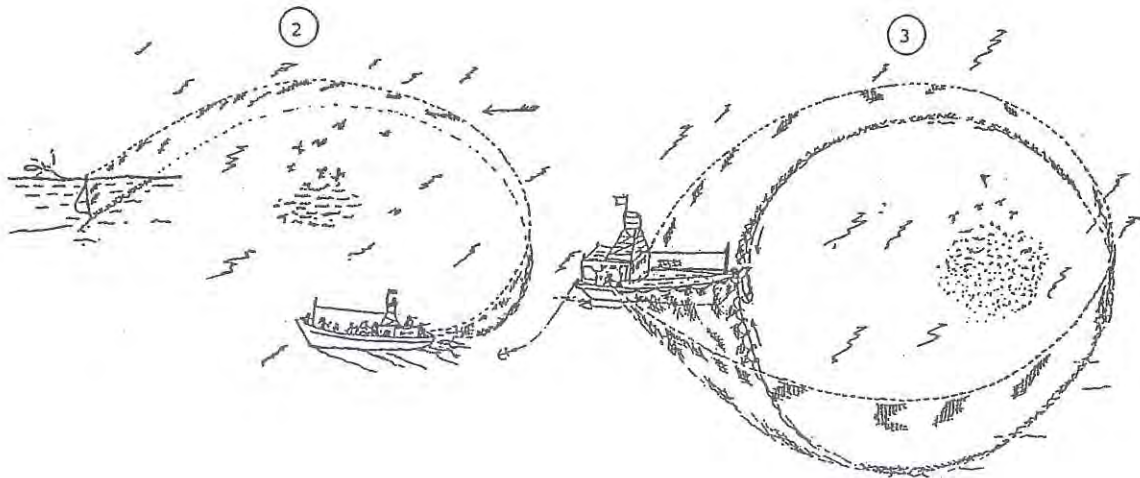
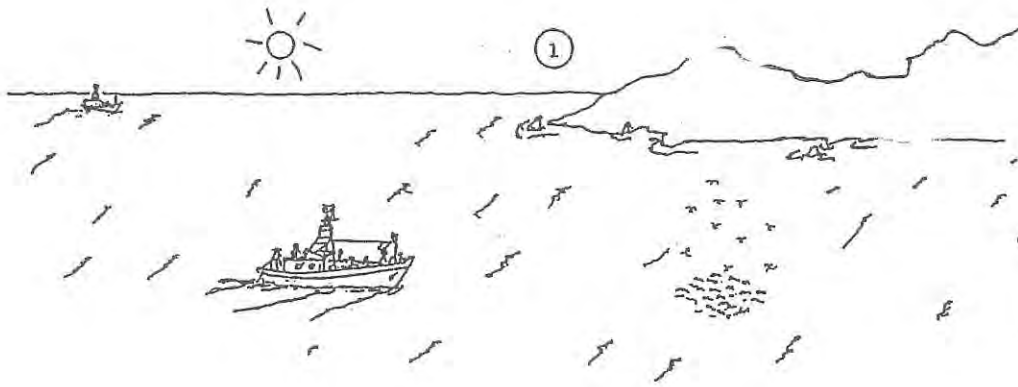
Loa 17.5 m
 hp 150

LOCATION

Ao Makhampom
 Rayong

Anchovy, Sardine





SURROUNDING NET

VESSEL

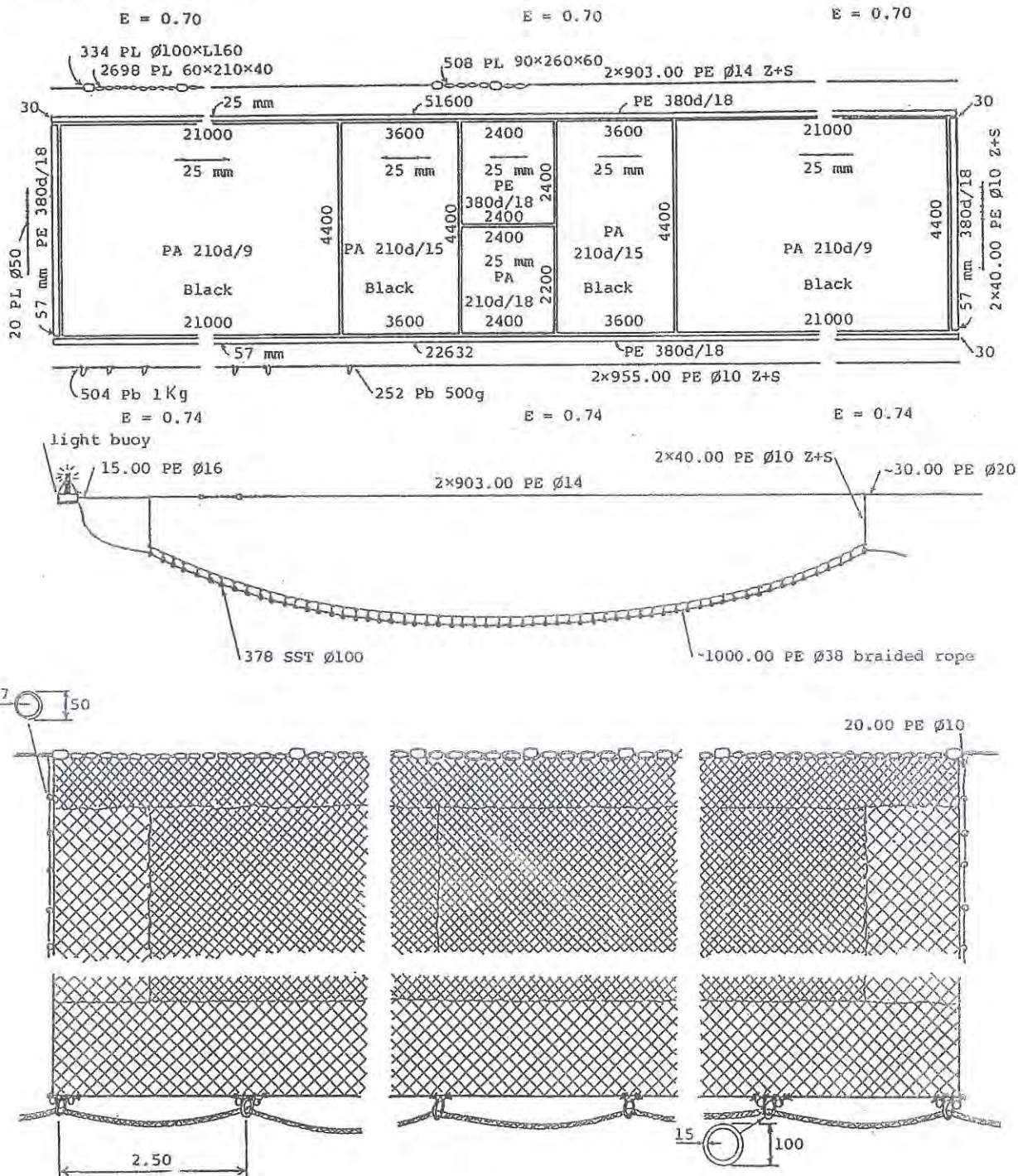
LOCATION

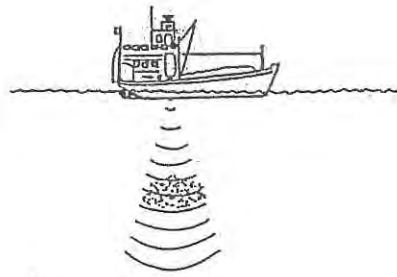
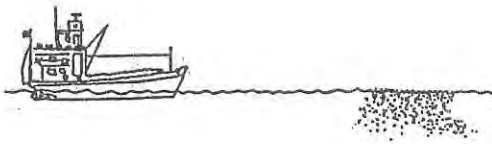
Thai purse seine
Uan Dawn

Loa 20 m
hp 320
EG 30 KVA

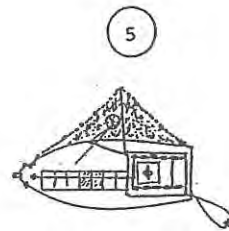
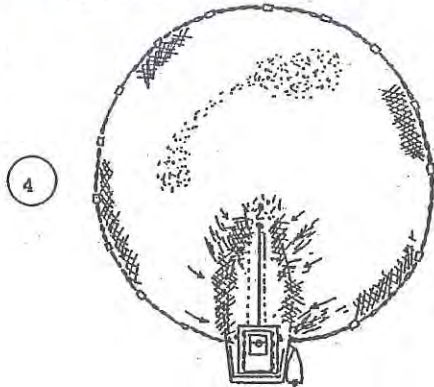
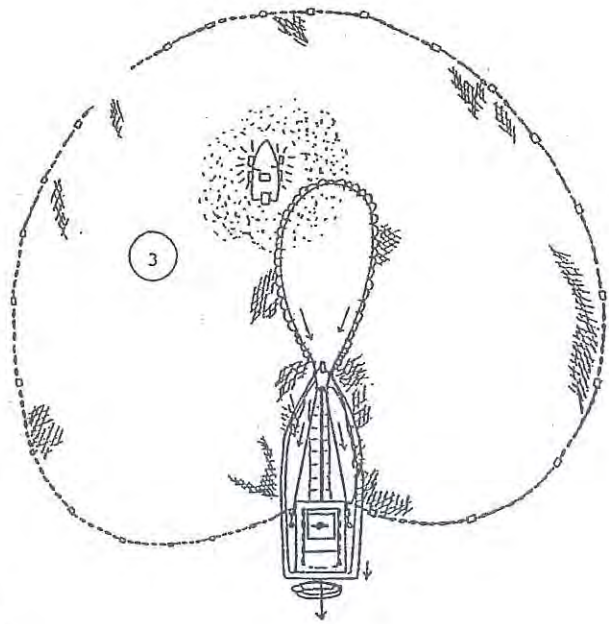
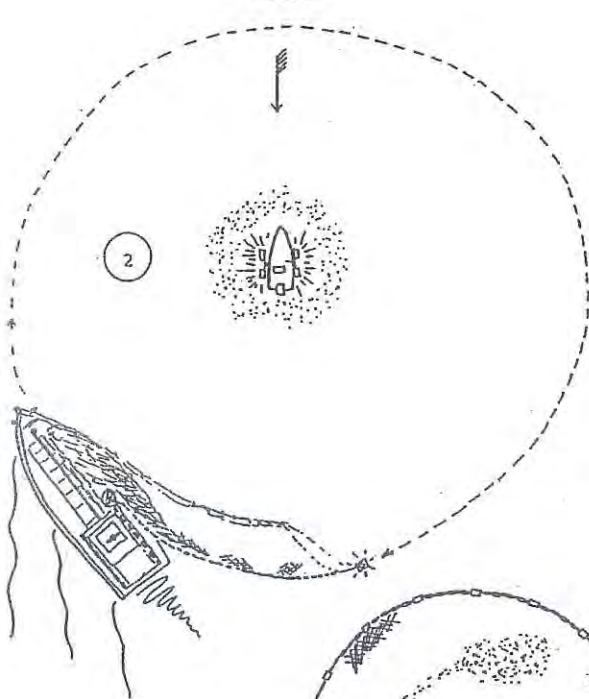
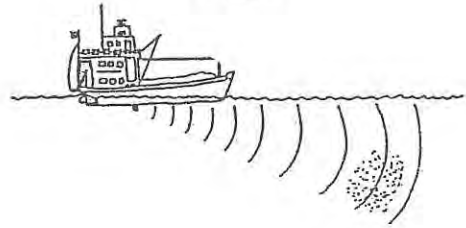
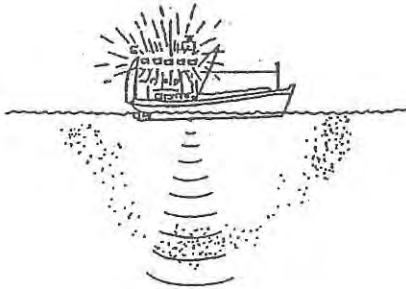
Prachuap
Prachuap Khiri Khan

Indo-pacific mackerel, Indian
mackerel, Scad, Sardine

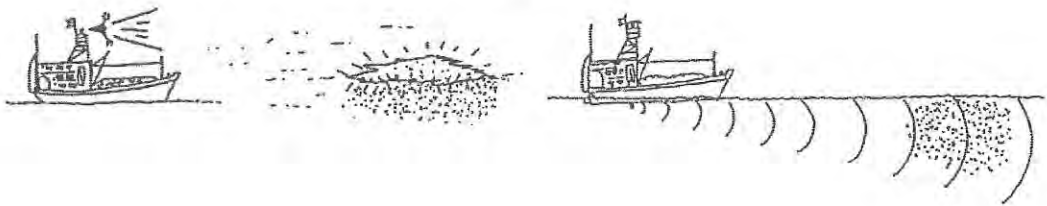




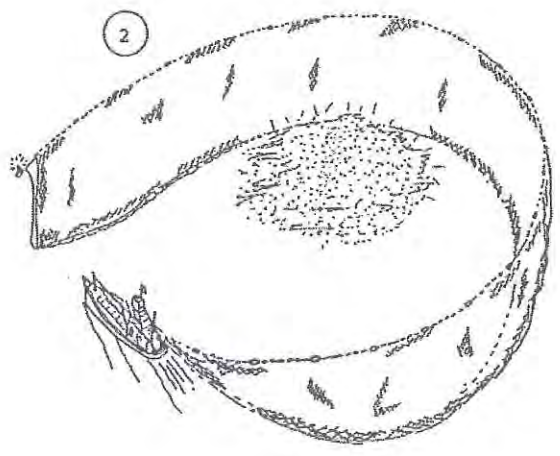
1



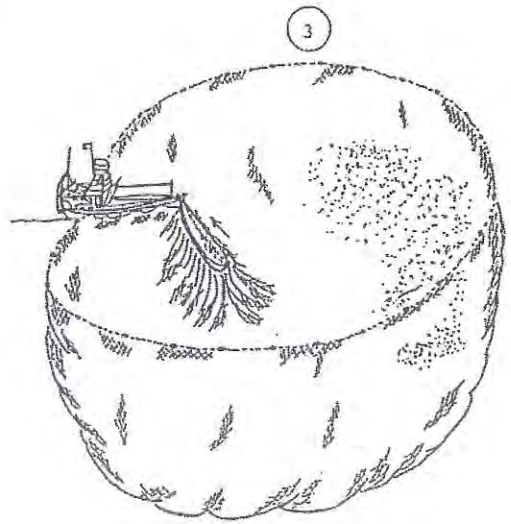
1



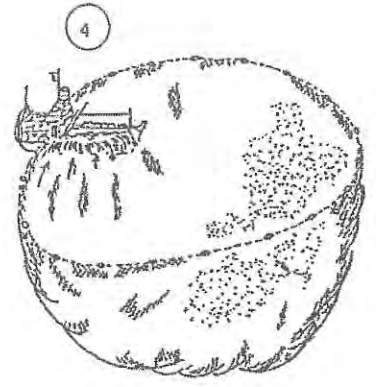
2



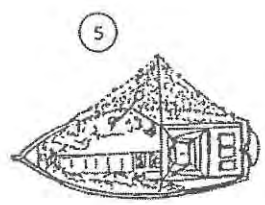
3

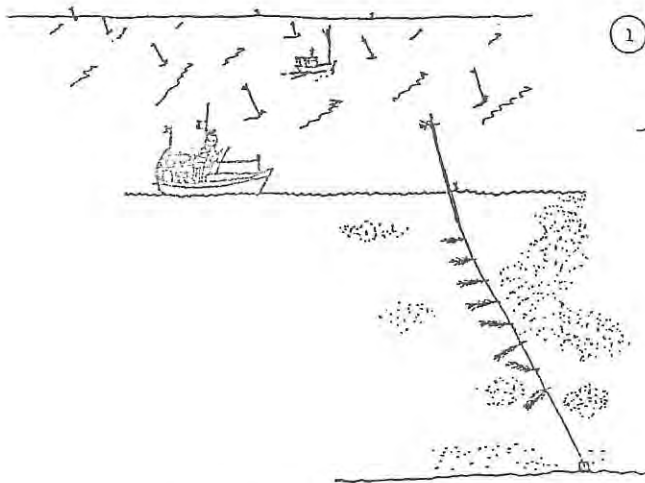


4

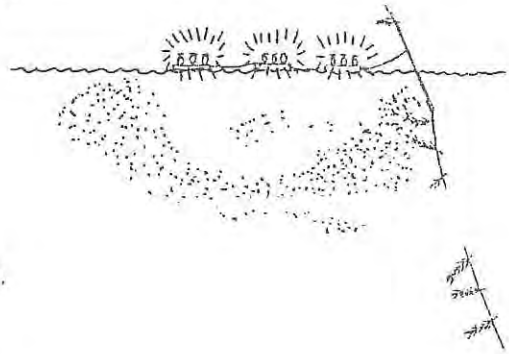


5

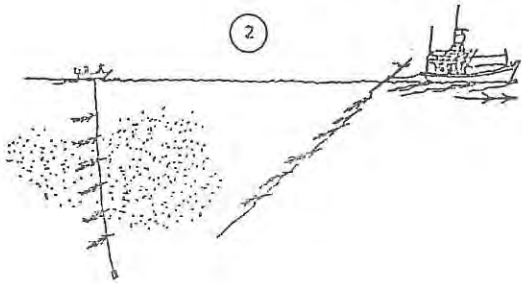




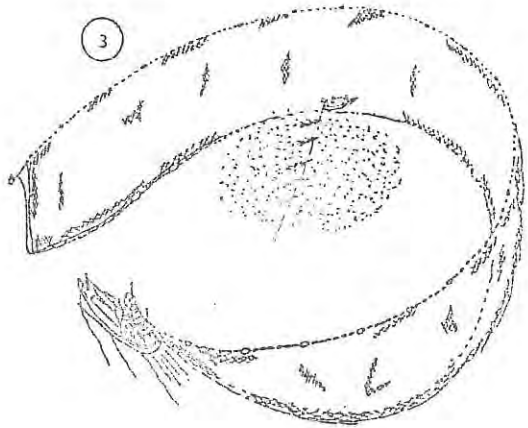
1



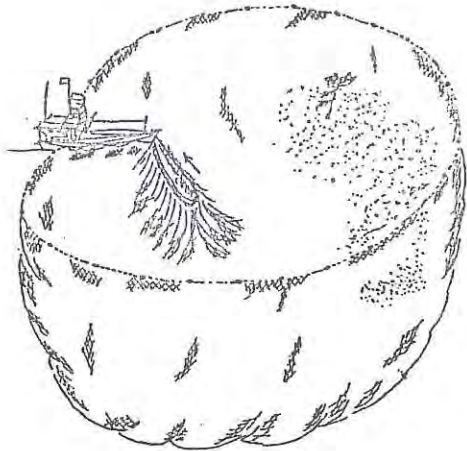
2



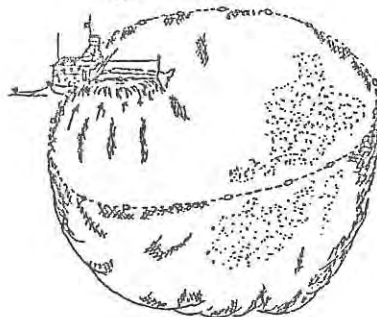
3



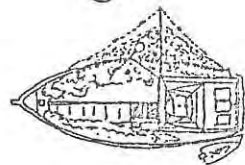
4



5



6



SURROUNDING NET

VESSEL

LOCATION

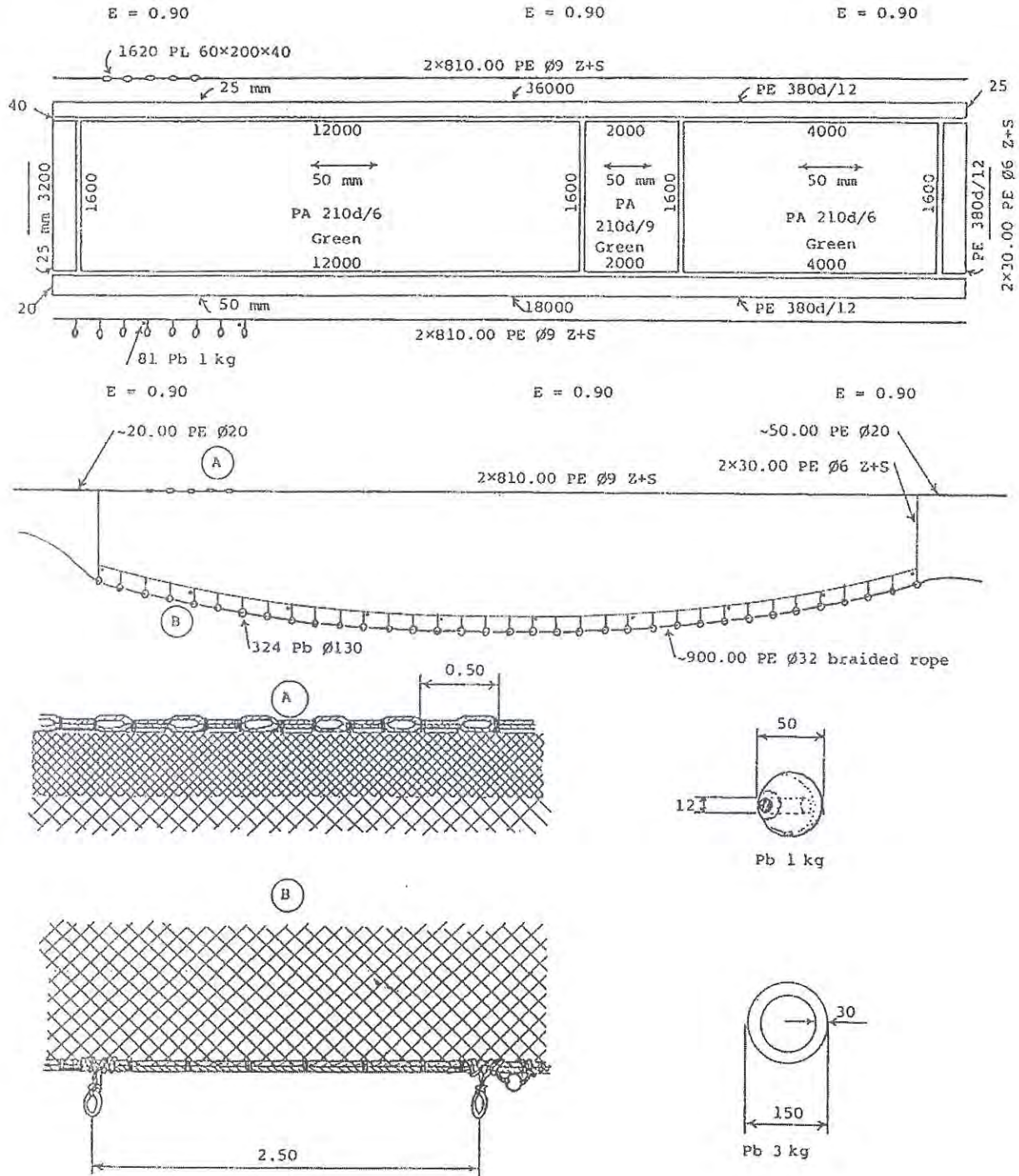
Black-Pomfret luring purse seine
Van Sung O Cheer

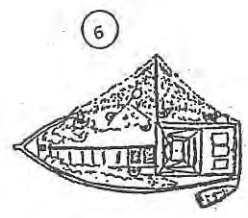
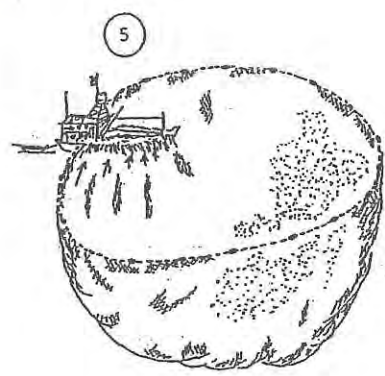
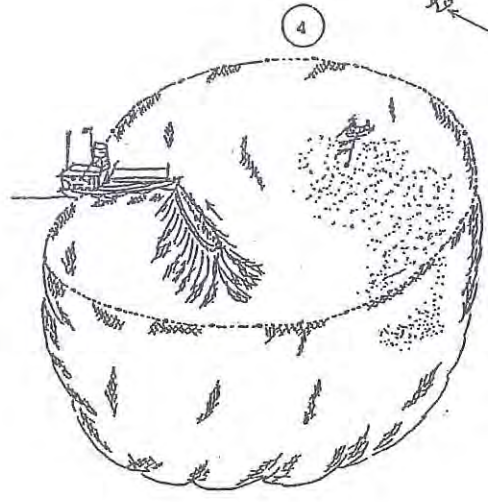
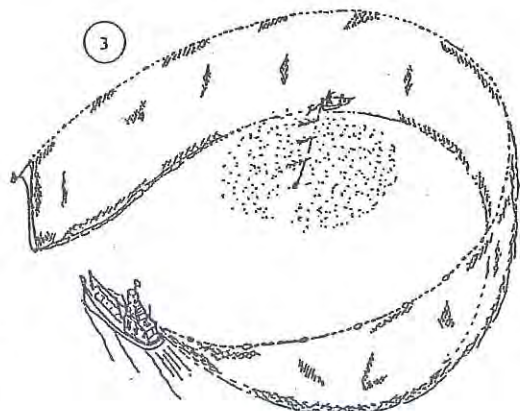
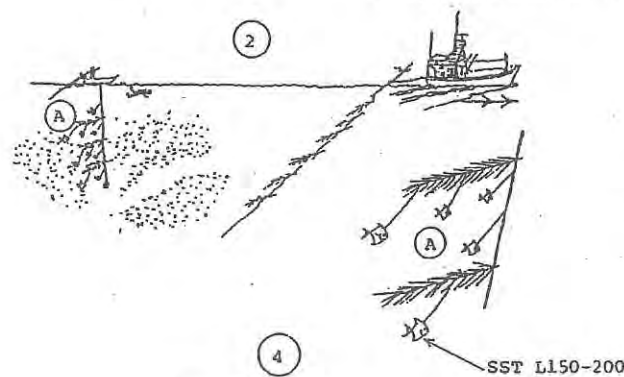
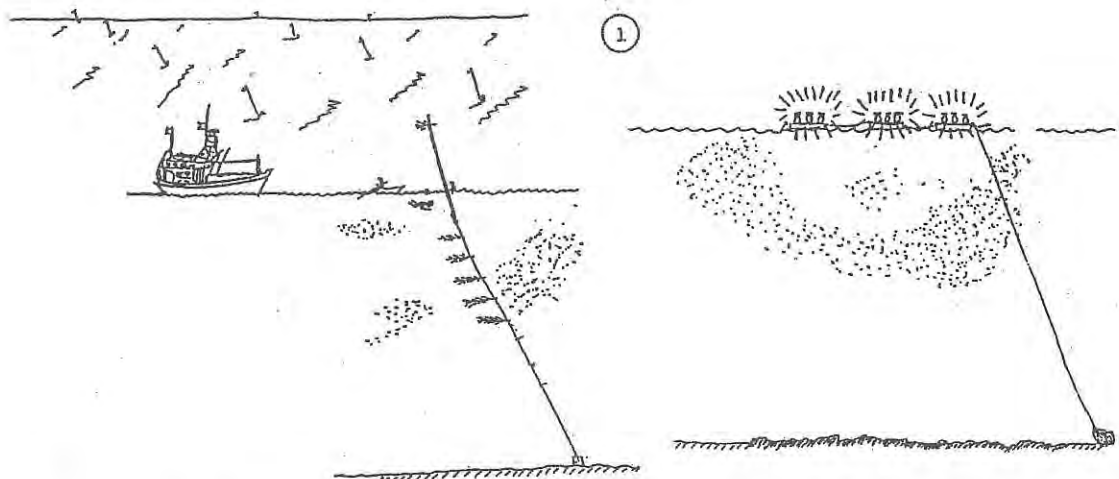
Loa 15 m
hp 240

Ranong

Black pomfret, Bonito,
Spanish mackerel

Ranong





SURROUNDING NET

Luring purse seine
Uan Takeing

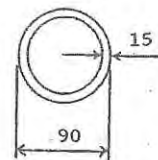
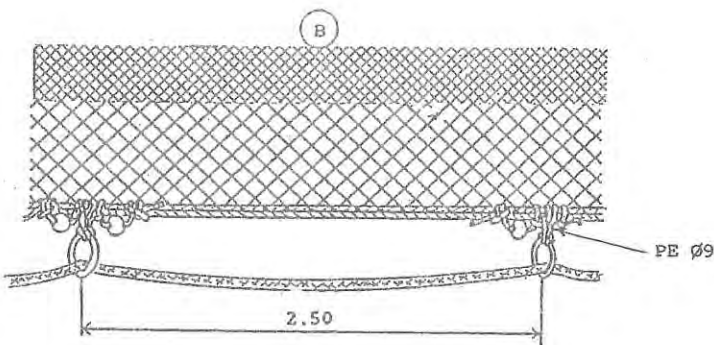
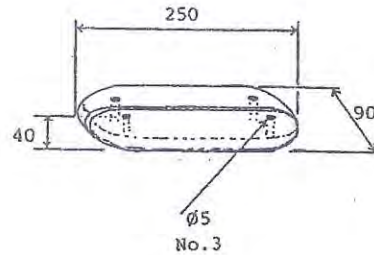
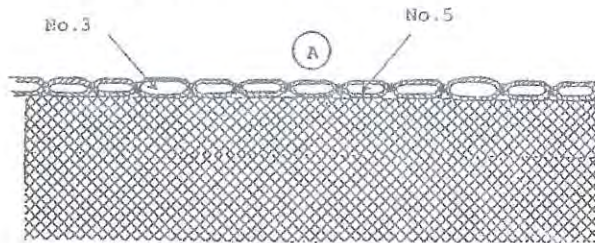
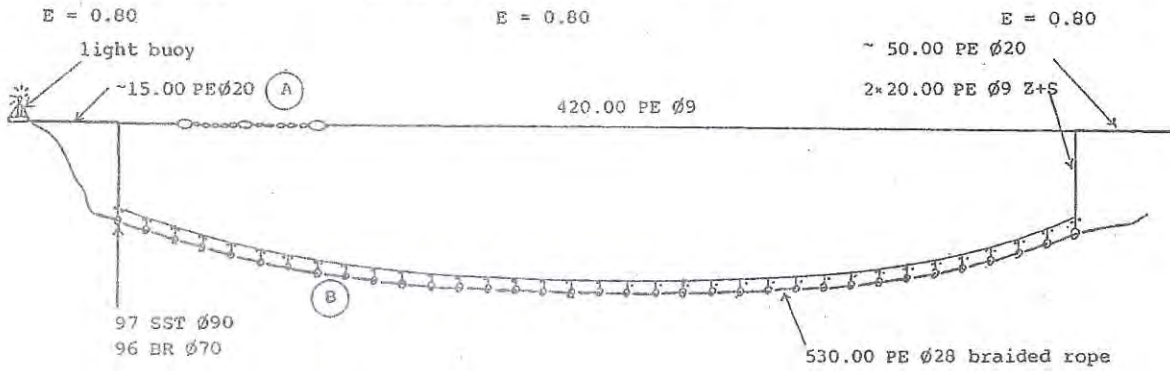
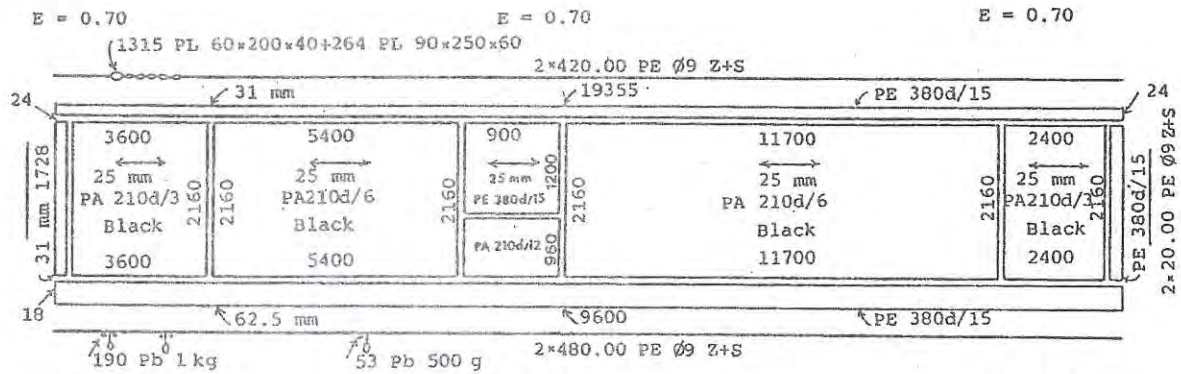
Sardine, Trevally, Indo-pacific
mackerel.

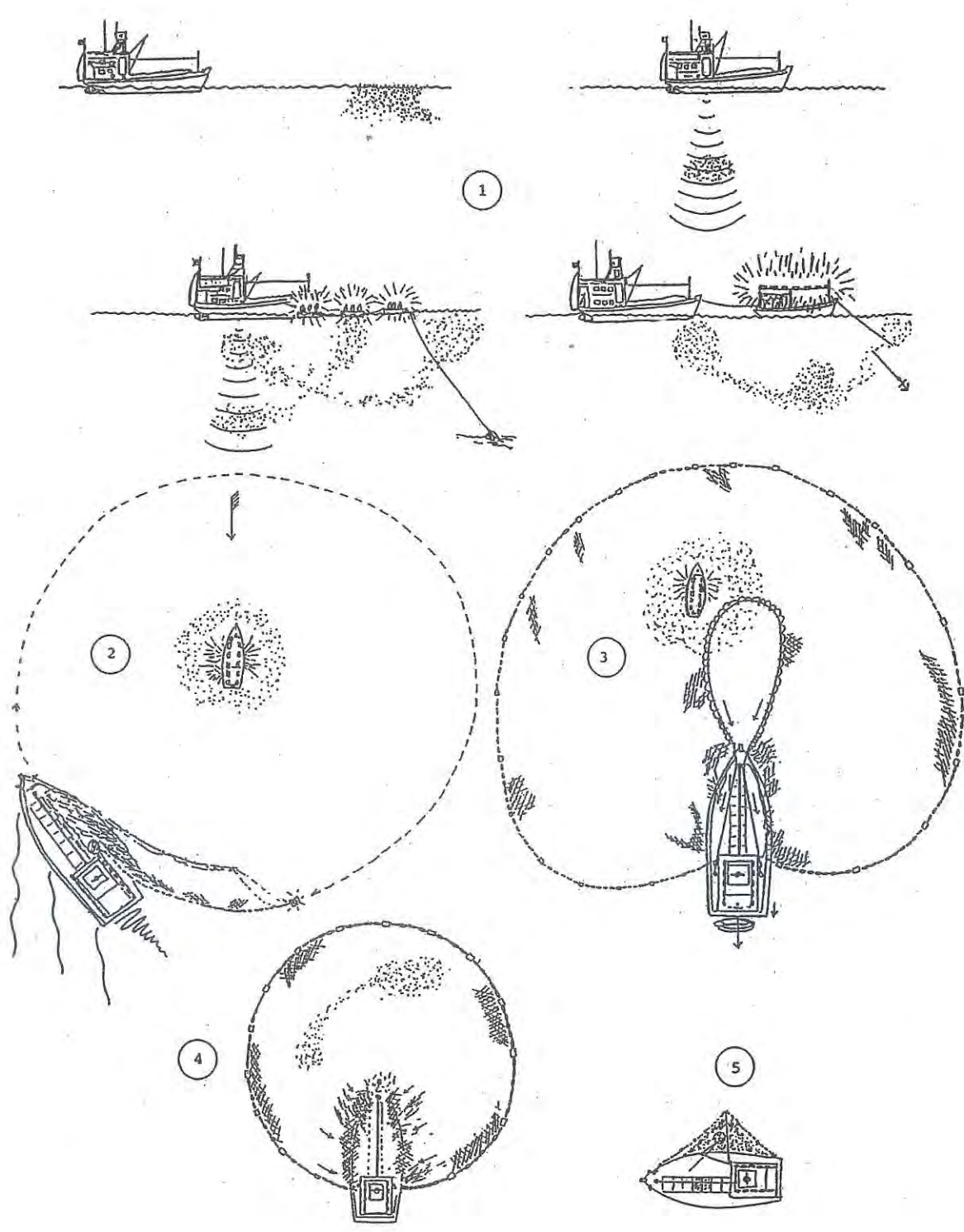
VESSEL

Loa 15 m, 10 m
hp 150, 30
EG 3 KVA, 10 KVA

LOCATION

Ban Pakbara
Satun





SURROUNDING NET

Bonito purse seine
Uan Lom Pla 0

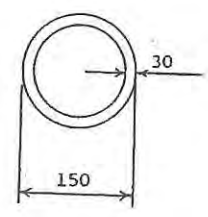
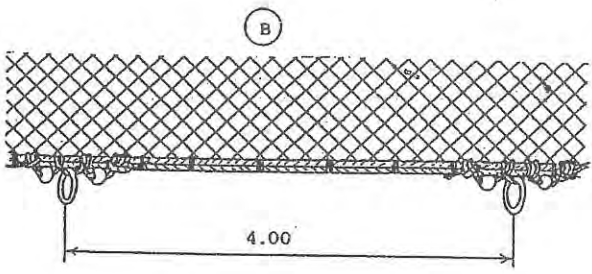
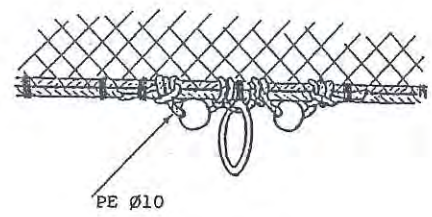
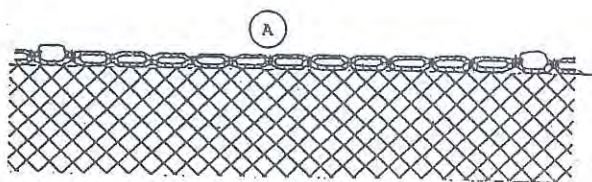
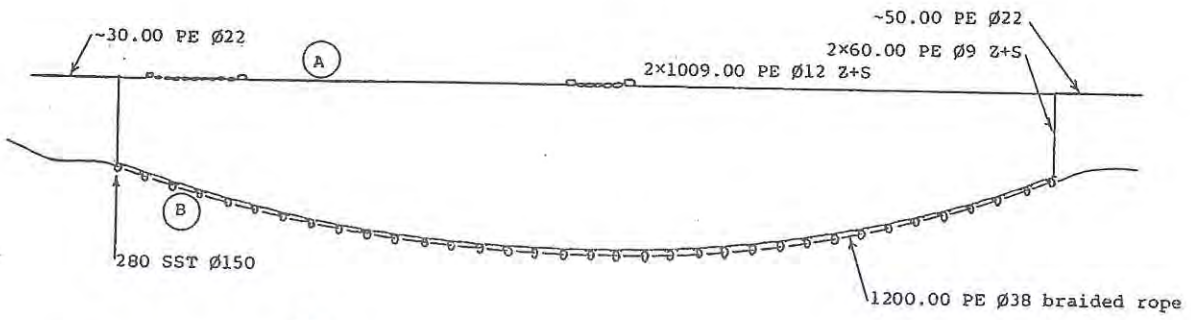
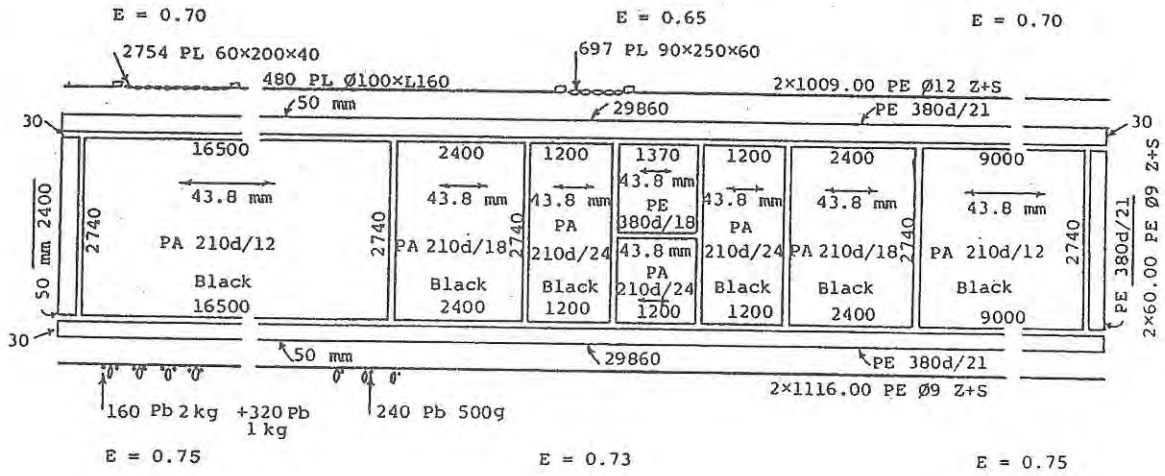
Bonito, Tuna, Trevally,
Mackerel

VESSEL

Loa 30 m
hp 350
EG 40 KVA

LOCATION

Paknum Prasae
Rayong



SURROUNDING NET

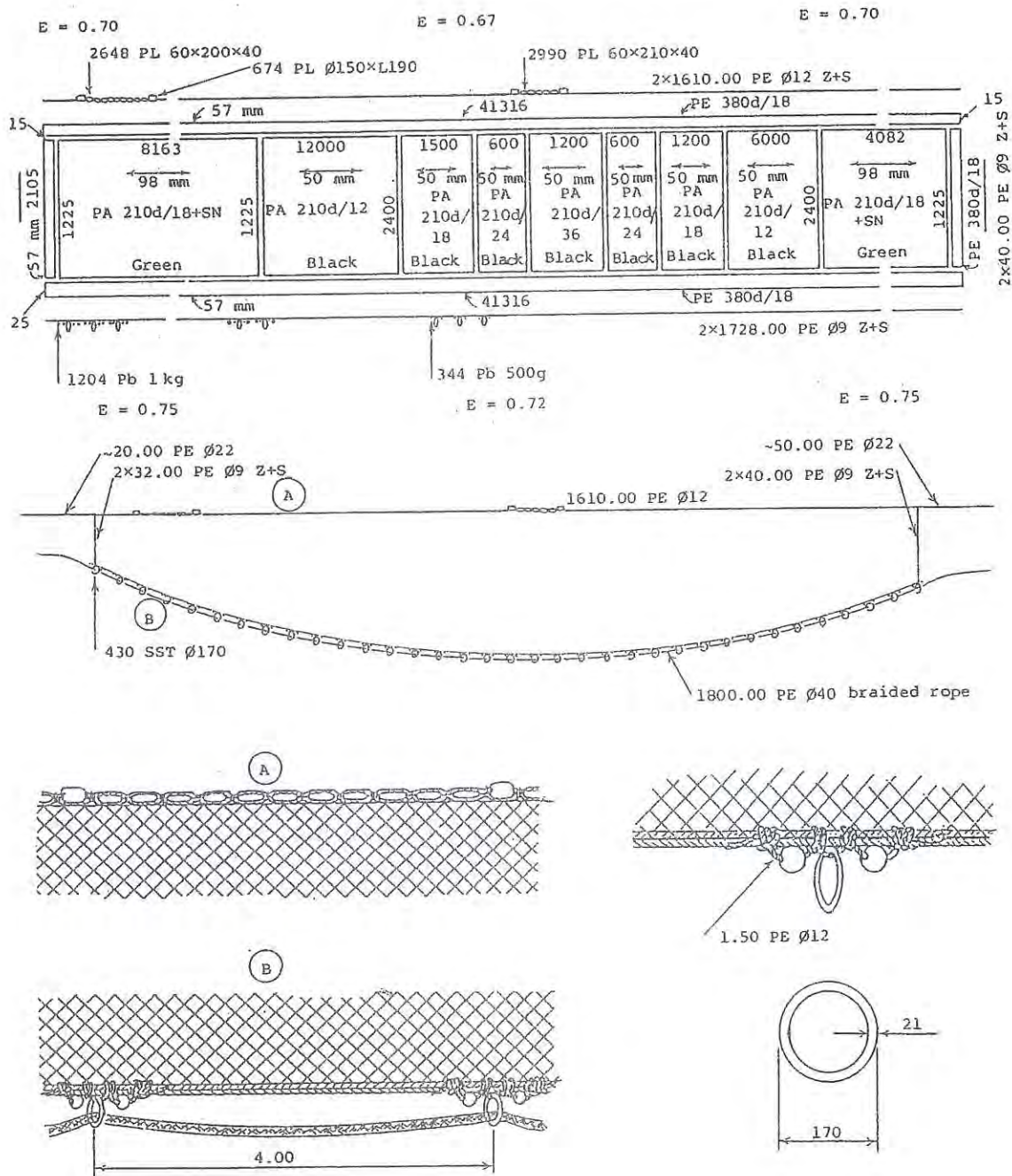
Bonito purse seine
Uan Laom Pla O
 Bonito, Tuna, Spanish mackerel,
 Trevally

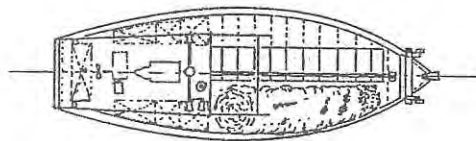
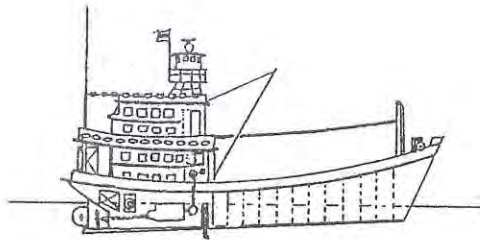
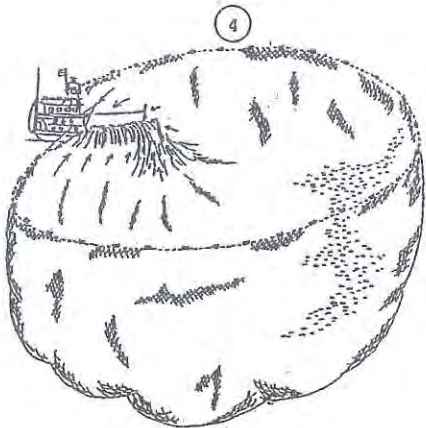
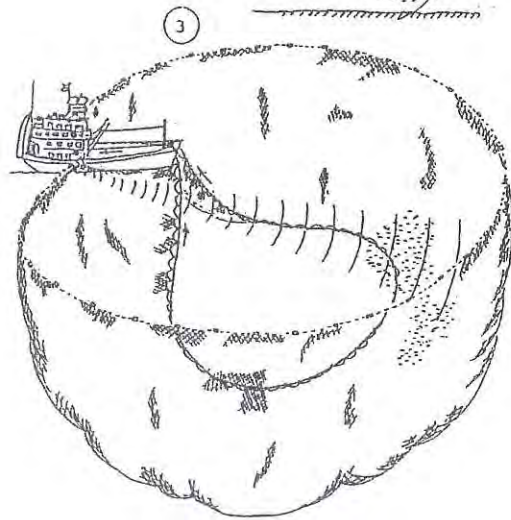
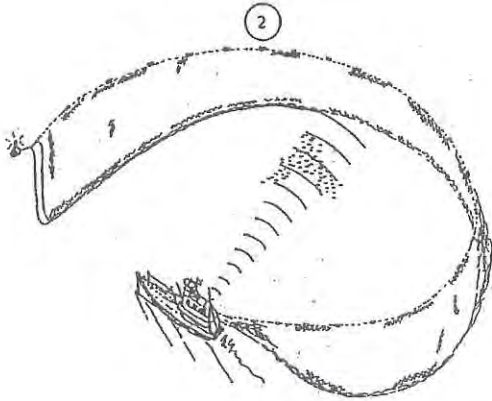
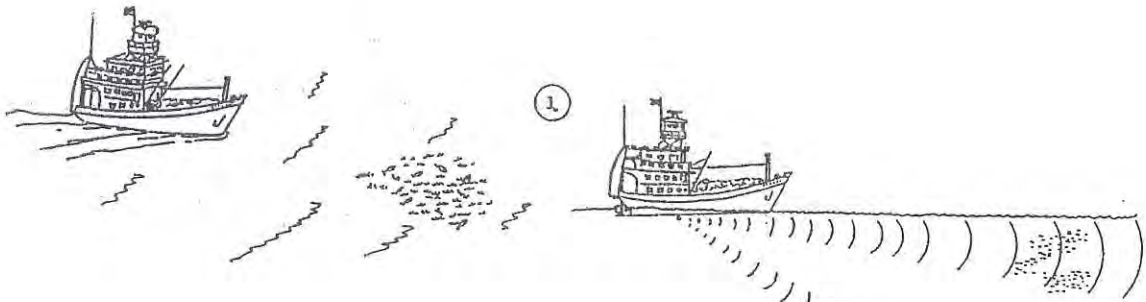
VESSEL

Loa 28 m
 GT 100
 hp 460
 EG 40 KVA
 LL 20x1000 W (Hg-lamp)

LOCATION

Paknam Prasae
Rayong





SURROUNDING NET

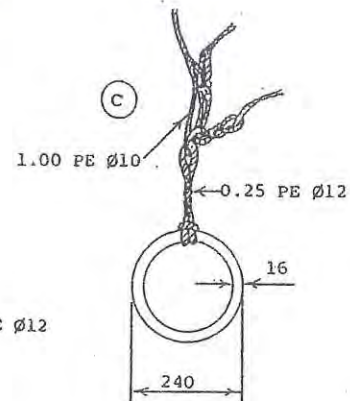
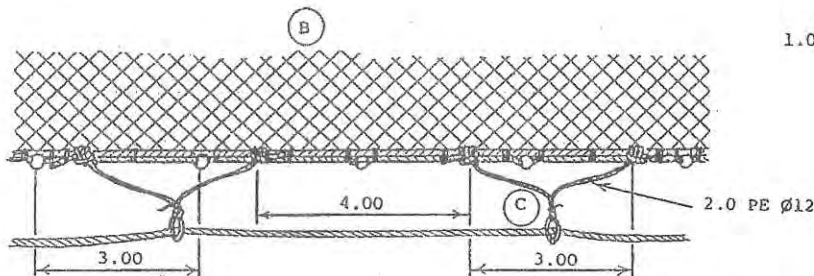
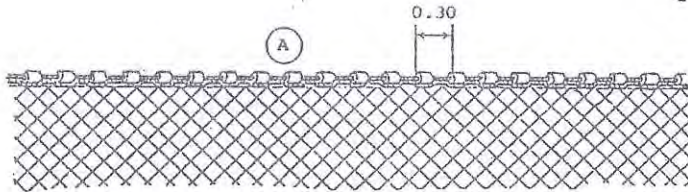
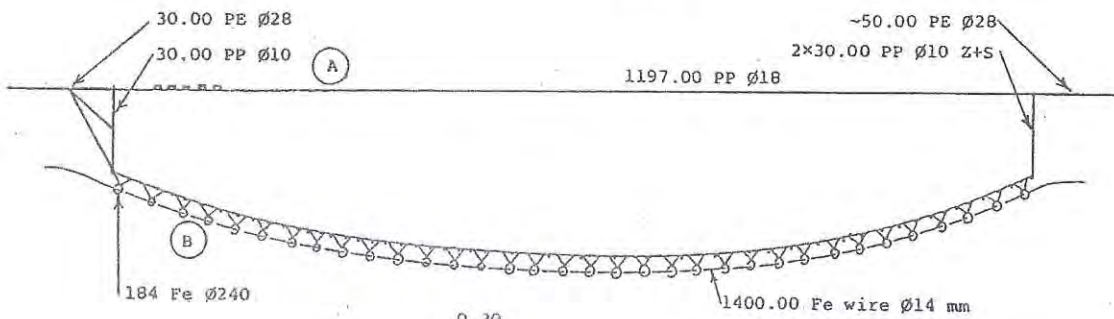
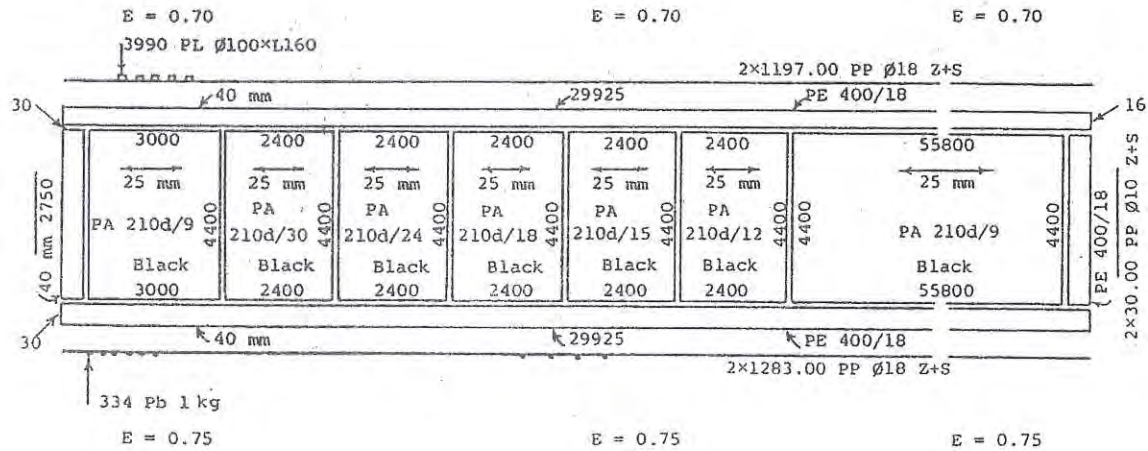
VESSEL

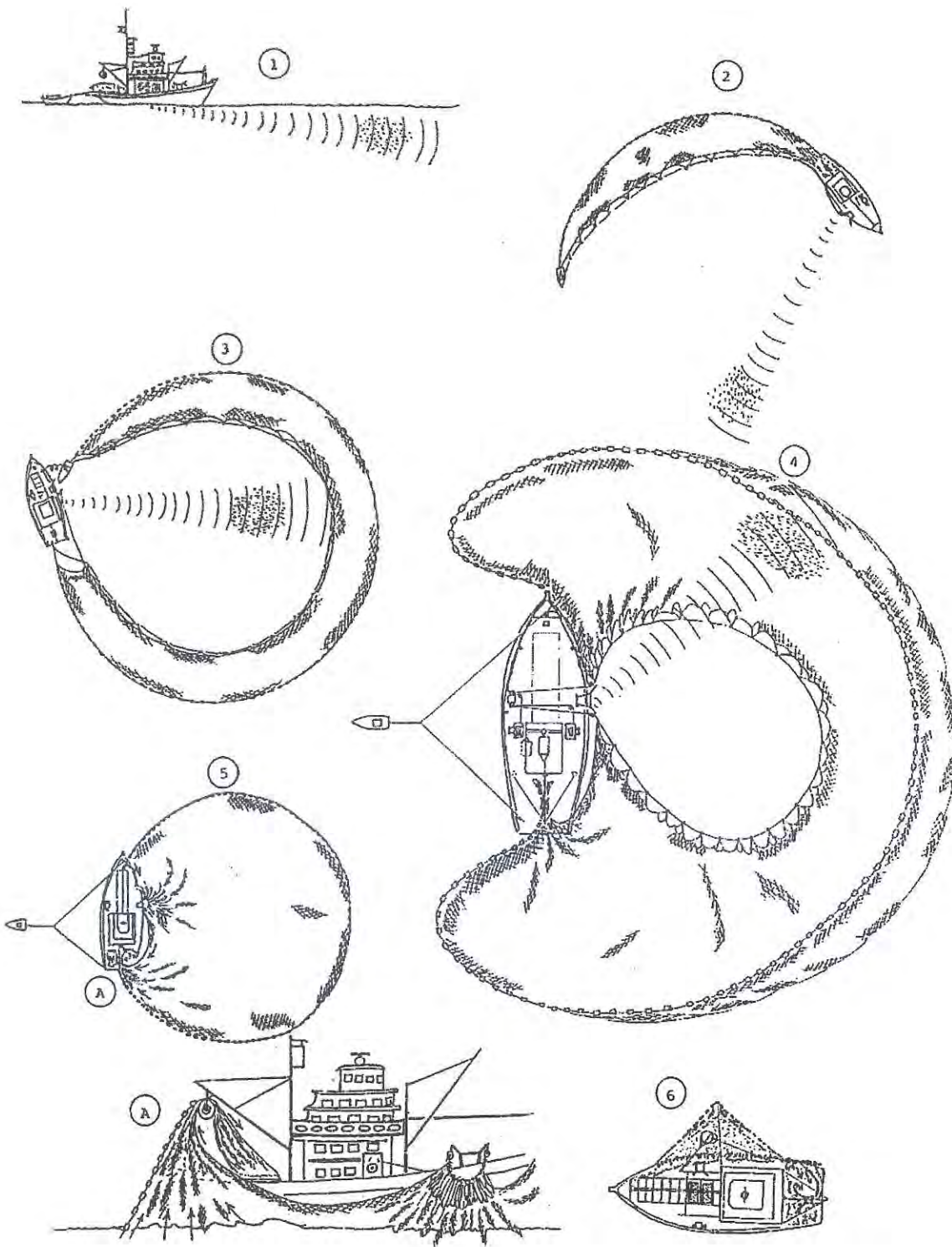
LOCATION

One boat purse seine with skiff
Uat Lom
 Scad, Sardine, Mackerel,
 Bonito

Loa 28 m + 6 m
 hp 520 145
 EG 10 KVA
 1.5 tons power block

Pattani
Pattani





SURROUNDING NET

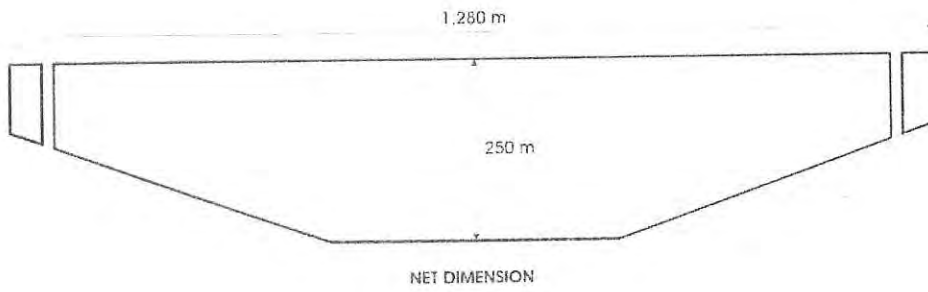
Tuna Purse Seine
Uon Lom Platoona
Skipjack, Tunas

VESSEL

Loa 65 m + 9m + 2x6 m
hp 2800ps + 400ps + 2x55ps
EG 2 x 720ps, 2 x 600KVA

LOCATION

M.V.SEAFDEC
Paknum
Samui Prakan

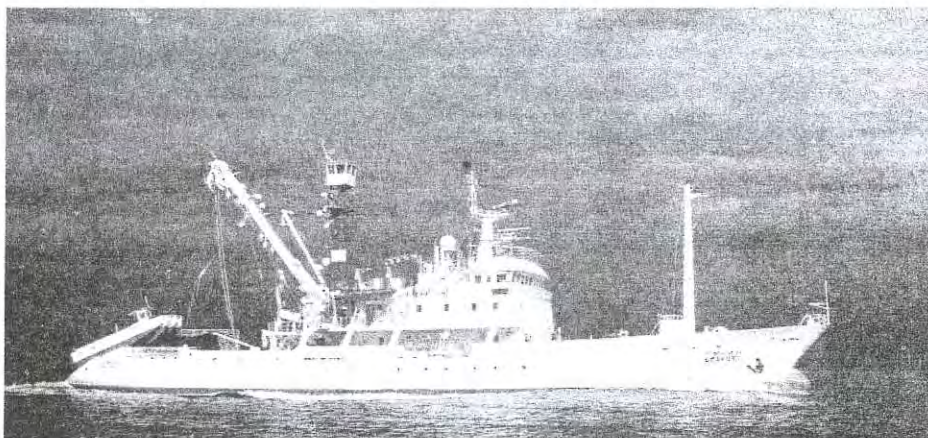
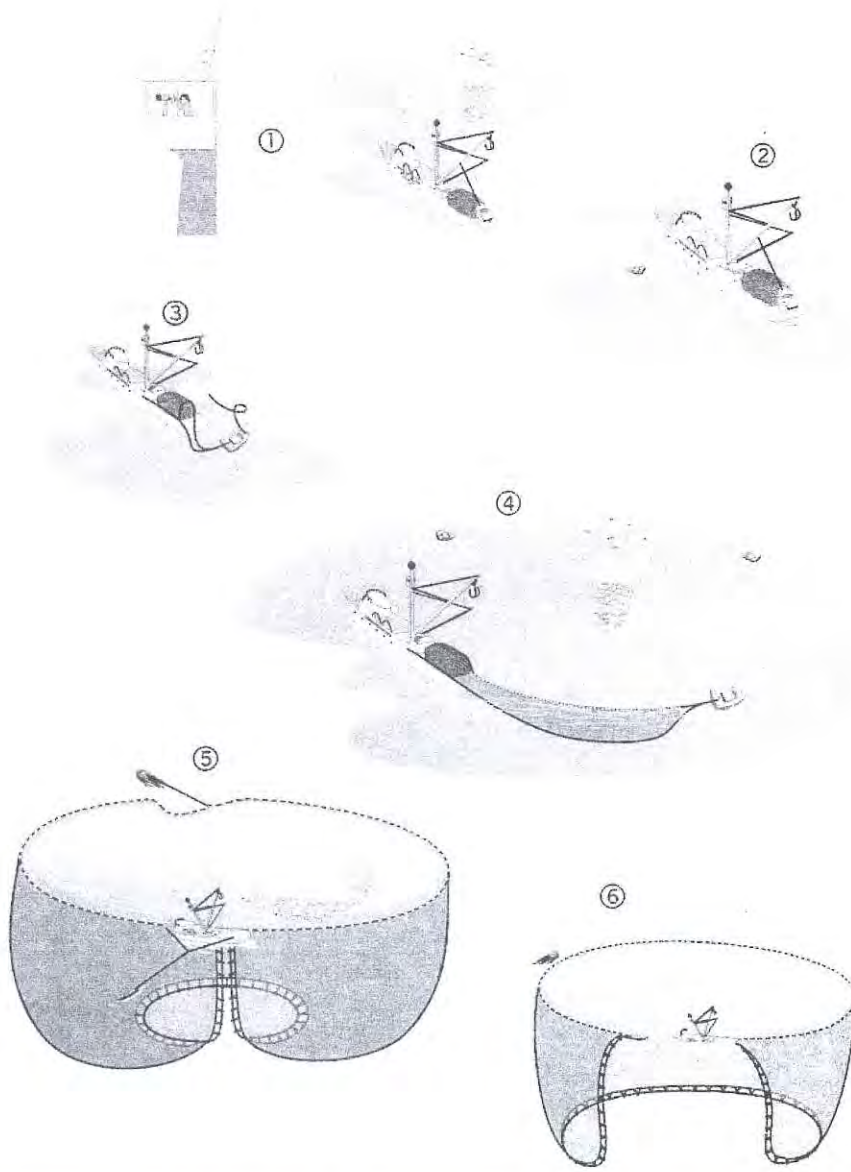


M.V SEAFDEC



Rv. 2002

Fishing operation M.V.SEAFFDEC



SURROUNDING NET

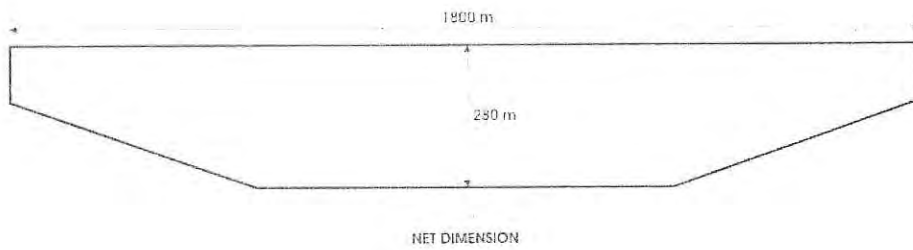
Tuna Purse Seine
Uon Lom Platoona
Skipjack, Tunas

VESSEL

Loa 62.5 + 9 + 6
hp 3200 ps + 1000
EG 3 x 600 ps, 3 x 480 KVA

LOCATION

R.V. Mahidol
Paknum
Samut Prakan

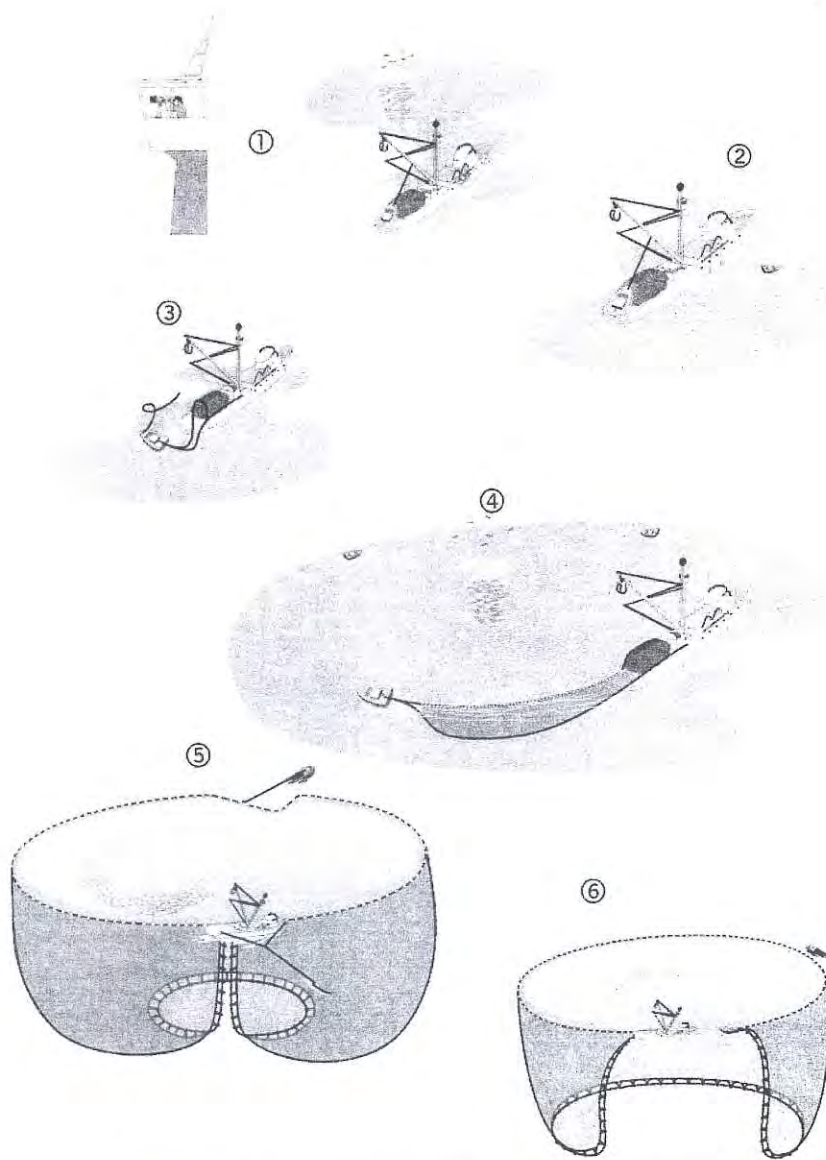


R.V. MAHIDOL



Rv. 2002

Fishing operation M.V.MAHIDOL



2. SEINE NETS

Aussanee Munprasit

Revised by

Isara Chanrachkij

CONTENTS

	Page
Seine net fishing	67
Fishing gear and methods	67
2.1 Beach seines	
Designs and specifications	68
Beach seines	68
□ Anchovy, planktonic shrimp	

SEINE NET FISHING

Seine net is a type of fishing gear which has been used in Thailand for long time ago, it is very simple fishing gear and method, so it is well known among small-scale fishermen the target species are fisheries resources who living along or near by shore such as acetes, shrimp, anchovy, Mullet, miscellaneous fishes etc. The most famous seine net is beach-seine.

FISHING GEAR AND METHODS

Beach-seine

This rather simple gear consists of two long wing nets and a bag net, or just a rectangular net without a bag. The wings are usually made of nylon, and in some cases there is a polyethylene minnow netting along the upper edge to retain small fish and planktonic shrimp. Simple beach-seines without a bag net have a 25 mm mesh-size and are intended for fish only. When there is a bag net, it is commonly made of polyethylene minnow netting, 2 x 2 mm mesh-size. The hanging ratio of wing net is about 0.7-0.9.

Fishing is done in the day-time, by 4-20 men, depending on the size of net.

SEINE NET

Beach seine
Uan Tubtaling, Uan Khen

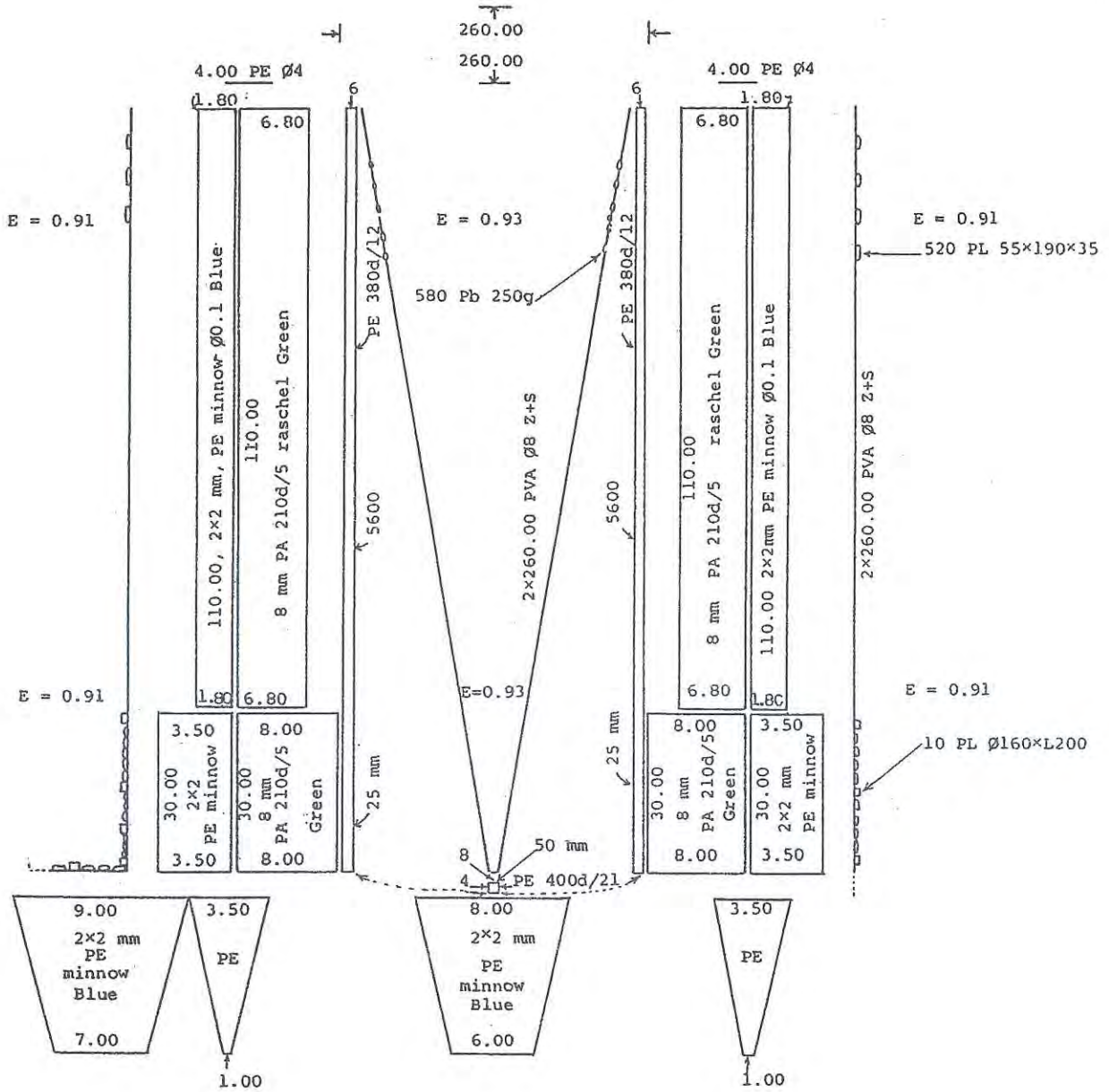
VESSEL

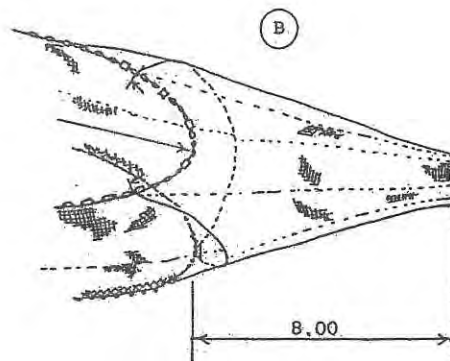
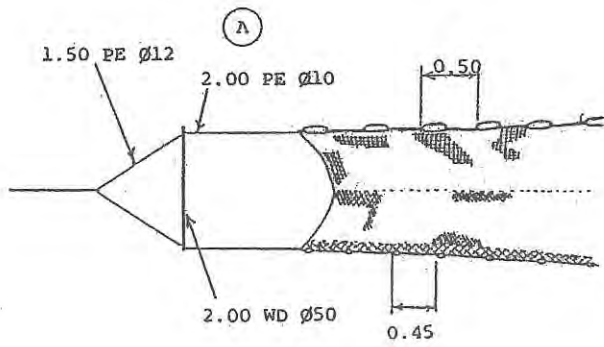
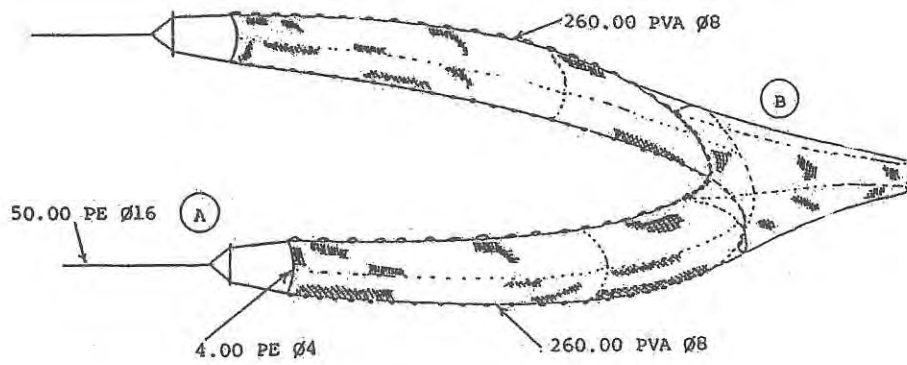
Loa 7 m
hp 3-5 LT or Rowing boat

LOCATION

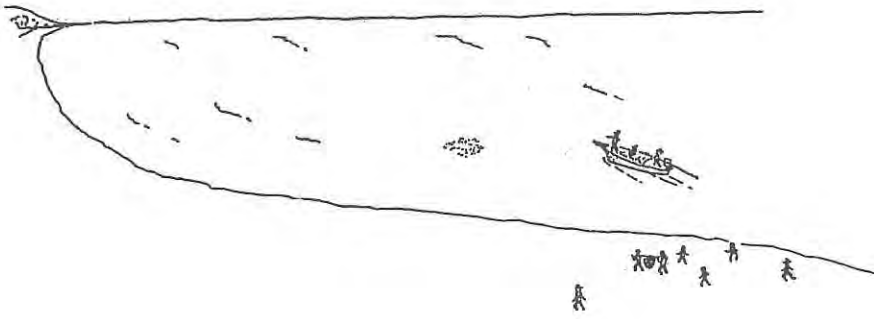
Ban Hin Khao
Rayong

Anchovy, Planktonic shrimp

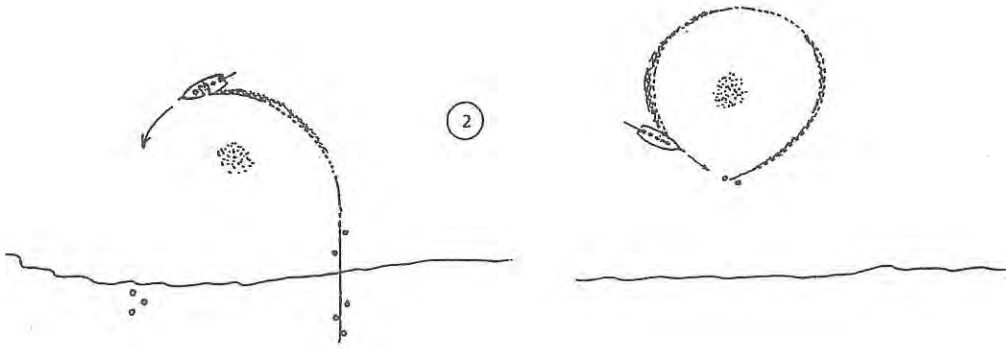




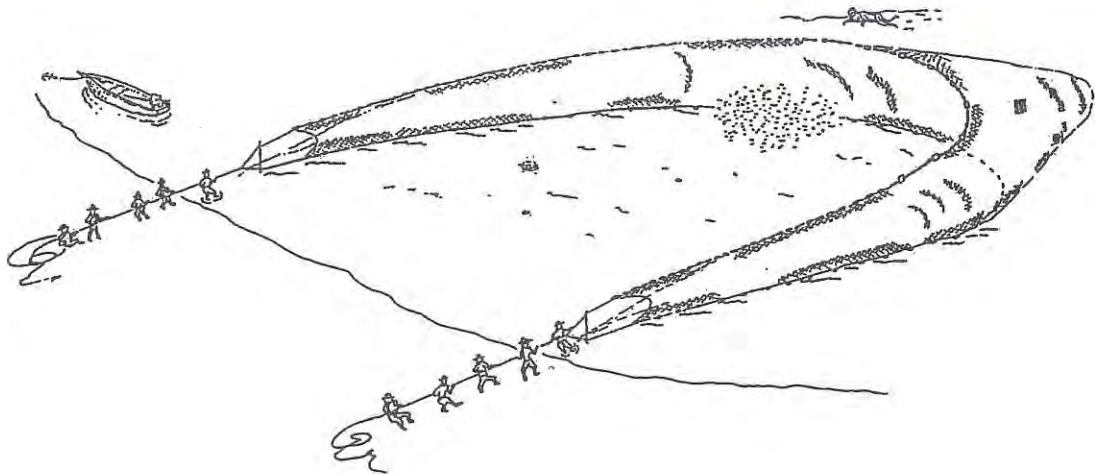
1



2



3



3. TRAWL

**Bundit Chokesanguan
Prasert Masthawe**

**Revised by
Nopporn Manajit**

CONTENTS

	Page
Trawl fishing	77
Fishing gear and method	79
3.1 Beam trawl	
3.2 Otter trawl	
3.3 Otter trawl with booms	
3.4 Pair trawl	
Design and specification	83
<u>Beam trawl</u>	83
<input type="checkbox"/> Acetes	
<input type="checkbox"/> Shrimp	
<input type="checkbox"/> Sea cucumber	
<input type="checkbox"/> Jelly fish	
<u>Otter trawl</u>	96
<input type="checkbox"/> Acetes	
<input type="checkbox"/> Shrimp	
<input type="checkbox"/> Bottom fish	
<u>Otter trawl with booms</u>	136
<input type="checkbox"/> Shrimp	
<input type="checkbox"/> Bottom fish	
<u>Pair trawl</u>	164
<input type="checkbox"/> Bottom fish	

TRAWL FISHING

Trawl is one of the most recently introduced fishing gears in Thailand. It is now the most wide-spread and the most important gear in terms of production and the number of fishing units.

The first experiments with pair trawl and otter trawl fishing, conducted in the early 1950s by some private fishing companies, were unsuccessful. In 1960, however, the Department of Fisheries intervened and with the technical assistance from the Federal Republic of Germany launched a program designed to promote trawl fishing, particularly otter trawl which was gaining reputation of being highly effective. After that, the number of otter trawl fishing boats has increased rapidly, with a corresponding sharp rise in production.

Trawl fishing in Thailand is classified into three types; otter trawl (including otter with boom-trawl, pair trawl and beam trawl. Among these, otter trawl is the most widely operated gear in Thailand. As can be seen from the fishery statistics for 1990 to 1997 (Table 3.1).

In the period from 1990-1997, the annual catch by trawl had stabilized at the level of about 1.5 million ton. About 85 per cent of the total catch is contributed by otter-trawl. The production by beam trawl is very low as a proportion of the total trawl catch. However, there was an important increase in the catch by this gear in 1980 and in subsequent years, mainly due to a significant presence of non penaeid prawns.

Table 3.1 Annual catches by trawl, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Otter-trawl	1,092,394	1,204,913	1,256,725	1,352,033	1,300,008	1,367,774	1,370,534	1,335,284
Pair-trawl	175,638	193,294	230,165	252,552	212,613	228,796	247,512	238,908
Beam-trawl	242	347	225	323	1,285	720	1,720	1,216
Total	1,268,274	1,398,554	1,487,115	1,604,908	1,513,906	1,597,290	1,619,766	1,575,408

Source: Fishery statistical bulletin for the South China Sea area, 1990-1997

According to the fishery statistic form 1990-1997, the annual catch by beam trawl has been increasing, particularly, the catch in 1996 became more than 7 time of the catch in 1992, this increase of catch is due to the increasing of the number of beam trawl fishing boats from 52 (in 1992) up to 286 (in 1996). For both the otter trawl and pair trawl, the number of fishing boats highest in 1990 (8,626 otter trawl fishing boats and 2,193 pair trawl fishing boats) and lowest in 1995 (6,321 otter trawl fishing boats and 1,576 pair trawl fishing boats) while the total catch is very much higher as can be seen from the fishery statistics for 1990-1997 (Table 3.2)

Table 3.2 Number of trawl fishing boats in Thailand, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Otter-trawl	8,626	8,037	7,538	7,213	6,482	6,321	6,840	6,886
Pair-trawl	2,193	1,811	1,876	1,750	1,708	1,576	1,843	1,804
Beam-trawl	103	144	52	129	156	98	289	195
Total	10,922	9,992	9,466	9,092	8,346	7,995	8,972	8,885

Source : Fishery statistical bulletin for the South China Sea area, 1990-1997

An important factor in favour of beam trawl is a comparatively low proportion of trash-fish in the catch; the proportion of trash-fish decreasing from 36 percent (in 1982) became 0 percent (in 1997). For pair-trawl the proportion of trash-fish is about 34 percent and very much higher, about 55 percent by the otter-trawl (in 1997).

The major species caught by otter trawl are non-penaeid prawns, squid, cuttlefish and threadfin bream. Pair trawl fishing concentrates mainly on squids, cuttlefishes and threadfin bream. The non-penaeid prawns are the main species caught by beam trawl, accounting for 71 percent of the total catch.

The main species caught by trawl in 1997 were as follows:

<u>Otter trawl</u>	<u>Catch-year (mt)</u>
Trash-fish	453,327
Non-penaeid prawns	69,012
Squid	44,774
Cuttlefish	50,338
Threadfin bream	78,992
Others	638,841
<hr/>	
Total	1,335,284
 <u>Pair trawl</u>	 <u>Catch/year (mt)</u>
Trash-fish	131,027
Non-penaeid prawns	9,319
Squid	11,595
Cuttlefish	11,419
Threadfin bream	8,205
Others	67,343
<hr/>	
Total	238,908
 <u>Beam trawl</u>	 <u>Catch/year</u>
Non-penaeid prawns	980
Trash-fish	0
Others	236
<hr/>	
Total	1,216

Source : Fishery statistical bulletin for the South China Sea area 1997

FISHING GEAR AND METHODS

The trawl fishing in Thailand can be grouped into four major categories :

- Bottom beam trawl
- Bottom otter trawl
- Bottom otter trawl with boom
- Bottom pair trawl

3.1 Beam trawl

The beam trawl was the forerunner of all trawl gear designs known today. Its main feature is a beam whose purpose is to spread the netting. Most beams are made of iron and are between two to four meters long. Sometimes a heavy beam is supported by steel shoes at each end which run over the sea bed. A ground rope and a head rope are joined together to the cement ski that works as a bobbin. The weight of the cement ski is about 10 to 15 kilograms for small-size beam and about 40 to 45 kg. for big size beam trawl. The skies are connected with the beam by a length of chain. The towing bridle consists of two or three ropes, one from each shoe and one from the center of the beam. These come together and are shackled directly to the towing warp. The principal catch of beam trawl are shrimps, therefore the mesh size is relatively small. The mesh size of beam trawl also depends on the catch.

Setting: On arrival at the fishing ground, the beam trawls are hoisted on the booms which are then swung out. The same method is used for recovery. The operation is undertaken while the fishing boat sail on a straight course.

Hauling: When hauling, the net is heaved in until it is at the boom tips. The cod-end is taken by the line attached to the cod-end strap, and the catch is emptied out directly.

Fishing grounds of beam trawl are in shallow waters with muddy bottom. This kind of fishing is very common in the south of Thailand such as Nakhon Sri Thammarat, Surat Thani, Chumporn. Fishing goes on throughout the year.

3.2 Otter Trawl

The most popular form of trawl fishing in Thailand is by otter trawl, in which otter boards are used for horizontal spreading of the net mouth. Most otter trawl nets consist of two panels; this is called a "two-seam net". The mouth is oval-shaped when viewed from front. Two wings stretch out to increase the swept area and to guide fish in the net's path down to the cod-end. There are two typed of otter trawl: one for shrimps and the other for fish.

The otter trawl for shrimp is usually operated from small fishing boat, 8-16 m in length and with the low to medium power of the main engine (30-120 h.p.). The netting is 30-60 mm mesh-size, polyethylene 250 d/6 or 380 d/6-12 for the wings, upper panel and the belly, and 20-25 mm mesh-size polyethylene 380 d/9-15 for the cod-end. In most cases, the triangular piece of netting at the top wings of both panels is omitted. The size of net depends on the power of the fishing boat; the head-rope varies from 11-23 m and the ground-rope

from 13-24 meters. The difference between them is 1-2 meters. Both are made of polyethylene or polypropylene. The ground rope is weighted with a chain, or with lead sinkers. Otter-boards are rectangular and flat, made of wood and iron, 50-100 cm wide and 100-200 cm long, with a bridle chain and a back strap. The sweep lines or hand-ropes are 10-36 m long, 14-26 mm in diameter, made of polyethylene, polypropylene or a combination rope.

The warps are 14-28 mm in diameter, also made of polyethylene or polypropylene. A capstan winch is used for hauling warps and lifting the catch in the cod-end onto the foredeck of the fishing boat. The net is pulled by hand at stern. Four to eight fishermen take part in a fishing operation. The shrimp otter trawls are mostly operated from Nakhon Si Thammarat to Songkhla province, and the catches consist of shrimps and trash-fish.

The fish otter trawls are the largest single fishery in Thailand. Most vessels used in this case are comparatively big, from 15 to over 30 m in length, with the main engines ranging from 100 to 500 h.p. The fishing expeditions take one or two weeks, sometimes even longer. The two-seam type of net is used, 120-180 mm mesh-size, polyethylene 700 d/12-21 netting for the wings, square, upper panel and belly, and 20-30 mm mesh-size polyethylene 380 d/9-15 netting for the cod-end. This net differs from the shrimp otter trawl net in that it has a triangular piece of netting at the top wings of both panels. The head rope is 28-40 m, and the ground rope 30-46 m long. The difference in their lengths is 2-6 metres. Both ropes are made of wire and combination rope. Wooden and rubber rollers, sometimes covered with spherical plastic capsul are attached on the ground rope for weighting and nothing. Otter-boards are rectangular and flat, 1-2 m wide, 1.2 x 2.4 m long, made of wood and iron. They have a fixed bracket and a bridle chain or fixed iron holders, and sometimes 1-5 plastic floats are attached at the front top part of the boards, so as to prevent the sinking of the boards into the muddy sea bed. Gallows, which are necessary for this type of trawl, are fixed at the stern of the boat. The necessary for this type of trawl, are fixed at the stern of the boat. The sweep lines or hand-ropes are 35-80 m long, 22-32 mm thick combination ropes. The warps are 14-18 mm thick wires, coiled on the warp drum winches on both sides of the boat, or in the middle of a stern trawler. Warps are hauled by a warp drum winch, the net is pulled by a capstan winch, and passes through a pulley on the crane boom at the fore-deck (or stern-deck of a stern trawler). The cod-end is hauled in the same way. Ten to twenty men are needed for a fishing operation. The main catch are bottom fishes and trash-fish. The major fishing ports are Samut Prakan, Samut Sakhon, Songkhla and Phuket.

Setting: When the gear is to be prepared, the boat streams along the desired bourse, into wind if desirable. The codend is thrown out and the working ropes retied in their correct positions on head line and wings and the net streamed out astern, the sweep lines run out. The otter boards are connected to the warps and unhooked from the gallows, all is ready for setting.

This may be accomplished by releasing the winch brakes simultaneously so allowing the otter boards to drop into the water and spread while "on the run" or alternatively the warps may first be eased out until the otter boards are just below the surface and seem to be spreading satisfactorily before the warps are released.

All is now ready to set the otter boards and run out the warps to their required extent.

Hauling: When hauling, the otter boards are hove up to the gallows and lift hanging on the warps, being clamped if necessary to prevent slamming. The sweep lines were wound by winch to the ground rope. Then the ground ropes, wings and bellies of the trawl also are hauled up to the stern and the codend is pulled to the fore deck for emptying.

3.3 Otter trawl with boom

This fishing gear is similar to the bottom otter trawl, except that a pair of booms are added to the fishing boat. The purpose of the booms is to increase the horizontal spreading of otter boards. Twin booms are arranged, hinging outward from the middle of fishing boat to provide outboard towing point for the towing warps.

The gear can be found in the inner Gulf of Thailand, from Trat to Chumporn province. Most of the catches consist of shrimps.

The operation of this gear is the same as for an ordinary otter-trawl, but a boom increases the spreading of otter boards. Thus the warp ends through a ring that is attached to the tip of the boom during towing. When setting and hauling, the towing warps are taken to the stern by a thin rope and the setting and hauling are done in the normal way. The warps are released back to the ring at the tip of the boom when towing.

3.4 Pair trawl

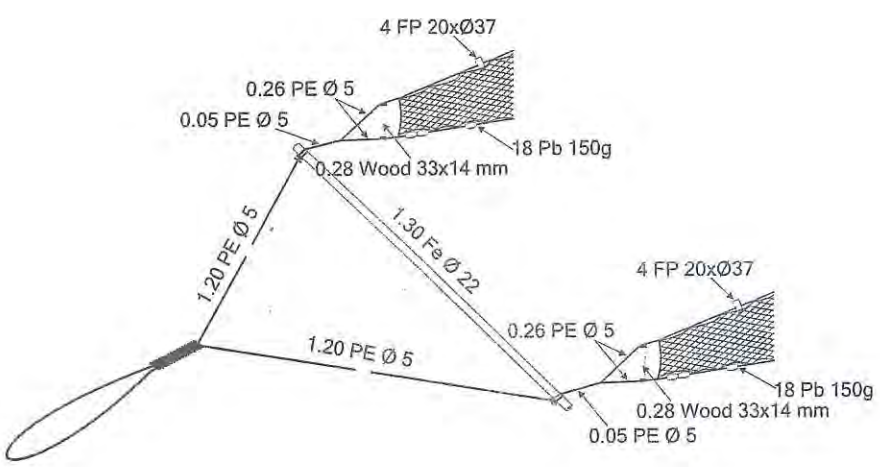
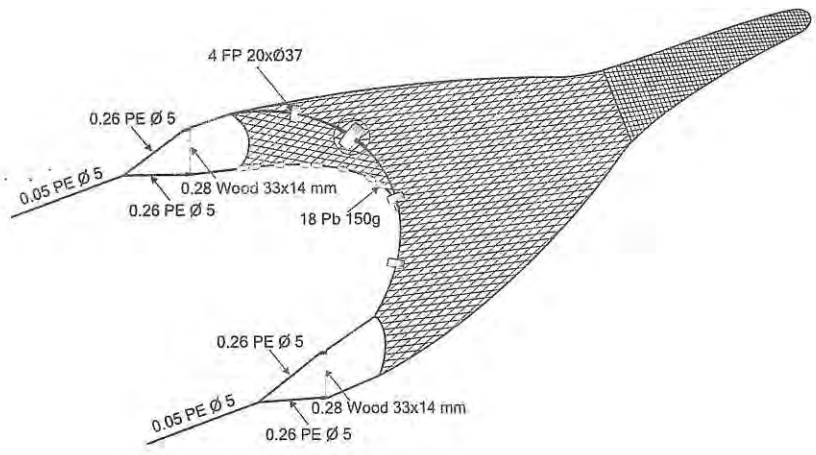
Pair trawling means that the net is towed by two boats. If both boats are small, less than 18 m long and with main engines of up to 150 h.p., it is a small pair trawl. A medium pair trawl combines towing of a boat of over 18 m in length and with a main engine of more than 150 h.p., with a small fishing boat. If both vessels are large, it is known as a large pair trawl. This fishing method was introduced in Thailand in the 1960s by Japanese fishermen.

In pair trawling, the net mouth is kept open by outward towing of the two boats, which always try to keep the same distance between them during operation. Otter boards are not necessary, the arrangement of gear is simplified, the warp is connected directly to the sweep lines whose other end is joined to a triangular iron frame at the end of Gridles from each wing of the net.

Setting: the cod-end is thrown into the sea, or pulled out by one boat, while the net boat keeps "dead-slow ahead", lowers the net, and tows it until it is stretched. The other boat approaches and the messenger line is thrown to it so as to transfer one wing of the net. The sweep lines are then connected to the triangular iron frame on each boat, and both boats sail-ahead together, paying out the sweep lines and warps evenly to required lengths, and the fishing commences.

Hauling: both vessels stop and turn toward the net position, warps are hauled and passed through gallows at the bow until triangular iron frame reach the gallows. The boats then converge until they are a short but safe distance apart and sweep lines are disconnected, messenger line is thrown to the net boat in order to return the wing net. Then net is hauled on board by manpower or by capstan winch passing through a pulley on the boom crane until the cod-end is hung and emptied.

A pair trawl is usually operated in the day-time. Fishing grounds are in the Gulf of Thailand and the Andaman Sea at the depth of water up to 40 meters. Most catches consist of trash fish, squid, cuttlefish and threadfin bream. The major landing ports are Samut Sakhon, Samut Songkhram, Songkhla, Ranong and Phuket.



Rv. 2002

TRAWL

VESSEL

LOCATION

Bottom, Beam Trawl

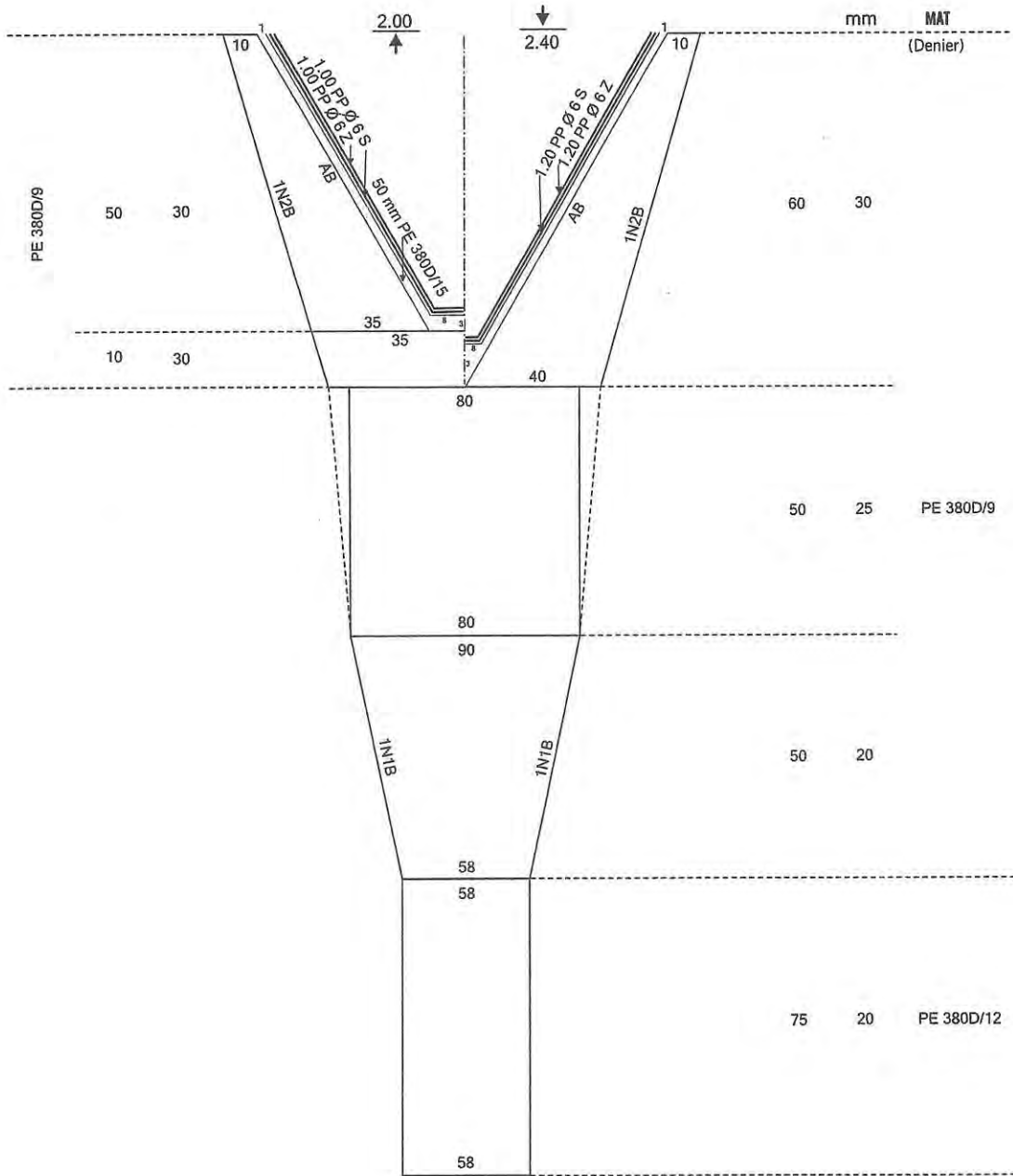
Loa 10 m

Muang

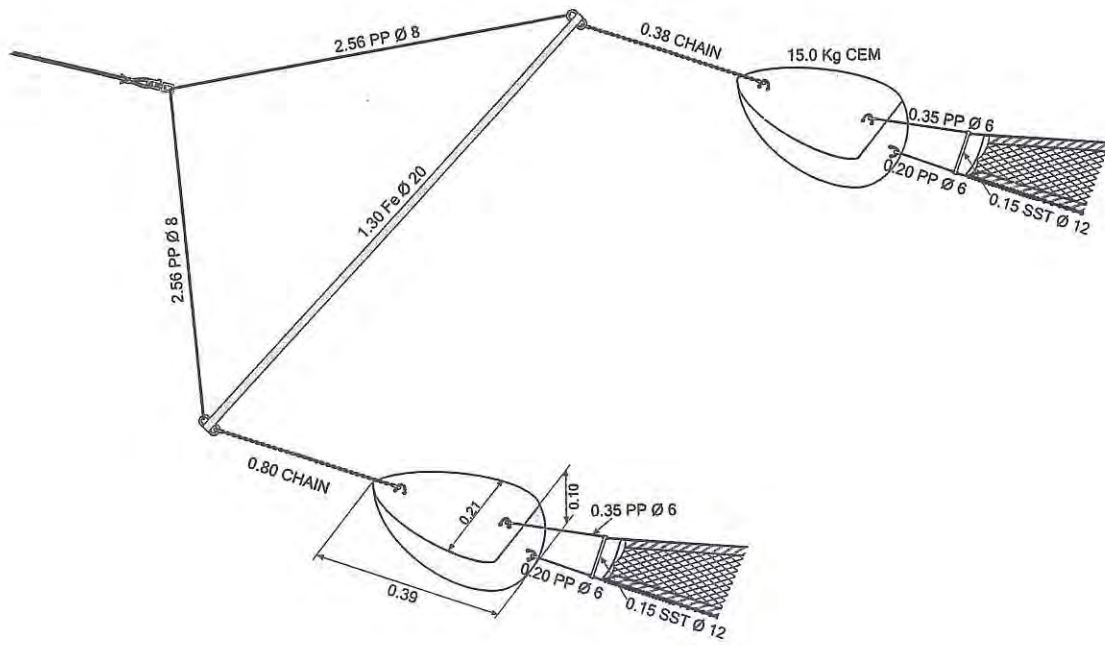
Shrimp

hp 8

Surat Thani



Rv. 2002



Rv. 2002

TRAWL

VESSEL

LOCATION

Bottom, Beam Trawl

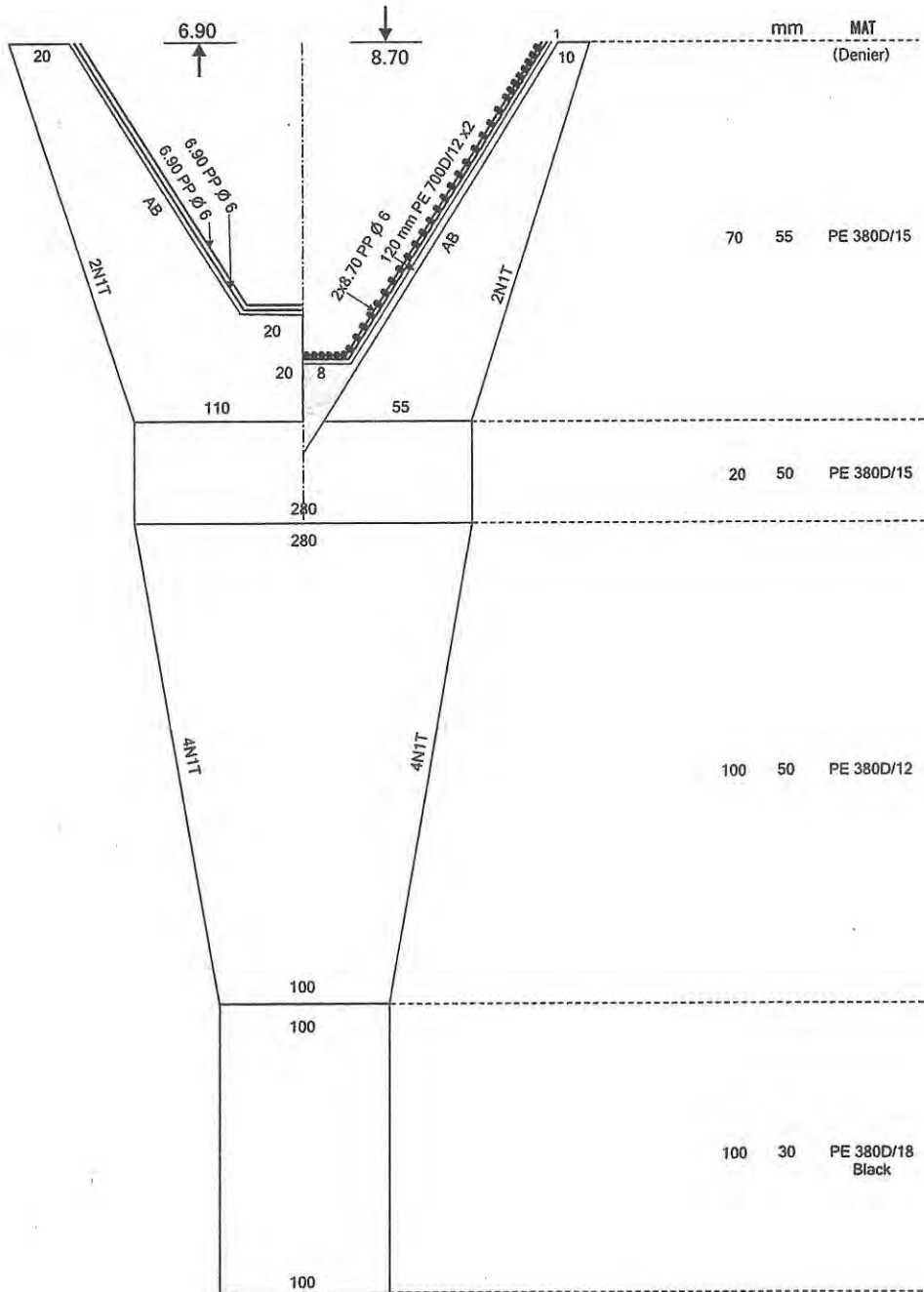
Loa 17 m

Paknam Lungsuan

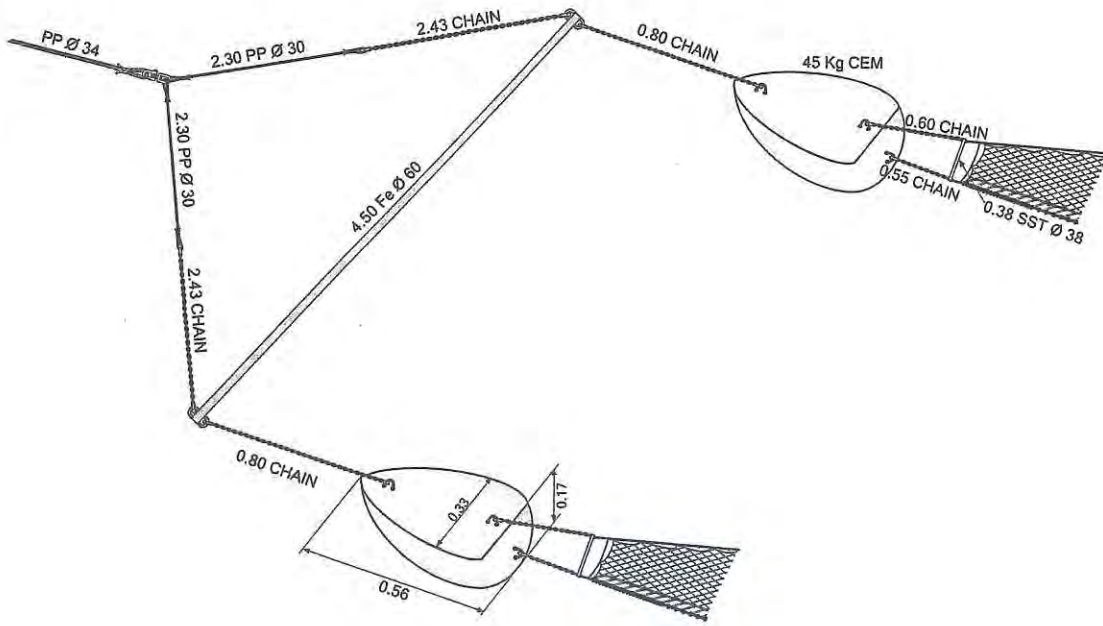
Shrimp

hp 235

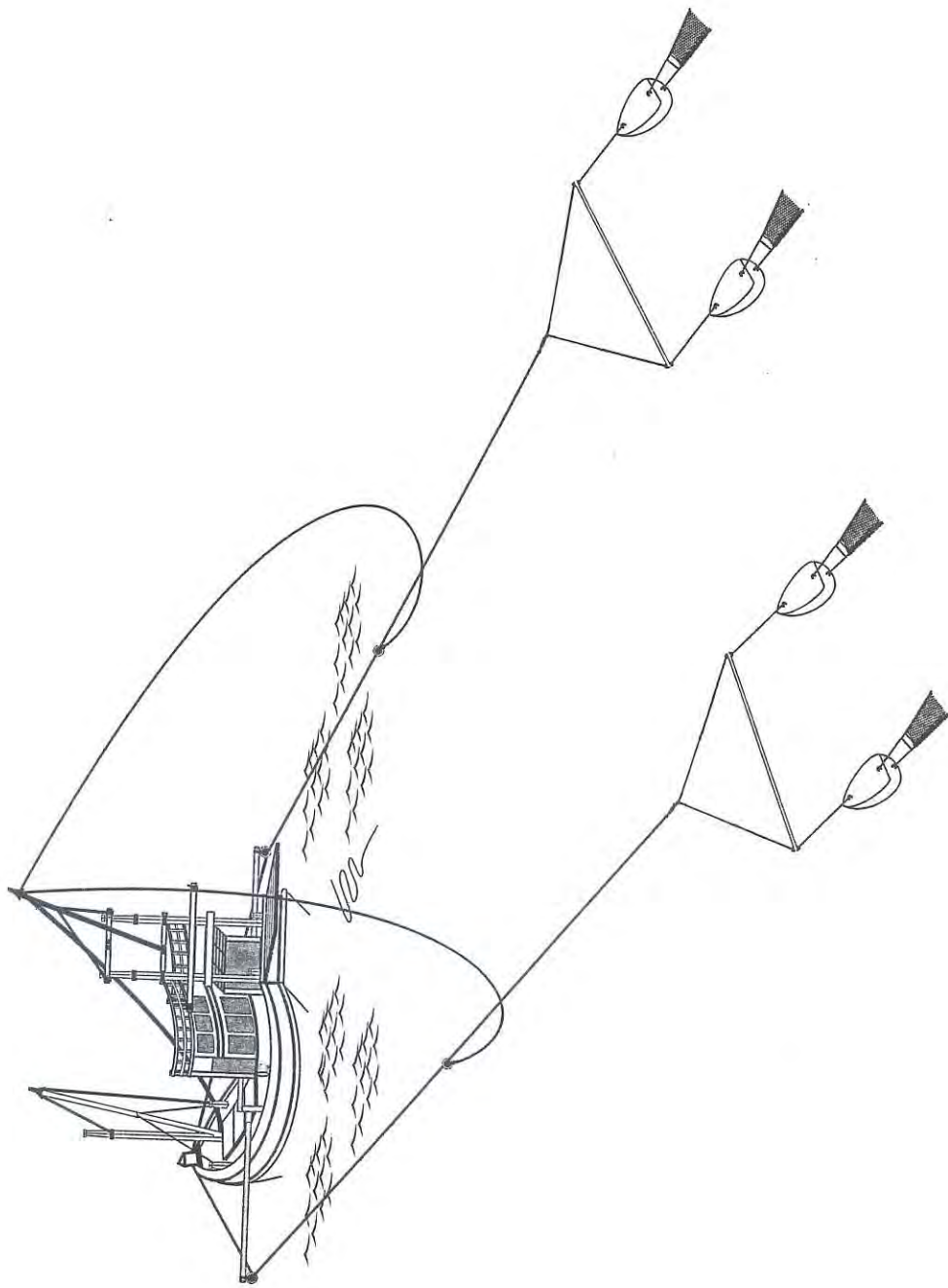
Chumporn



Rv. 2002



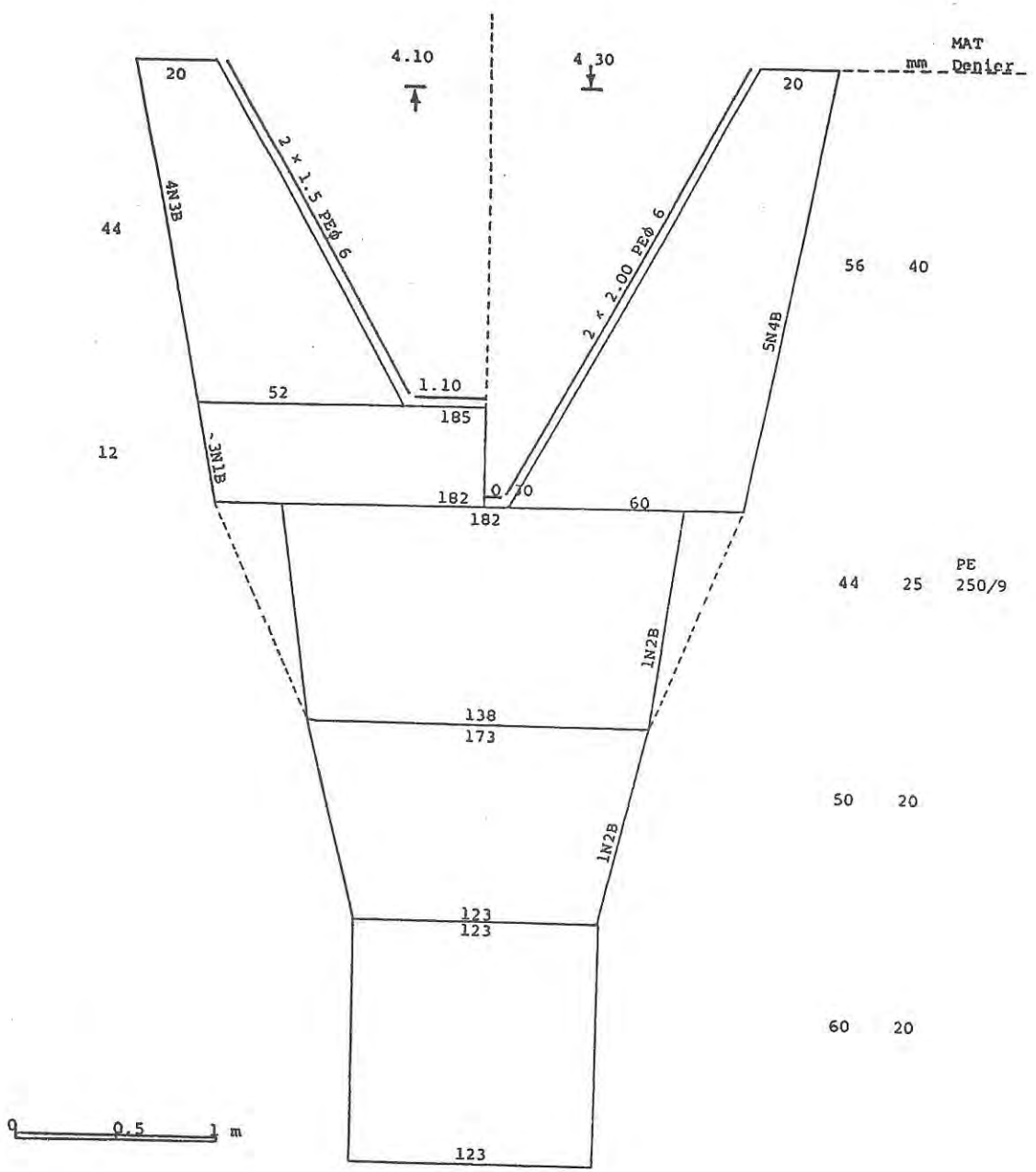
Rv. 2002

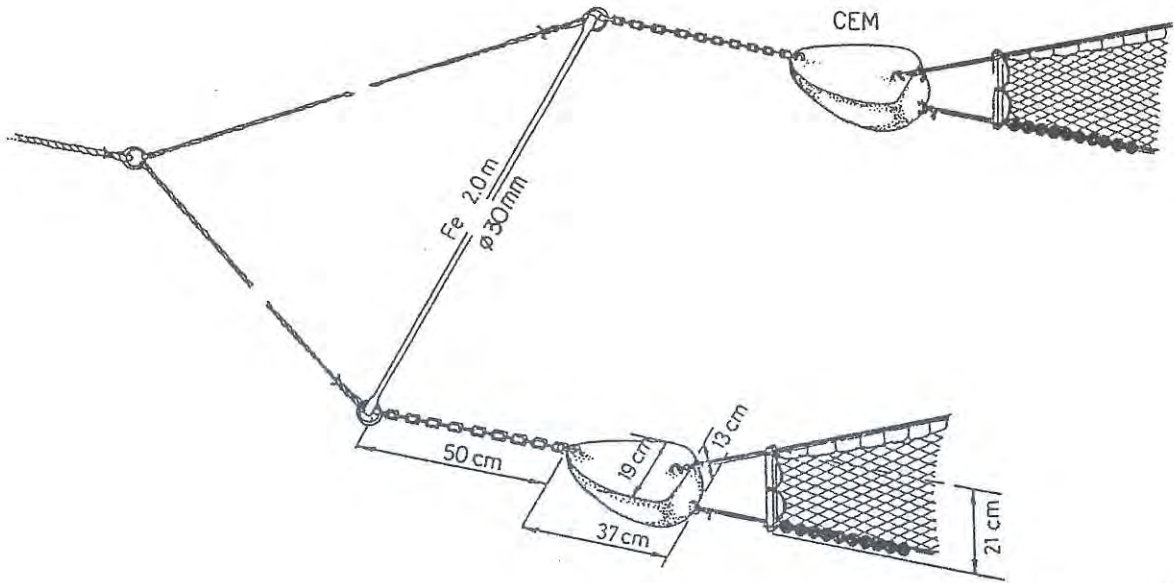
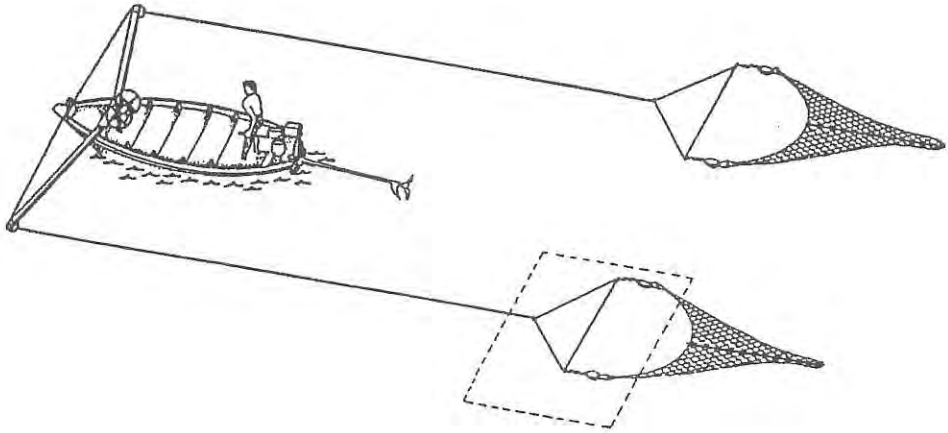


TRAWL
Bottom, beam
Shrimp

VESSEL
Pornprasang
Loa 11 m
hp 8

LOCATION
Paknakhon
Nakhon Si Thammarat

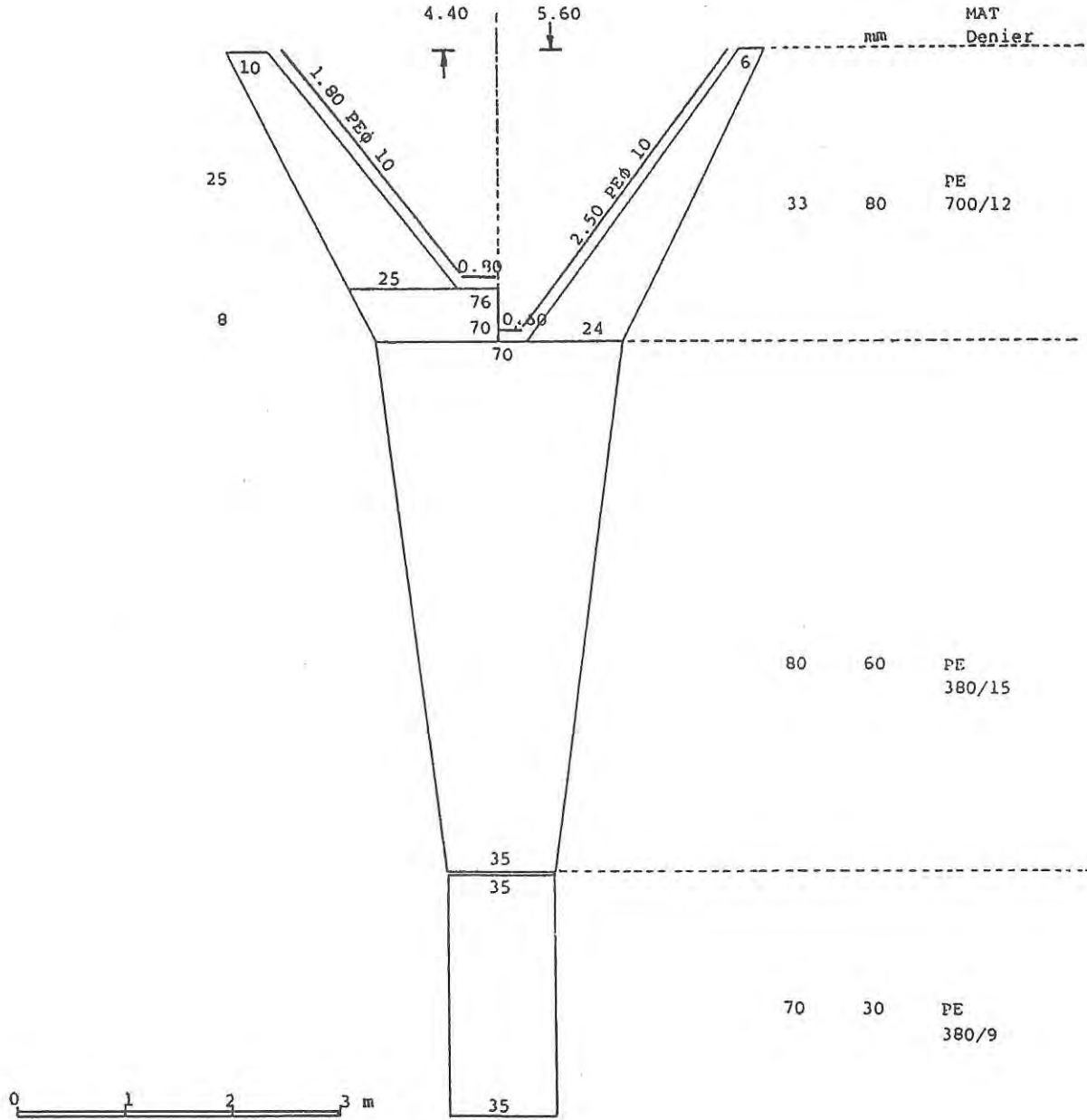


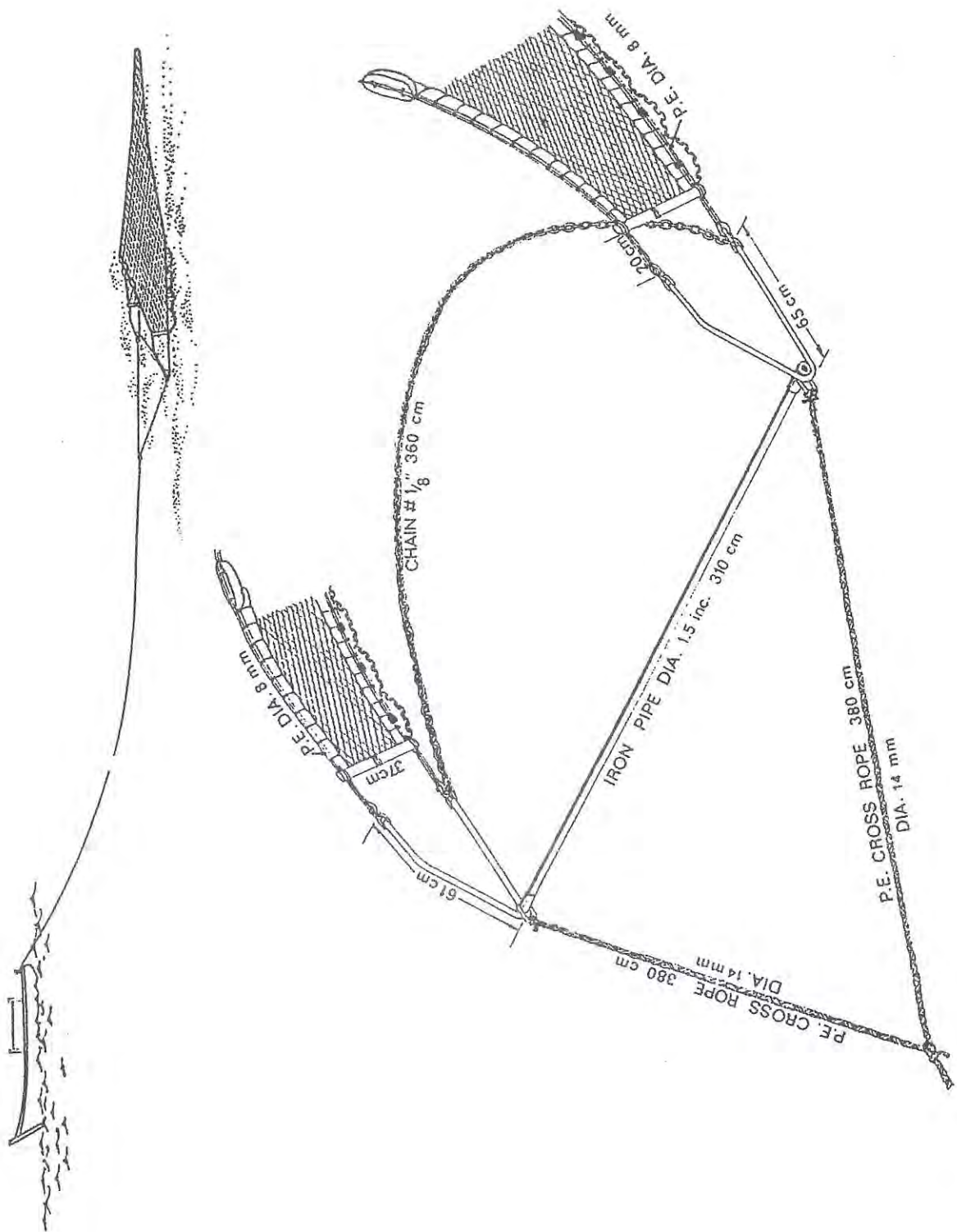


TRAWL
 Bottom, beam
 Sea cucumber

VESSEL
 Loa 10 m
 hp 7

LOCATION
 Kapoe
 Ranong





TRAWL

Beam Trawl

Jelly fish

VESSEL

Loa

8 m

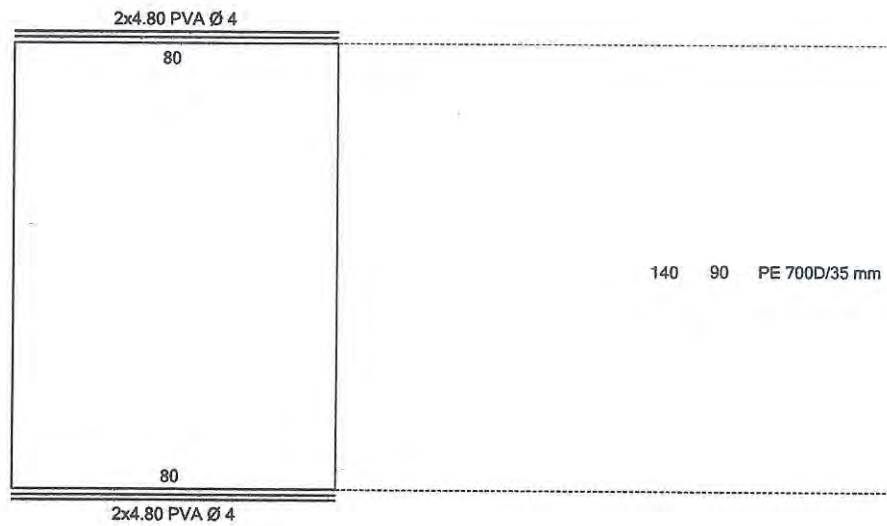
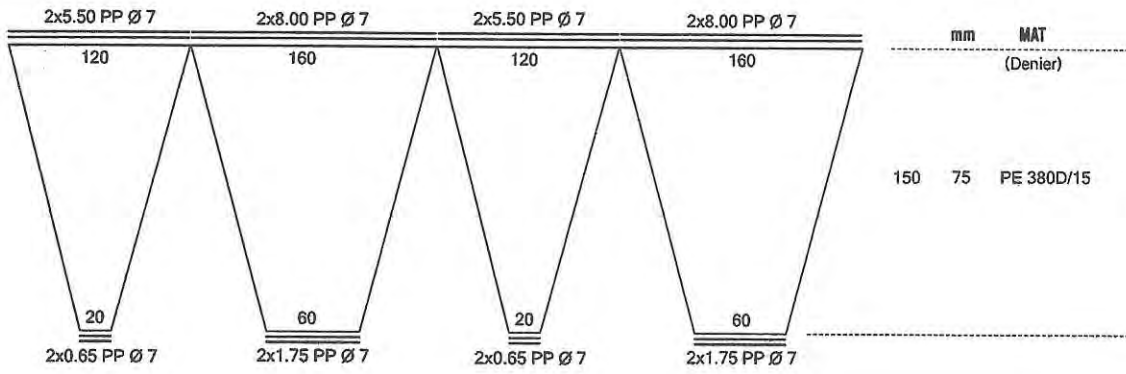
hp

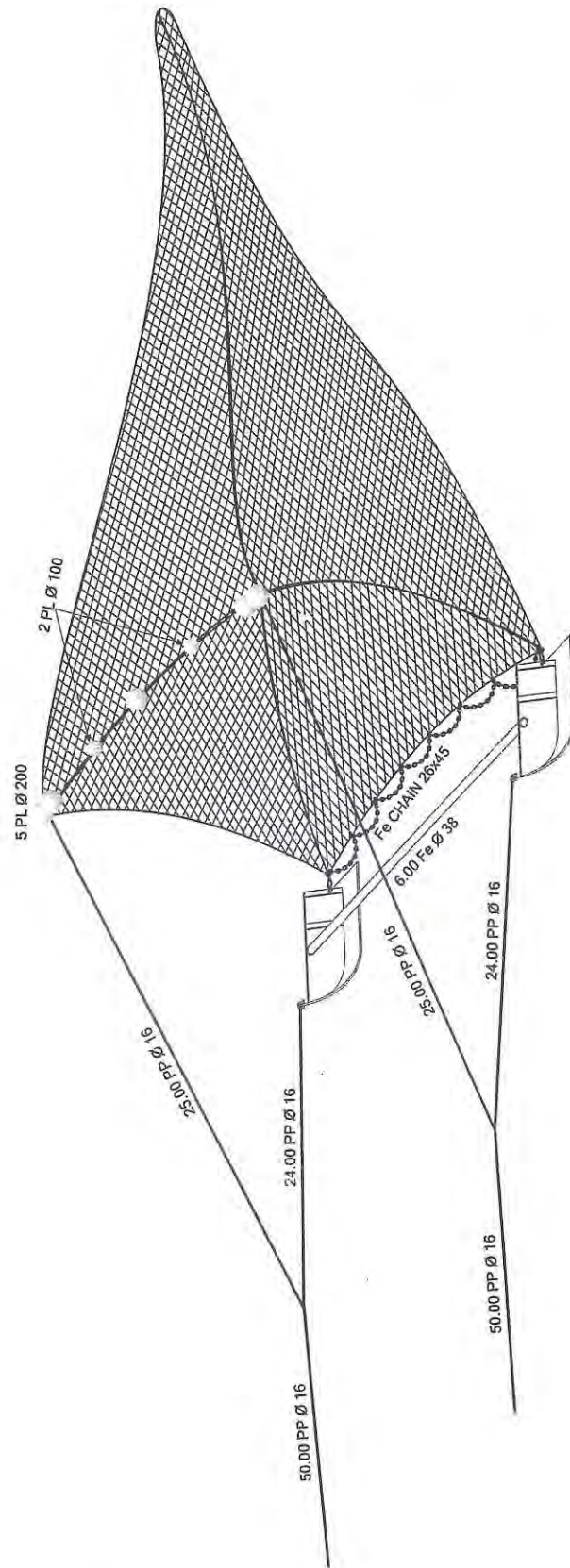
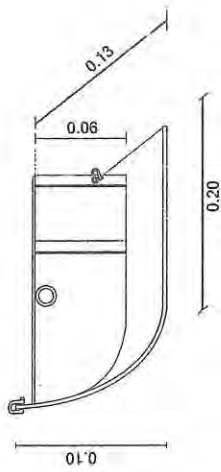
16

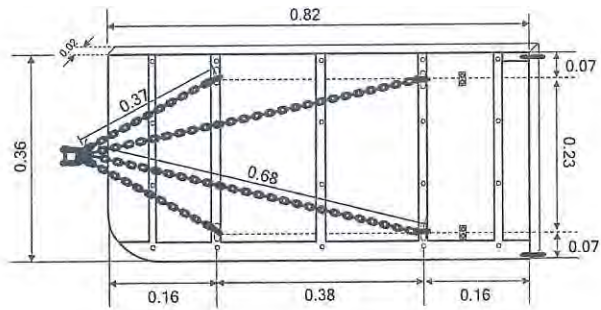
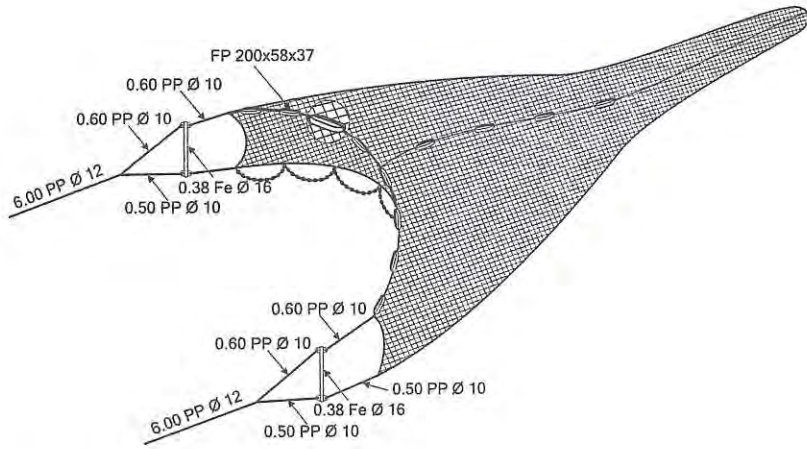
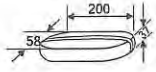
LOCATION

Ao Makhampom

Rayong

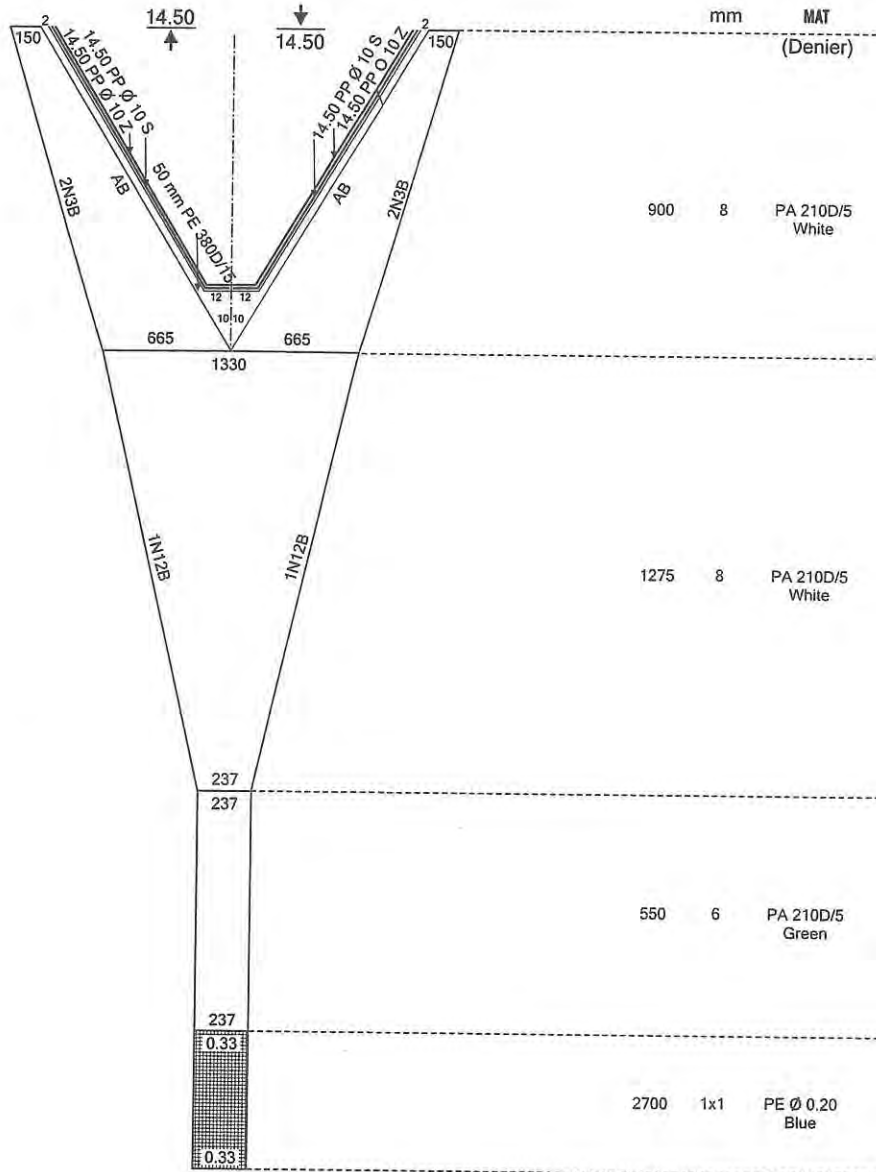




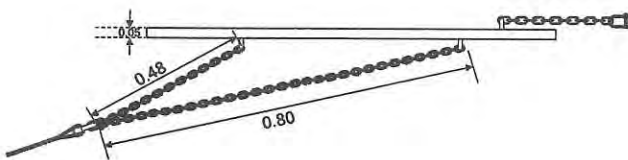
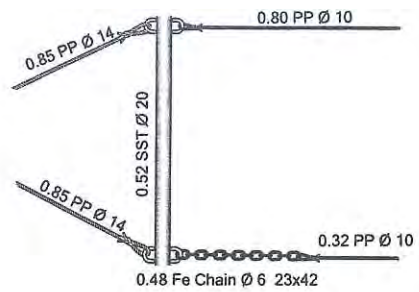
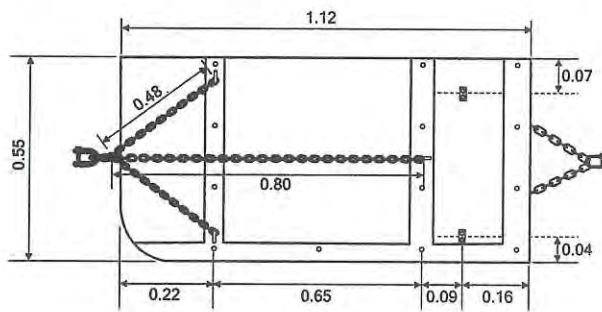
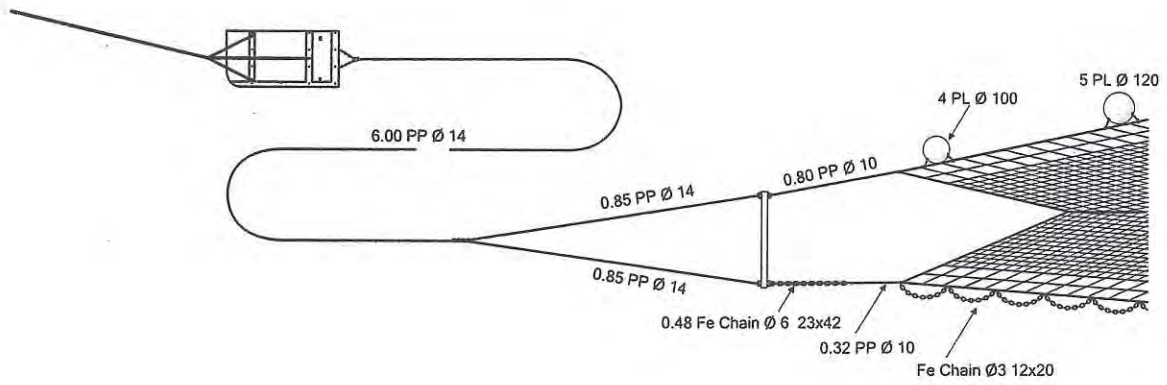


Rv. 2002

TRAWL	VESSEL		LOCATION
Bottom, Otter	Loa	8 m	Jana
Acetes, Shrimp	hp	16	<u>Songkhla</u>



Rv. 2002



Rv. 2002

TRAWL

Bottom, Otter

Shrimp

VESSEL

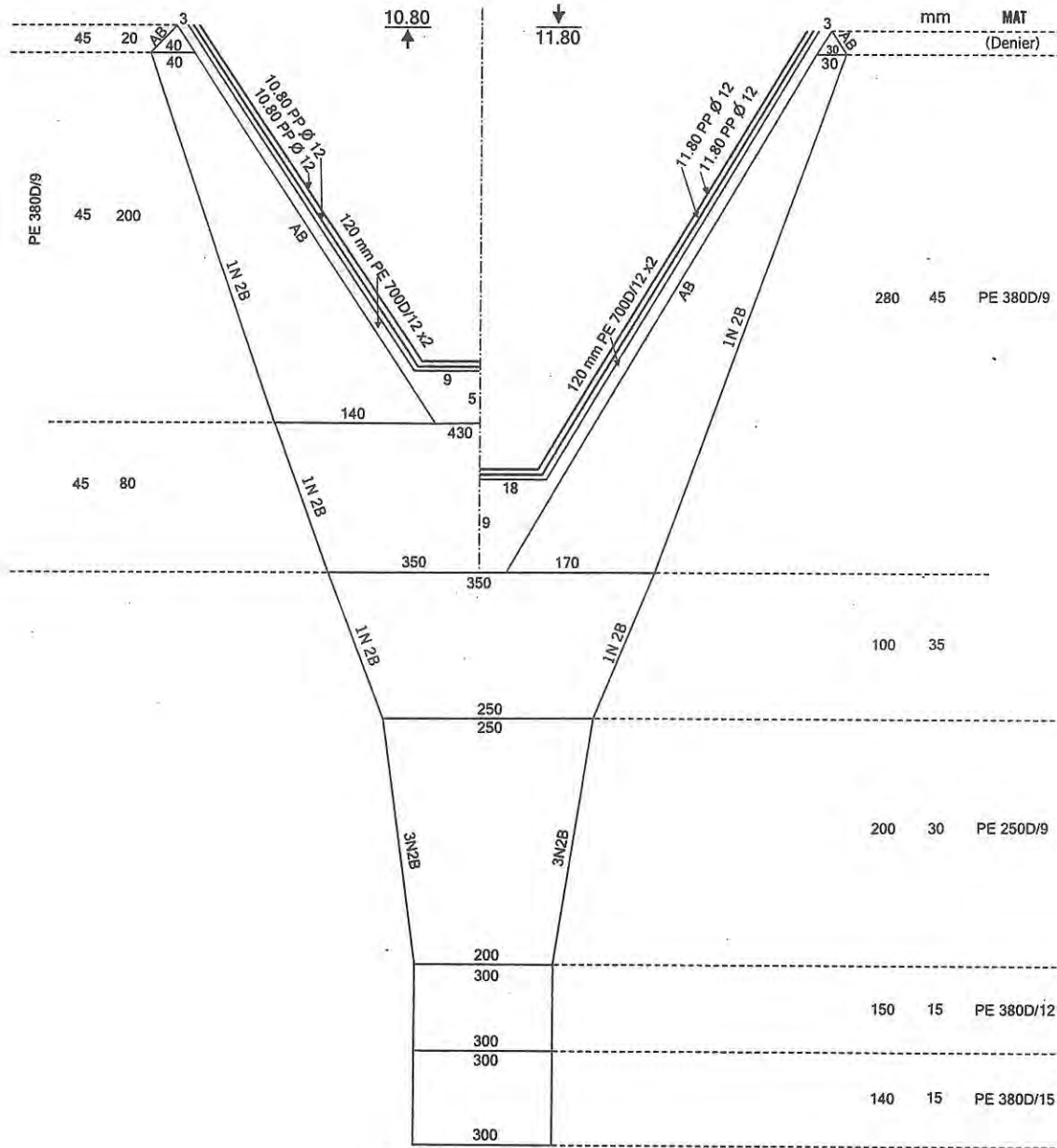
Loa 12 m

hp 80

LOCATION

Hua Sai

Nakhon Sri Thammarat

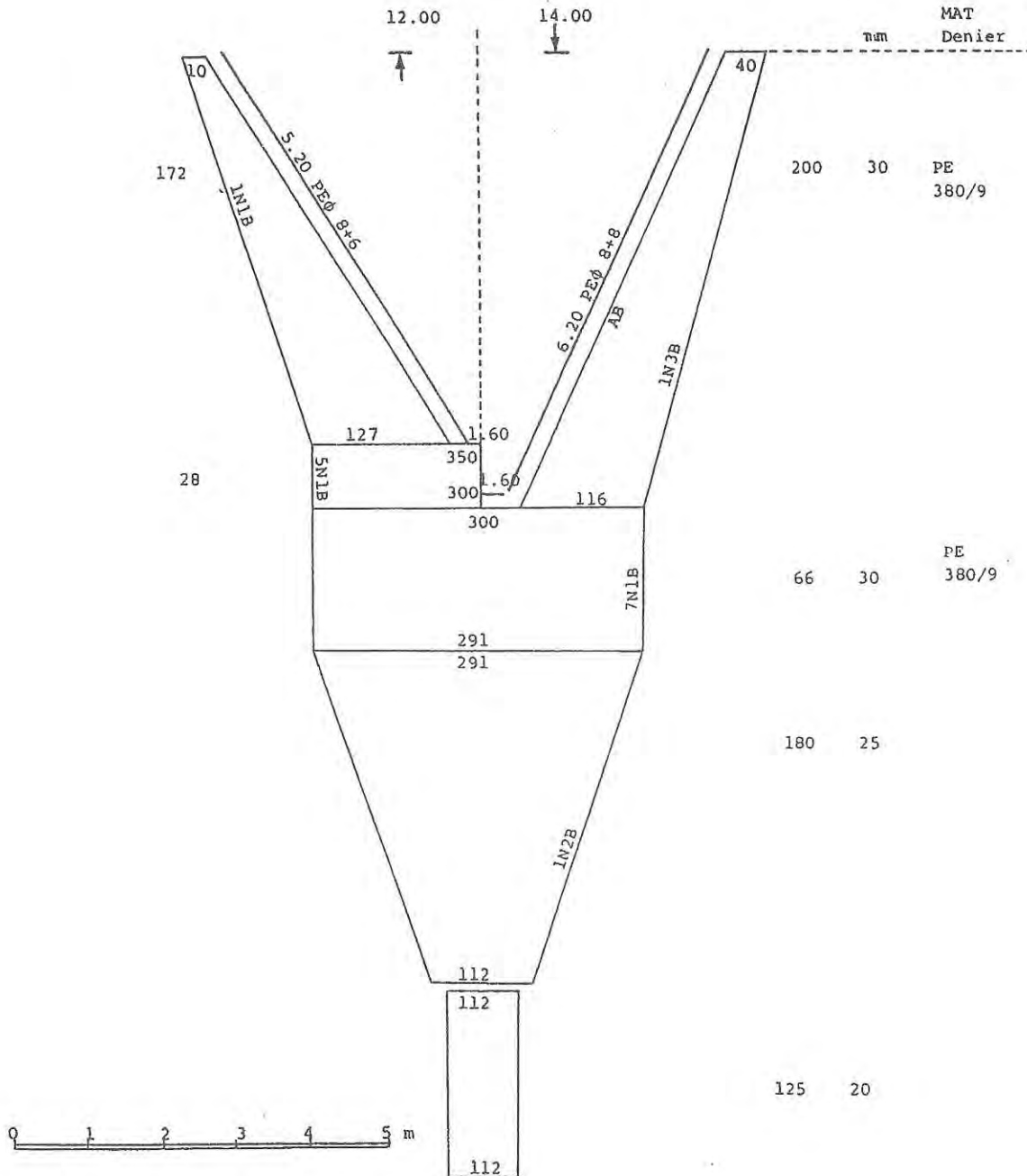


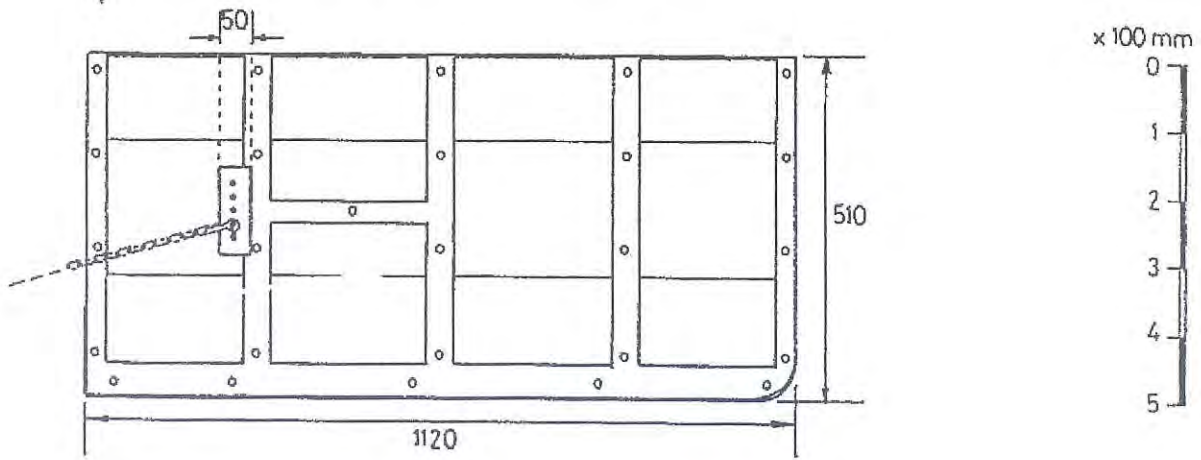
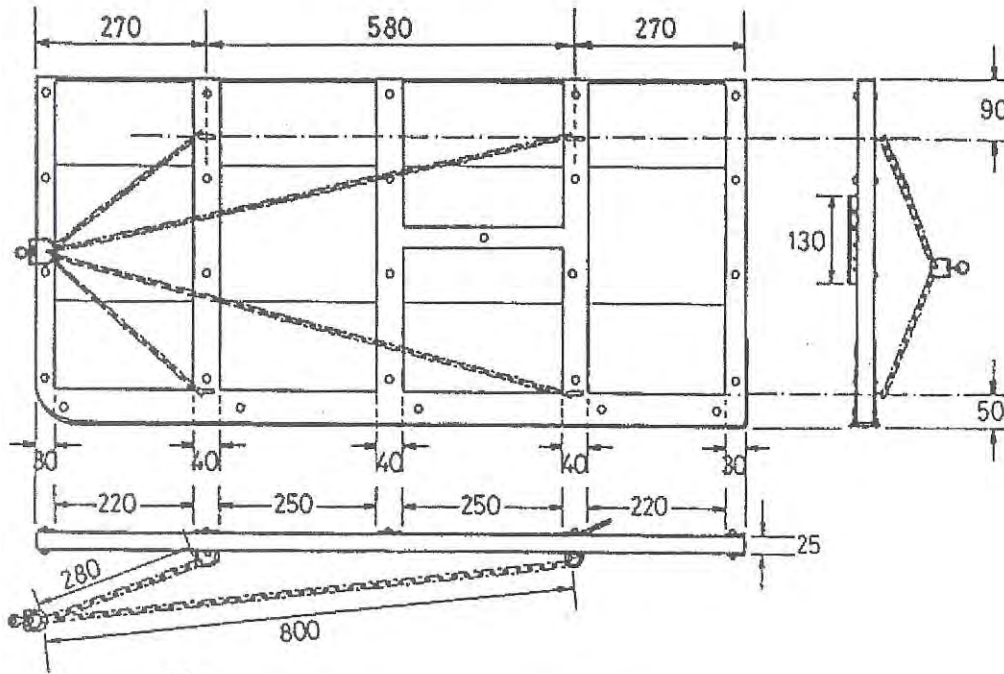
Rv. 2002

TRAWL
Bottom, otter
Shrimp

VESSEL
Loa 8 m
hp 80

LOCATION
Hausai
Nakhon Si Thammarat

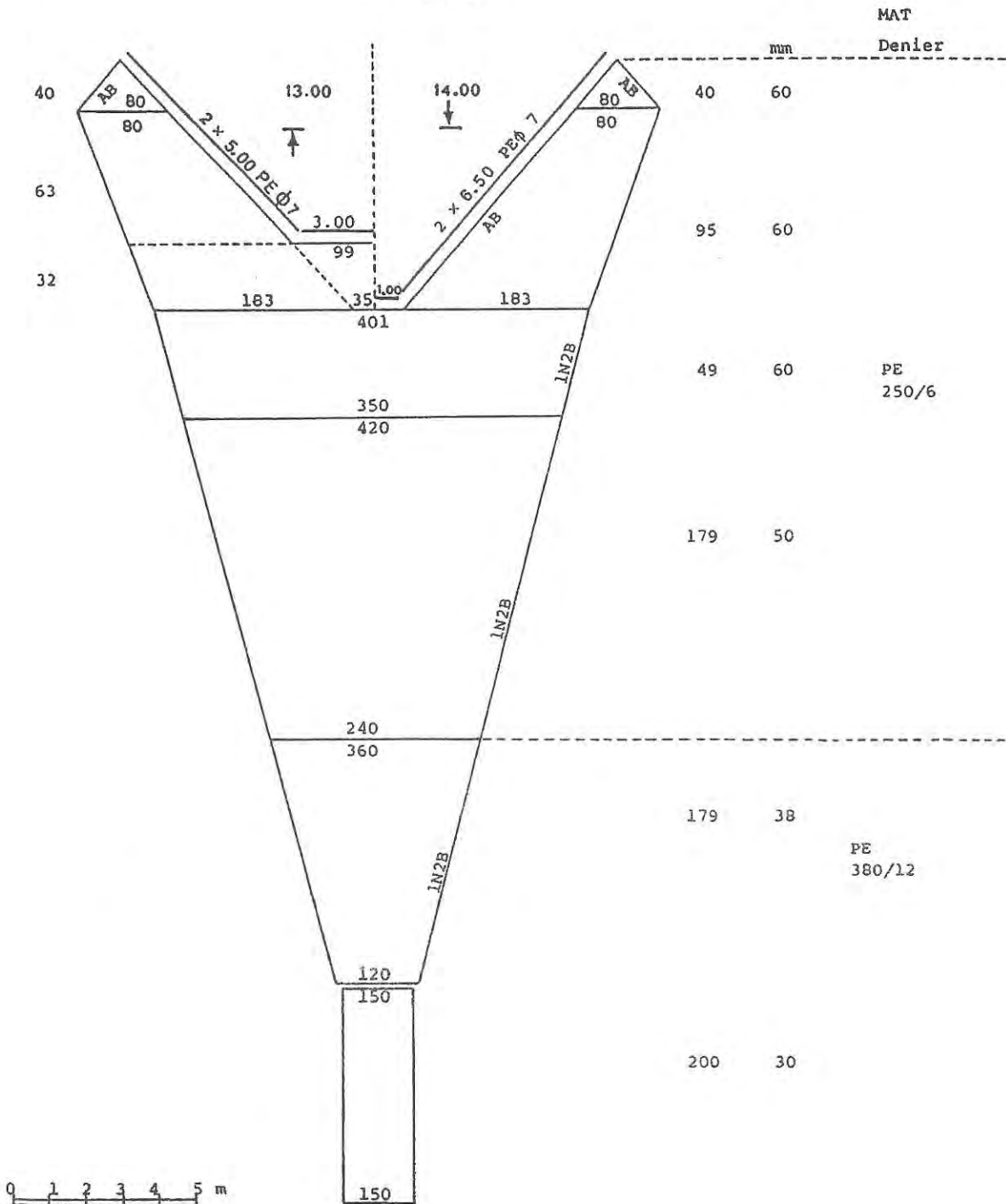


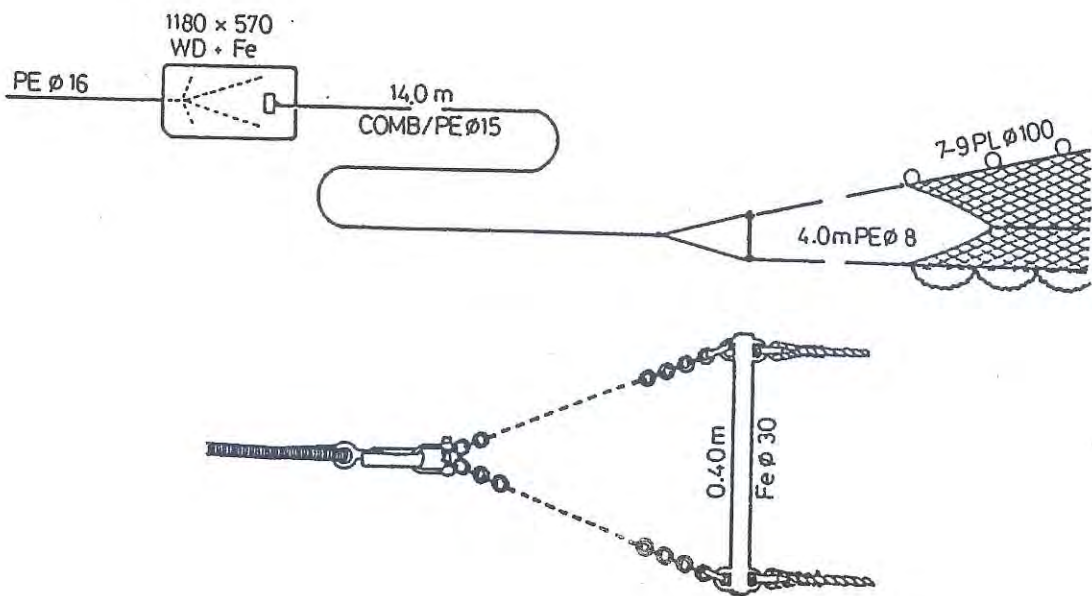
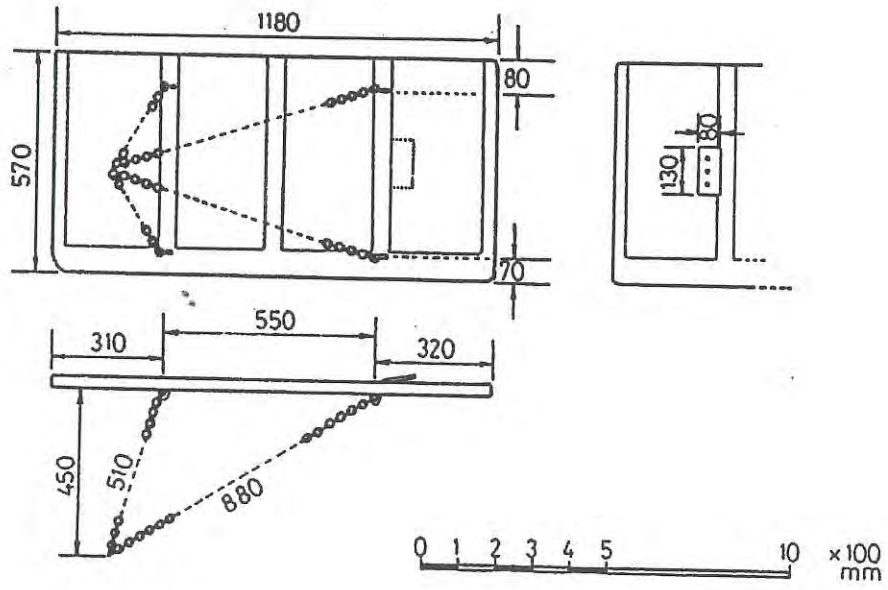


TRAWL
Bottom, otter
Shrimp

VESSEL
Arunrasmee
Loa 10
hp 40

LOCATION
Pakbara
Satun

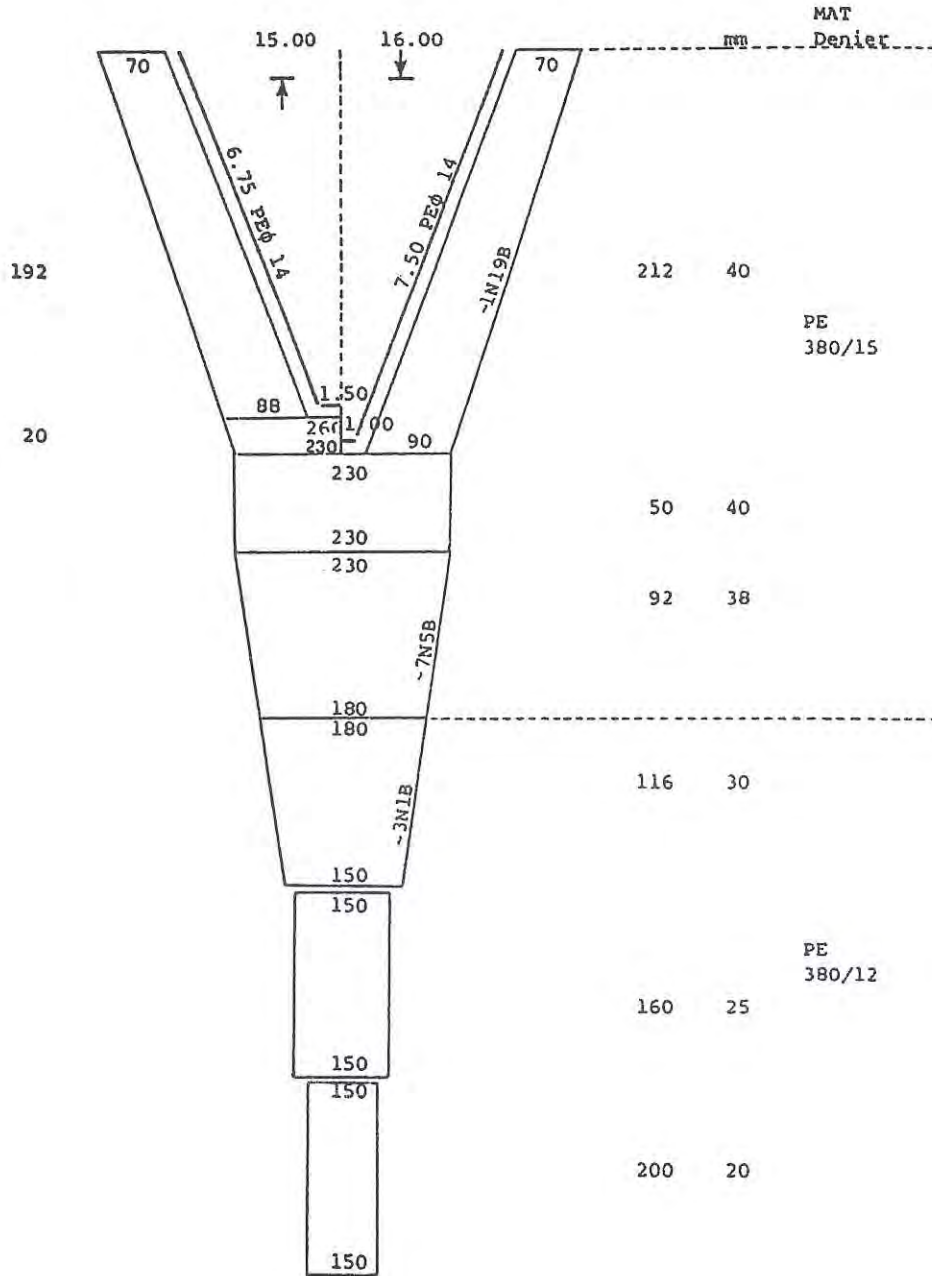


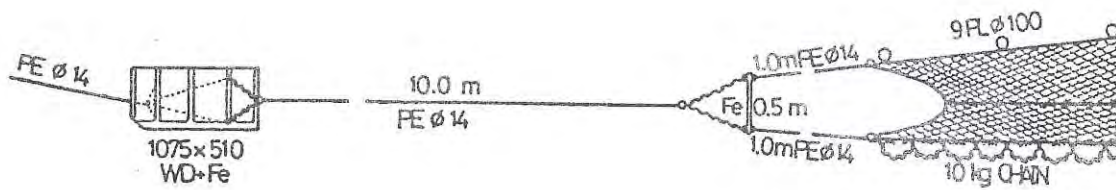
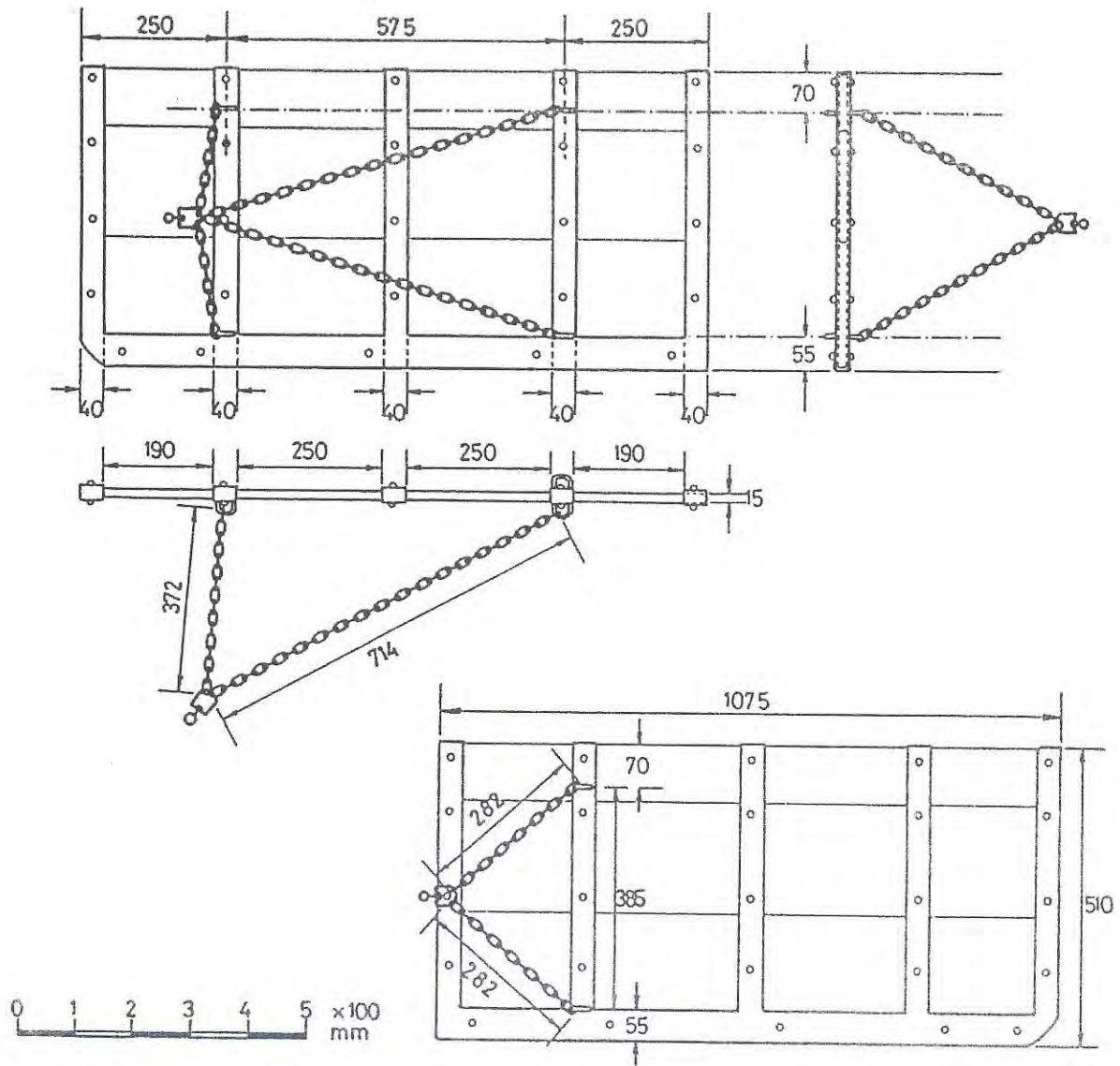


TRAWL
Bottom, otter
Shrimp

VESSEL
hp 30

LOCATION
Samut Sakhon
Samut Sakhon

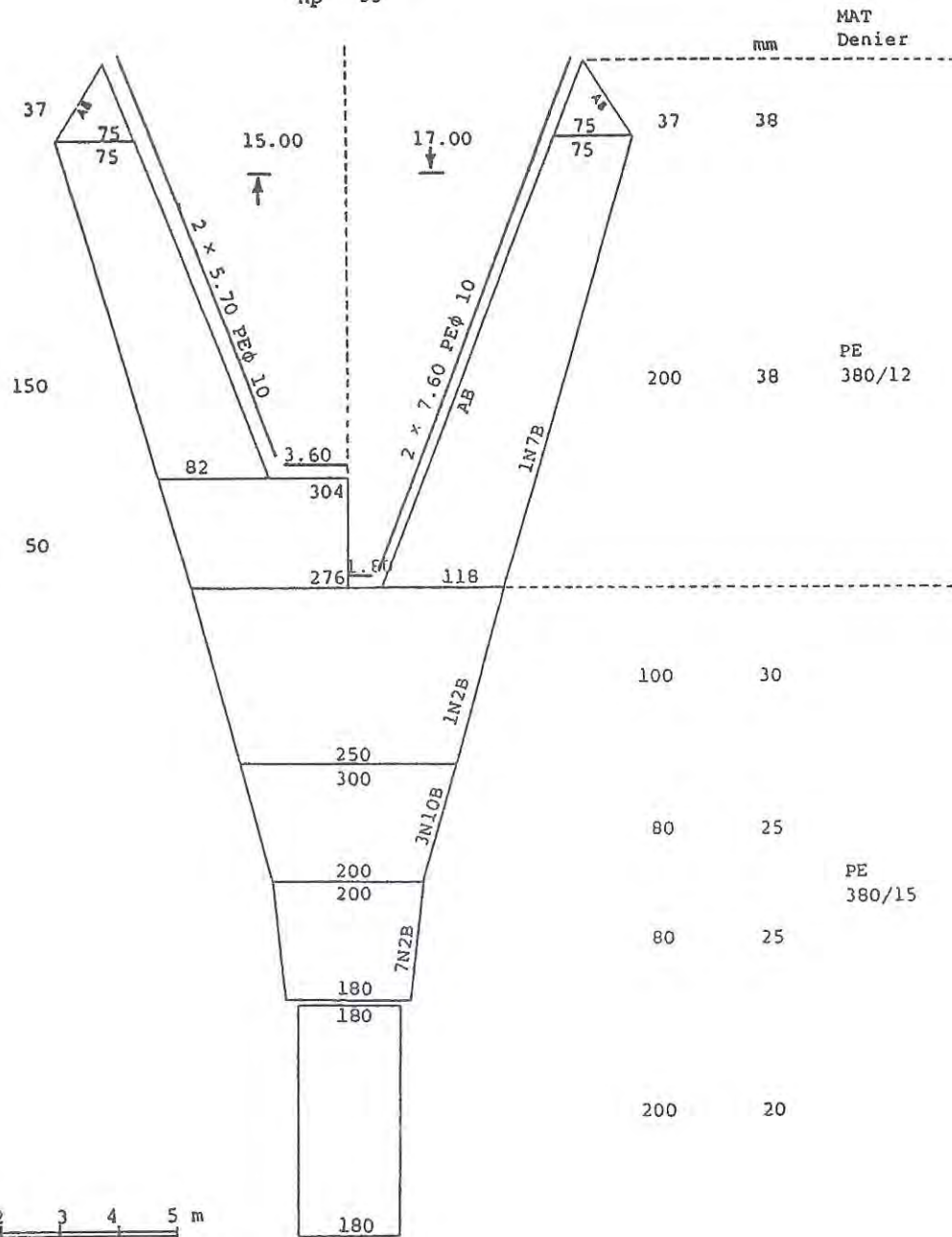


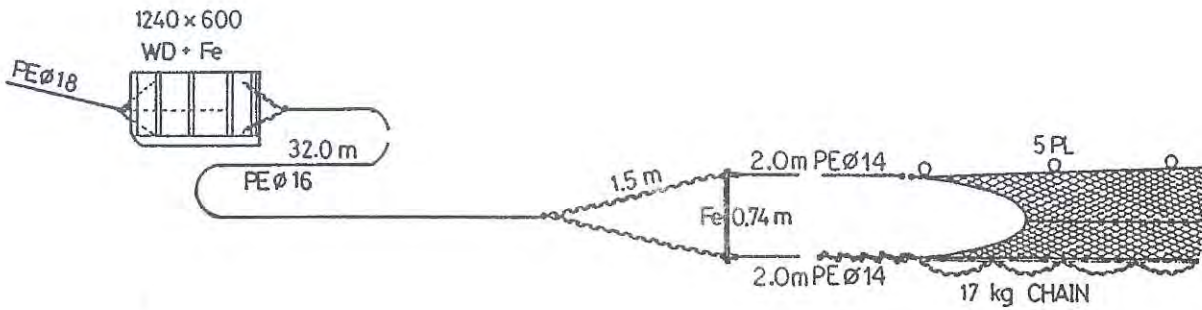
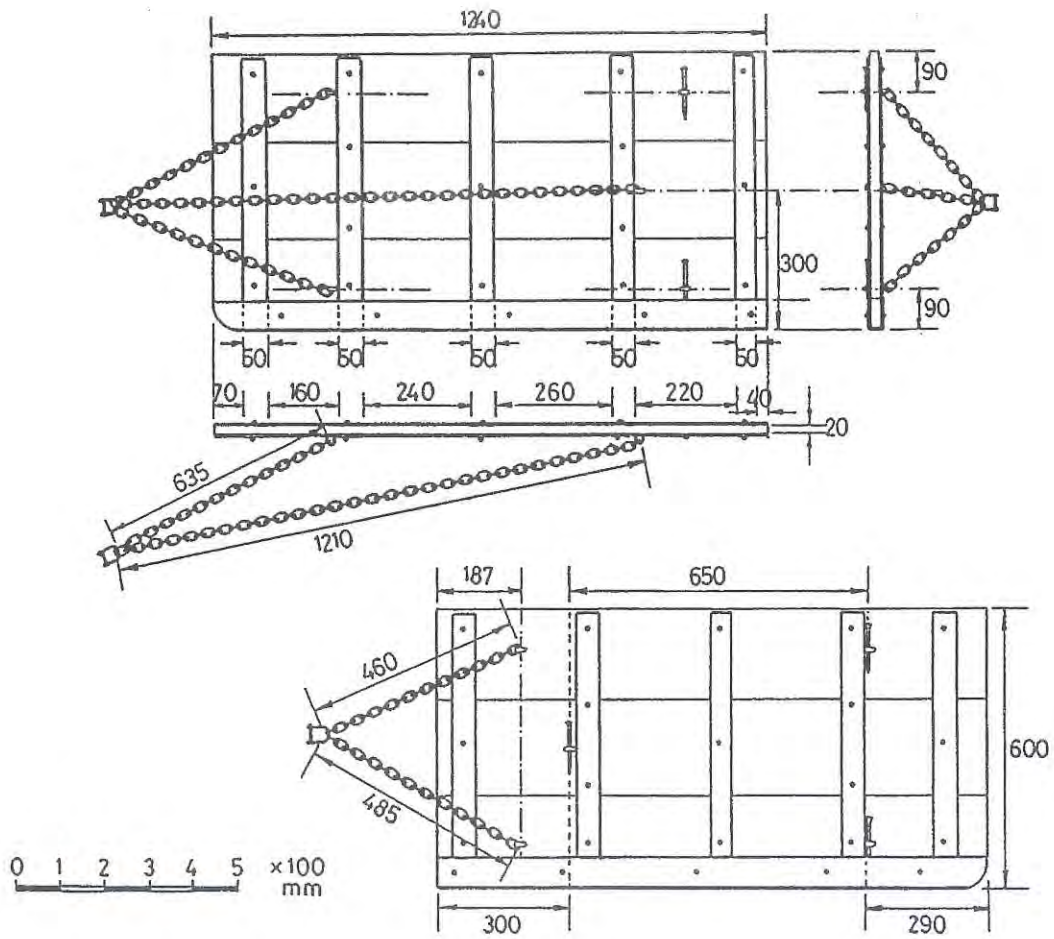


TRAWL
Bottom, otter
Shrimp

VESSEL
Anunakor
Loa 15.90 m
hp 35

LOCATION
Taba
Narathiwat

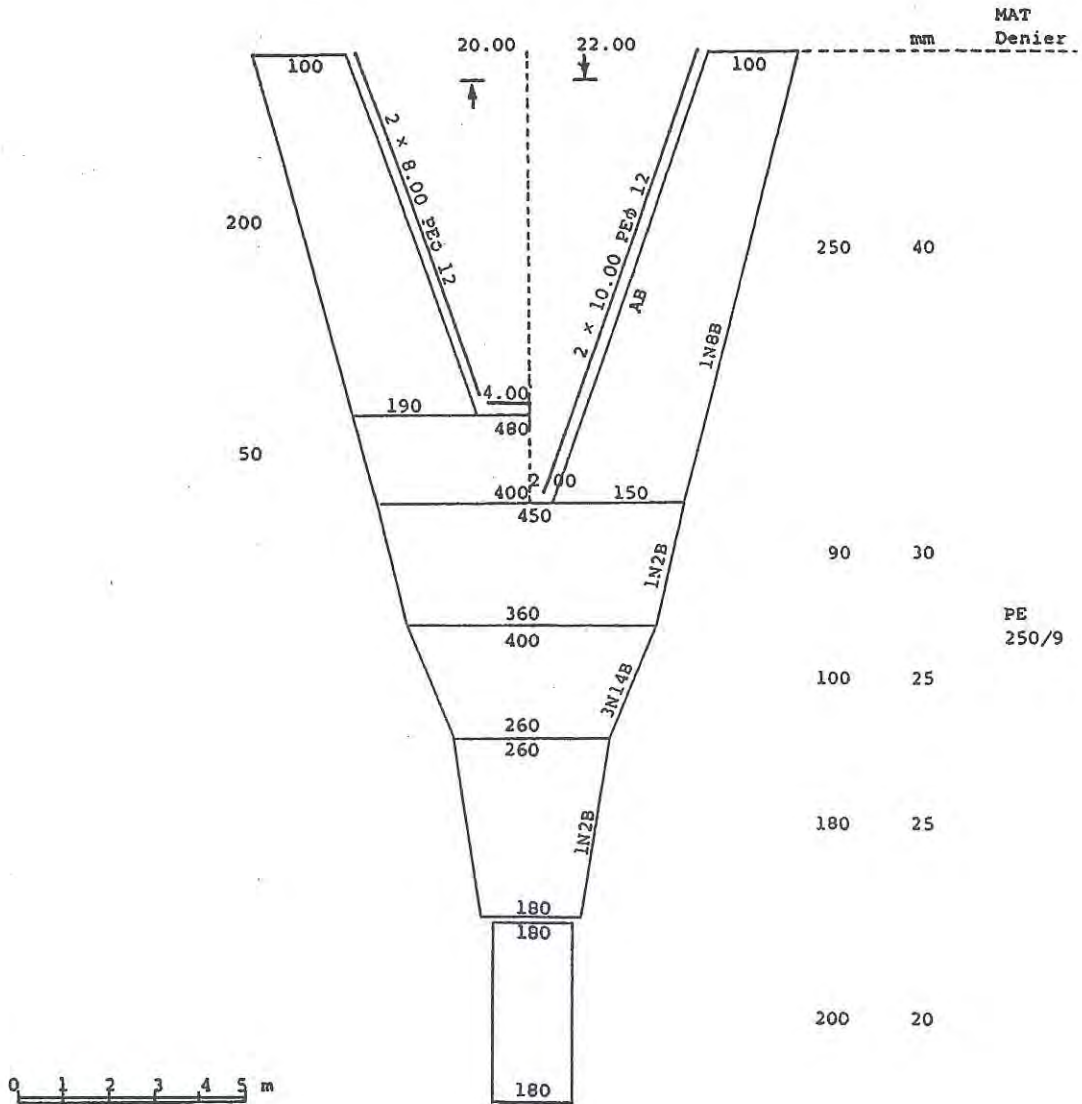


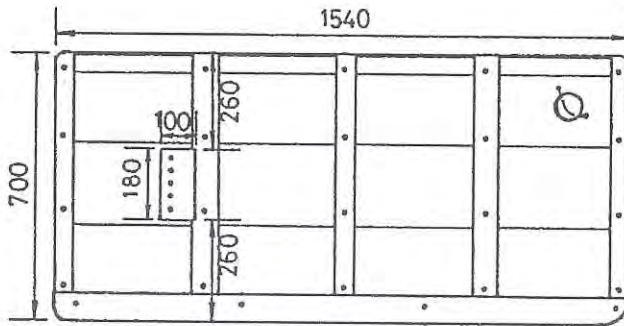
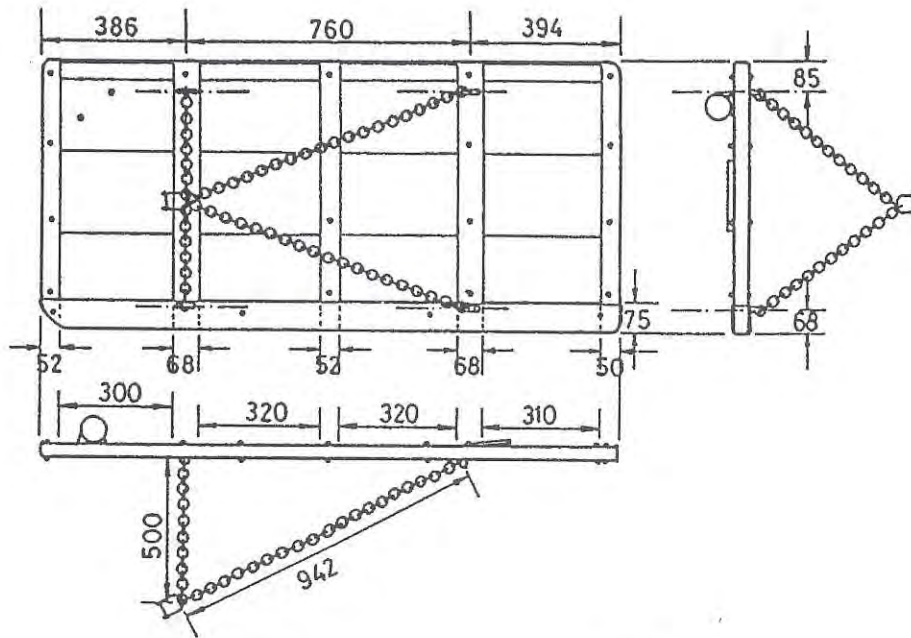


TRAWL
Bottom, otter
Shrimp

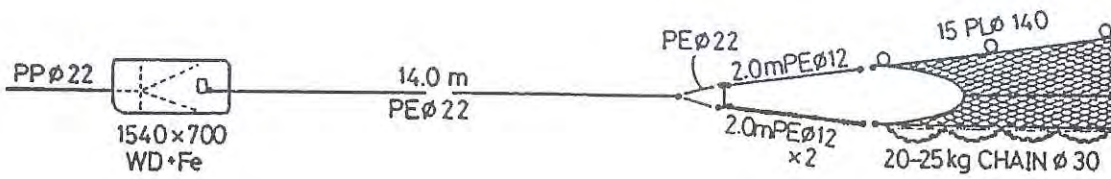
VESSEL
Kungnangnavee
Loa 14
hp 120

LOCATION
Pakpaying
Nakhon Si Thammarat





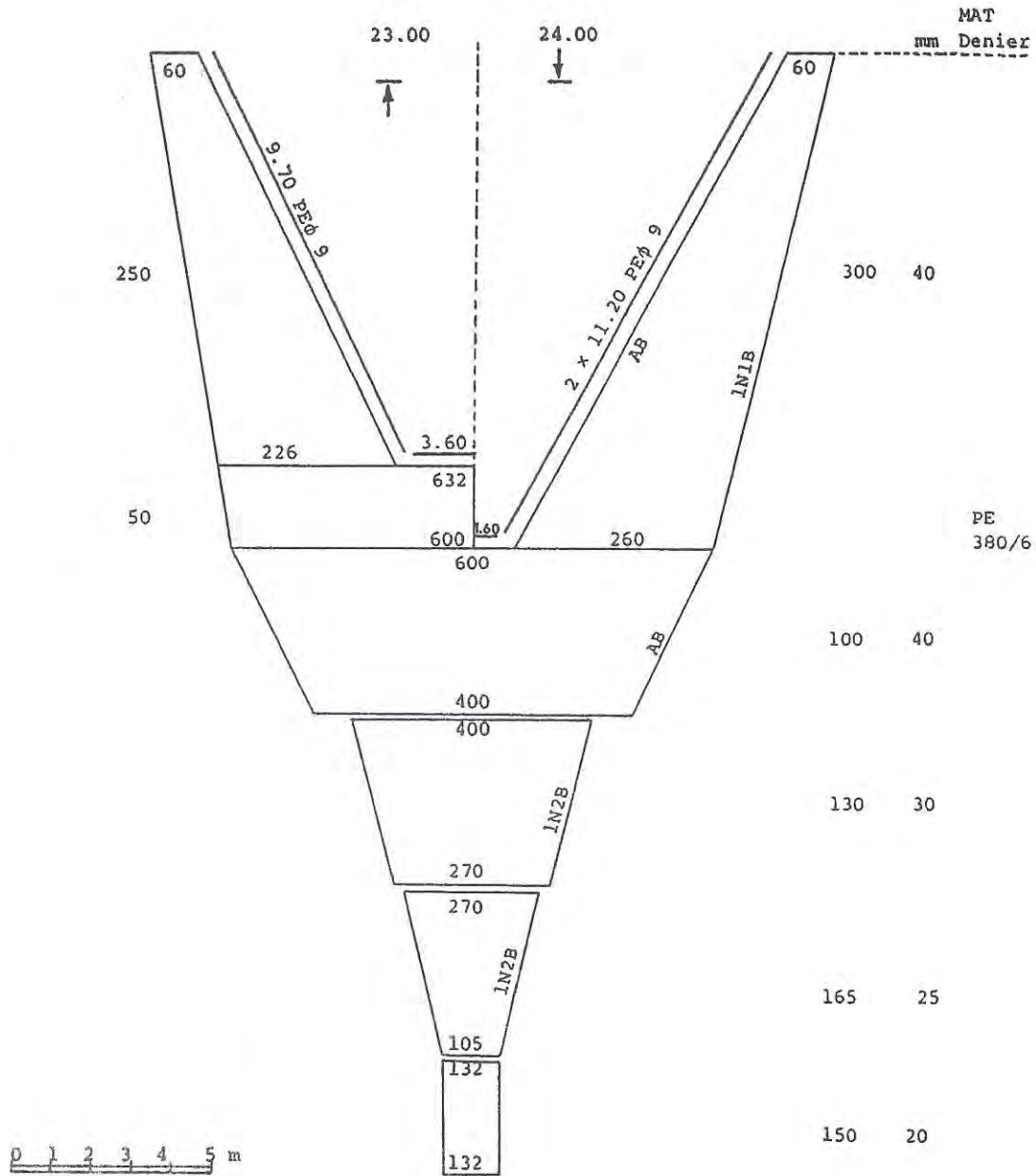
0 1 2 3 4 5 x100 mm

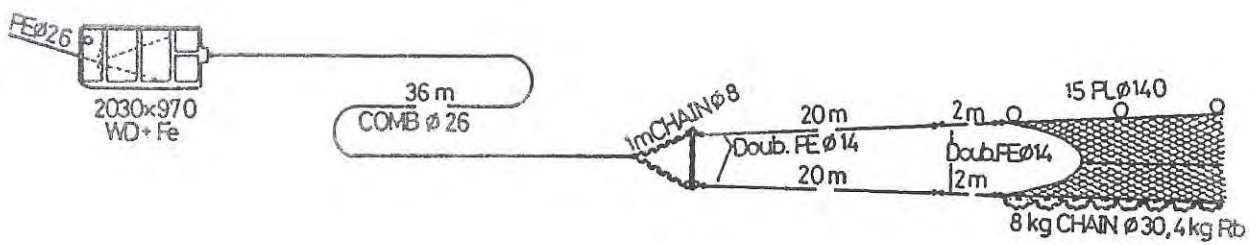
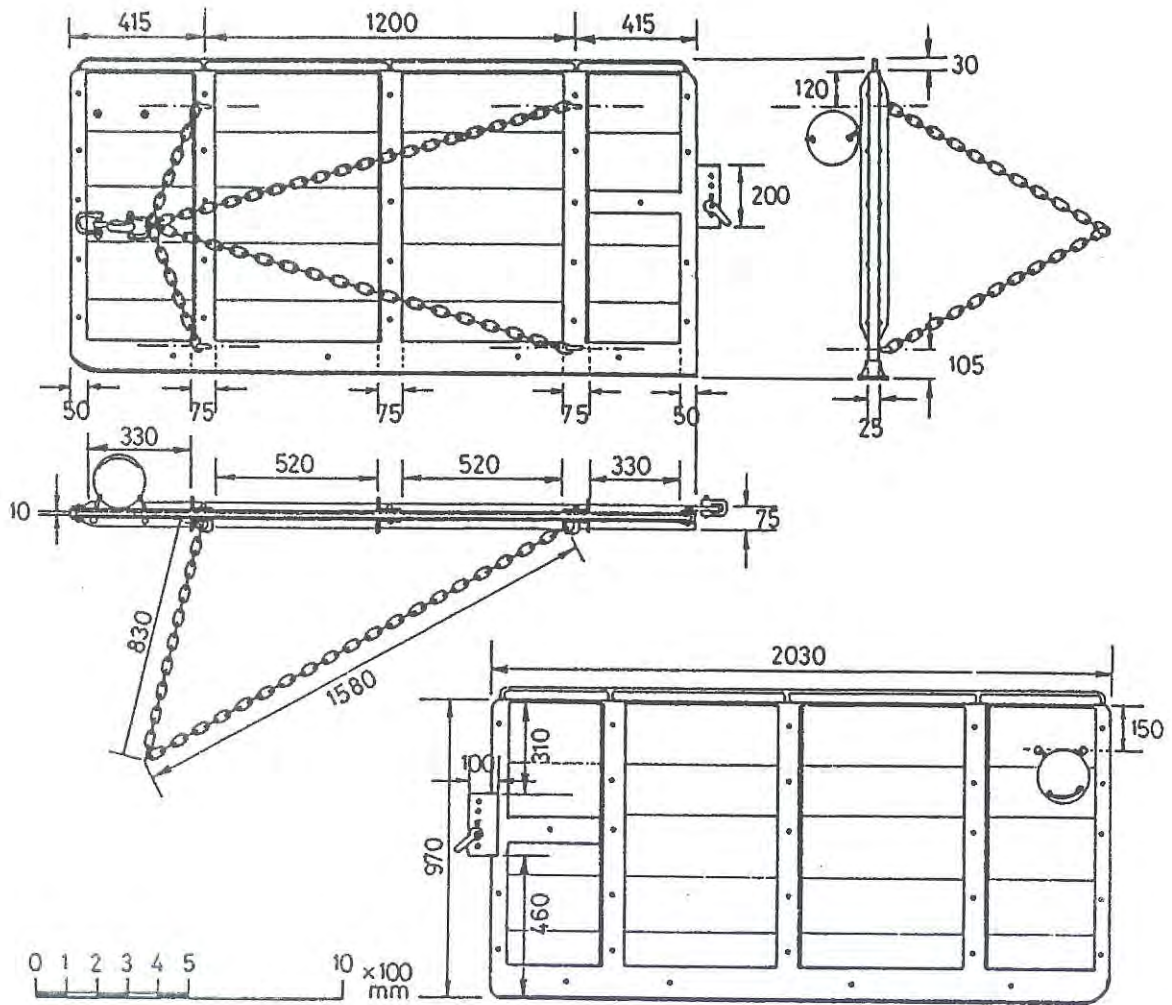


TRAWL
Bottom, otter
Shrimp

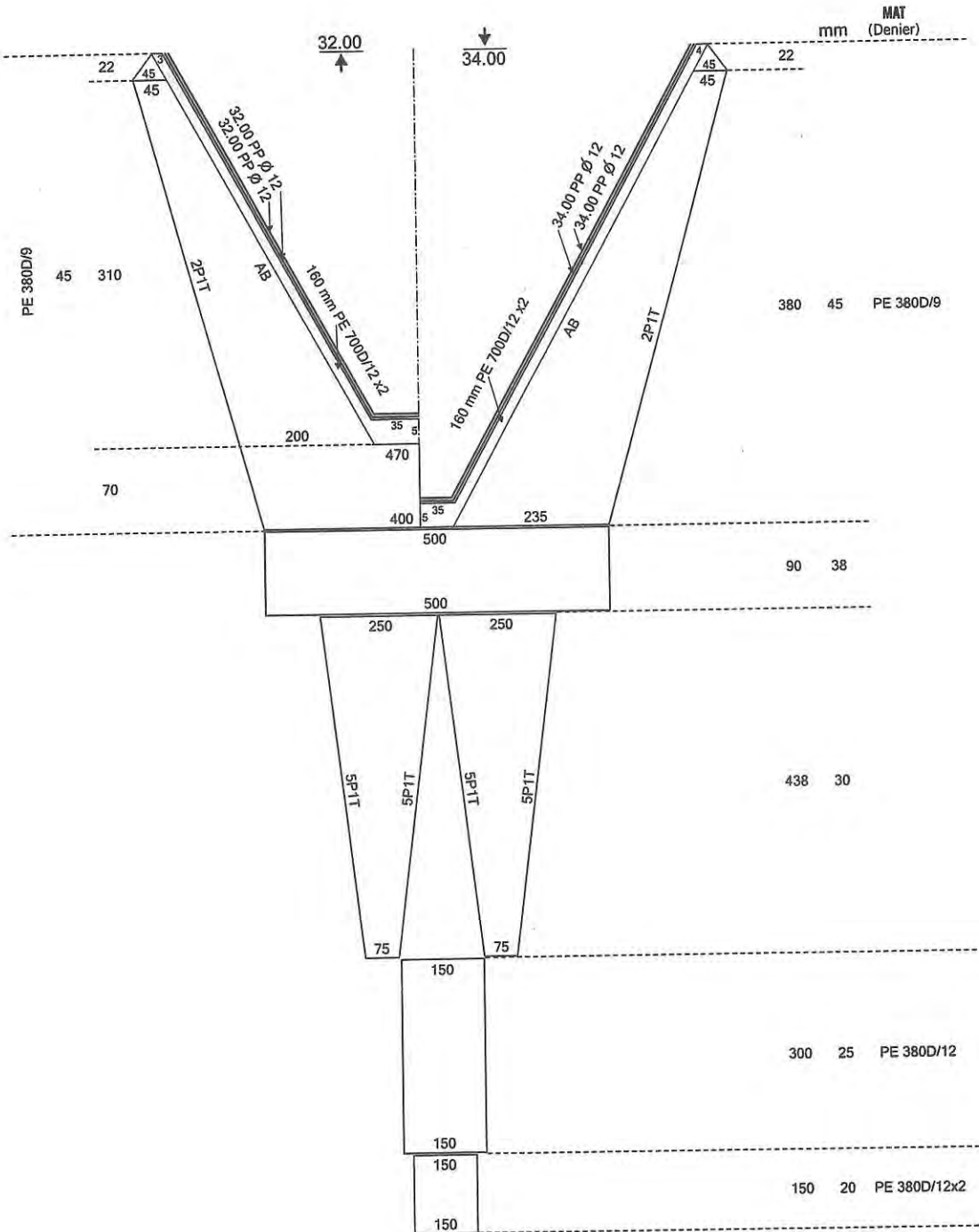
VESSEL
Dejkanya
Loa 12 m
hp 75

LOCATION
Huahin
Prachuap Khiri Khan





TRAWL	VESSEL	LOCATION
Bottom, Otter	Loa 18 m	Paknam Chumporn
Shrimp	hp 180	Chumporn

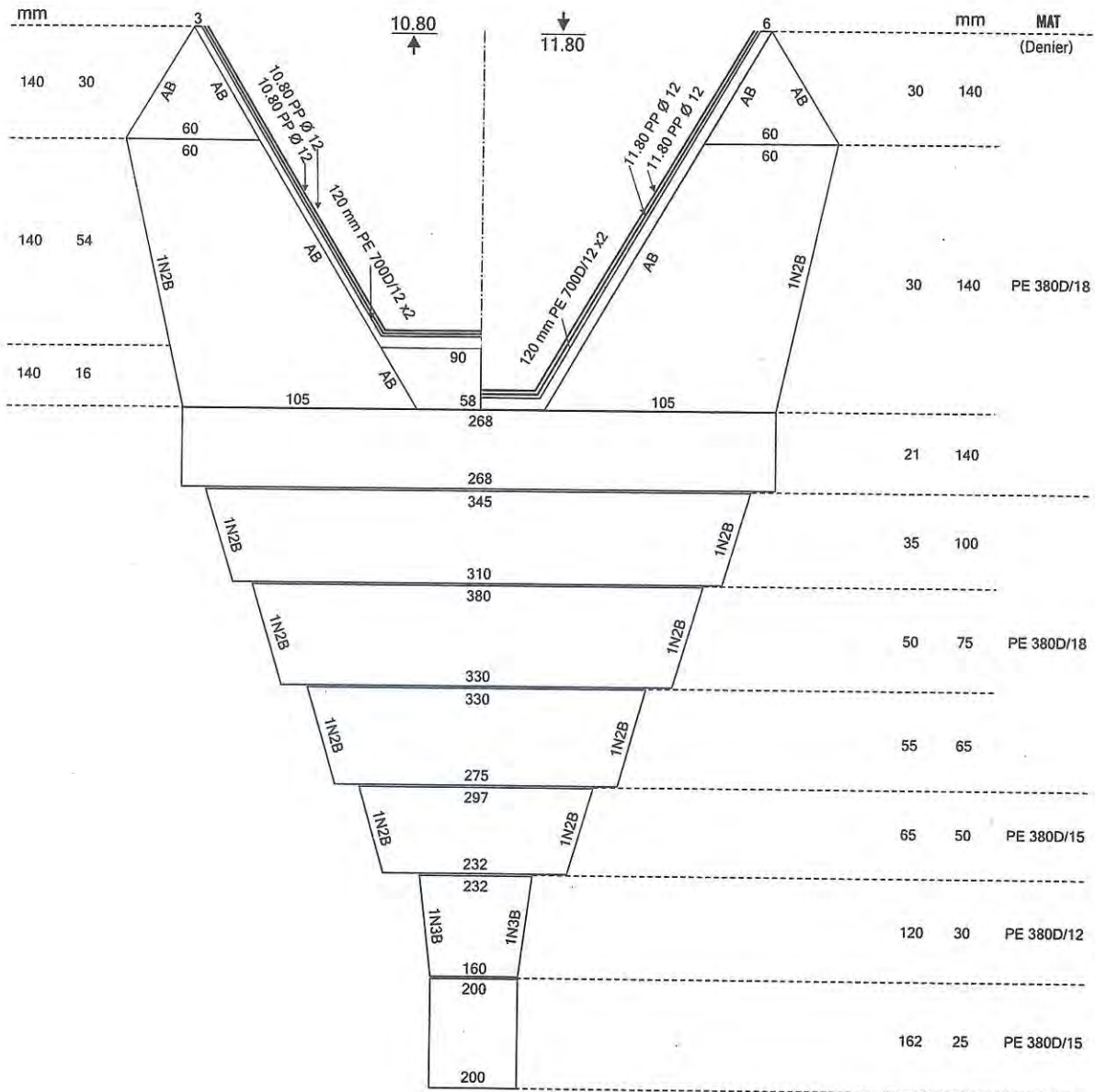


Rv. 2002

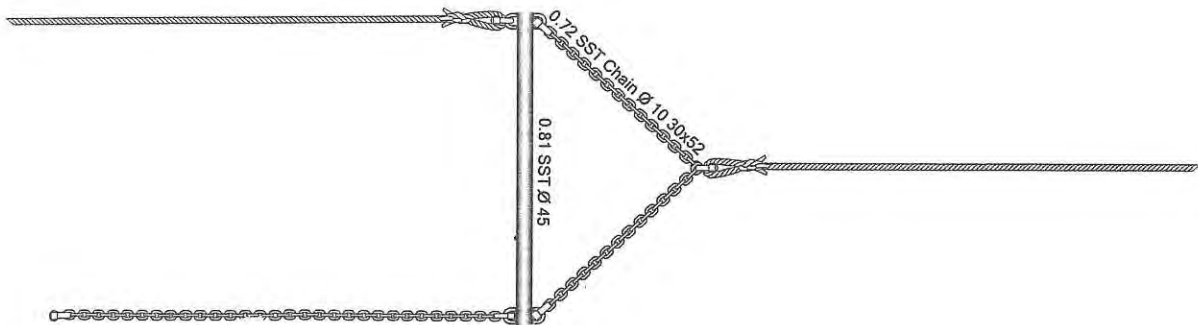
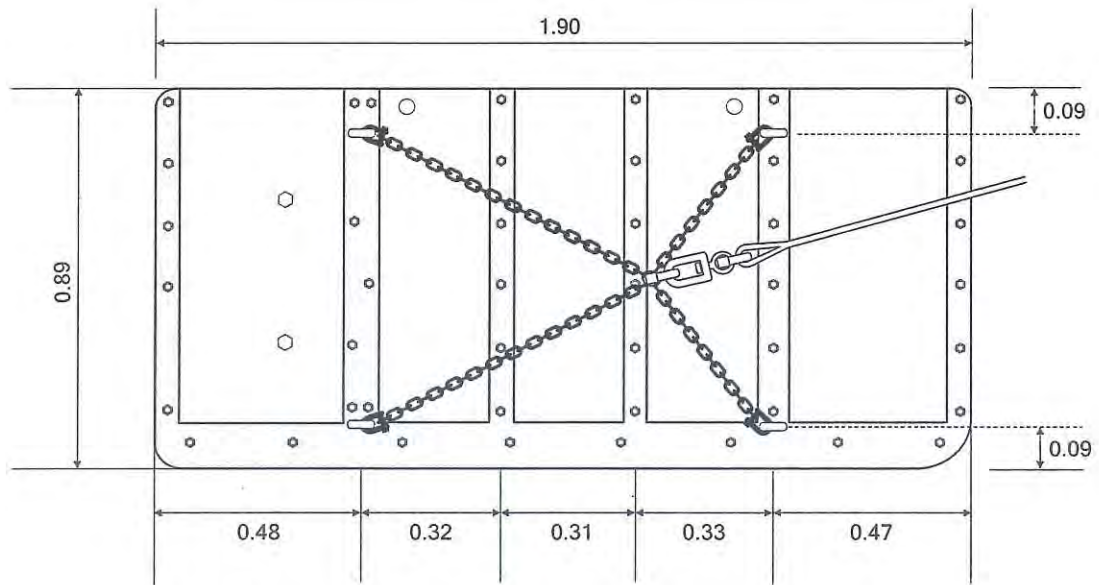
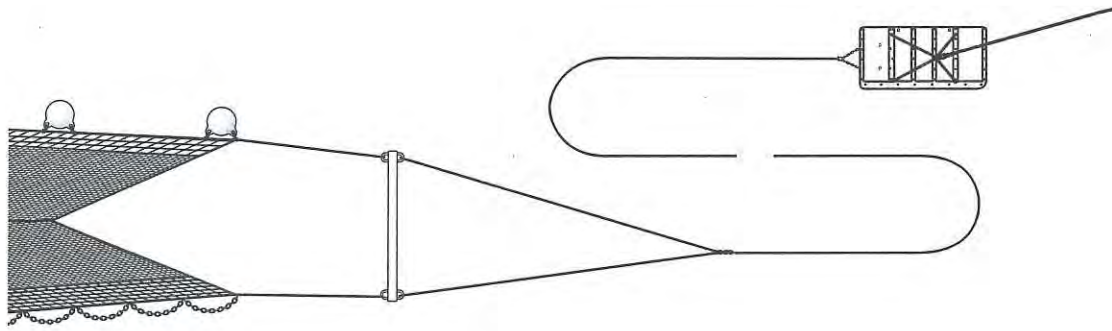
TRAWL
Bottom, Otter
Shrimp

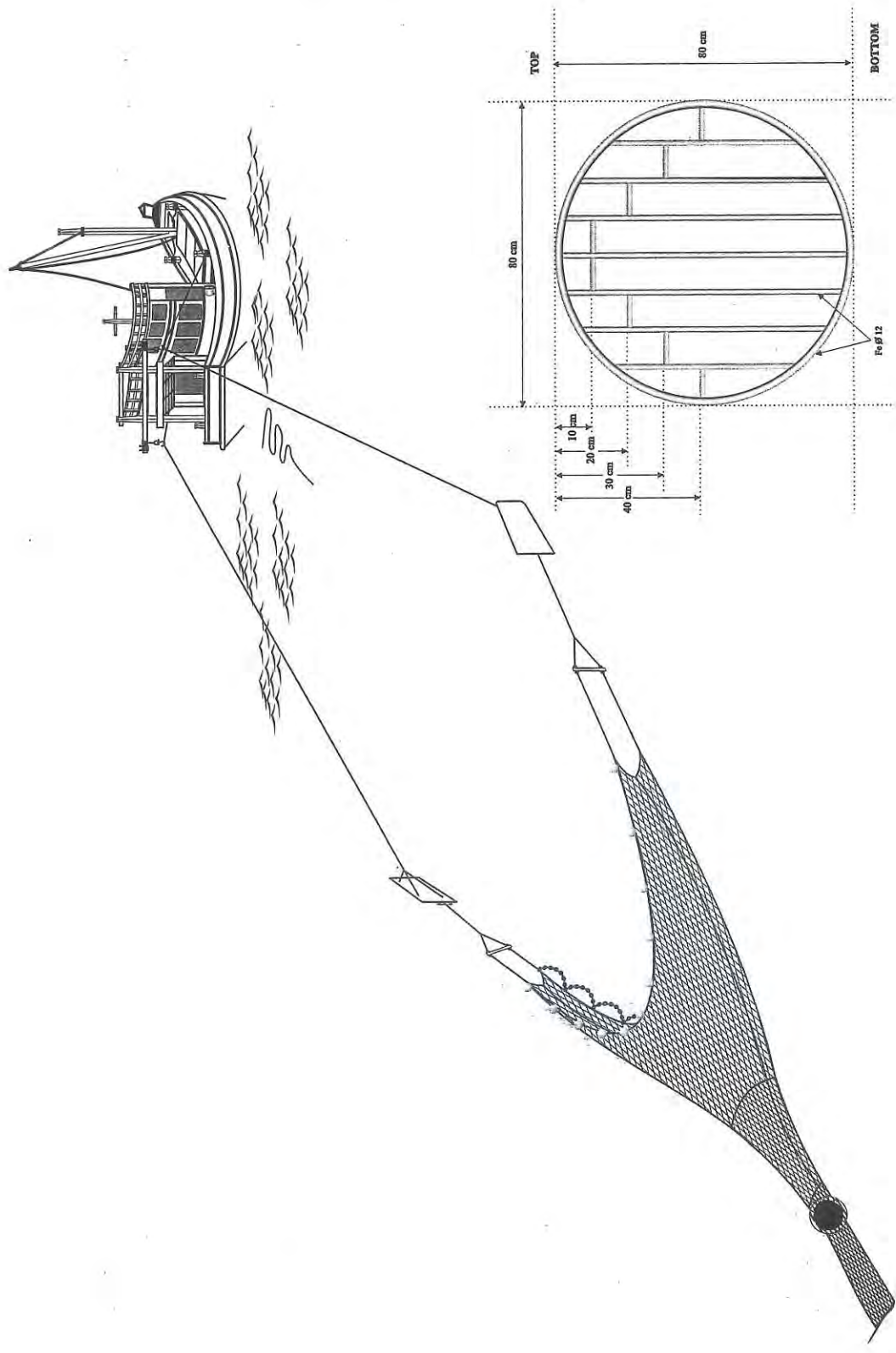
VESSEL
Loa 17 m
hp 235

LOCATION
Phra Samut Chedi
Samut Prakarn



Rv. 2002

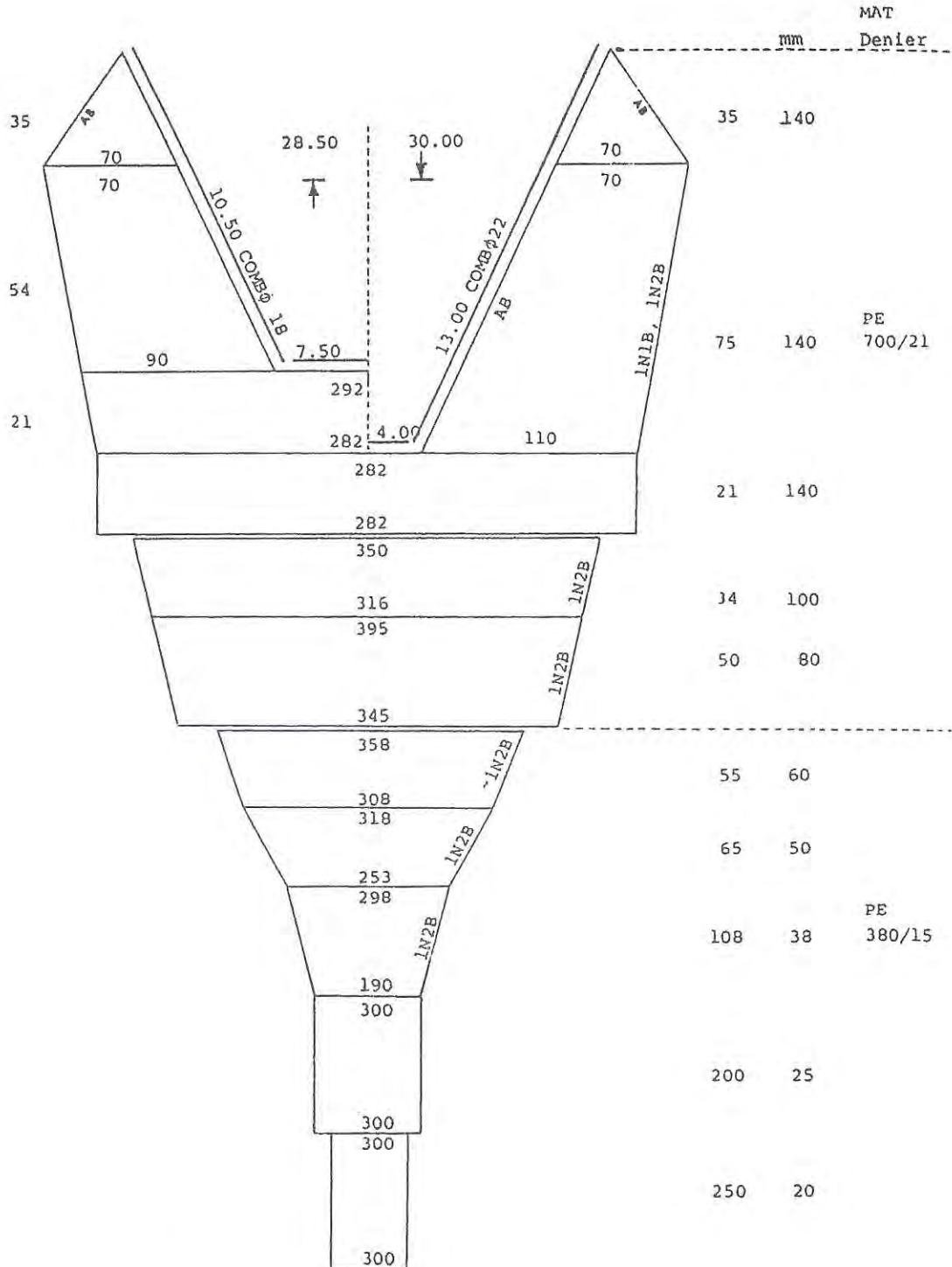




TRAWL
Bottom, otter
Bottom fishes

VESSEL
hp 150

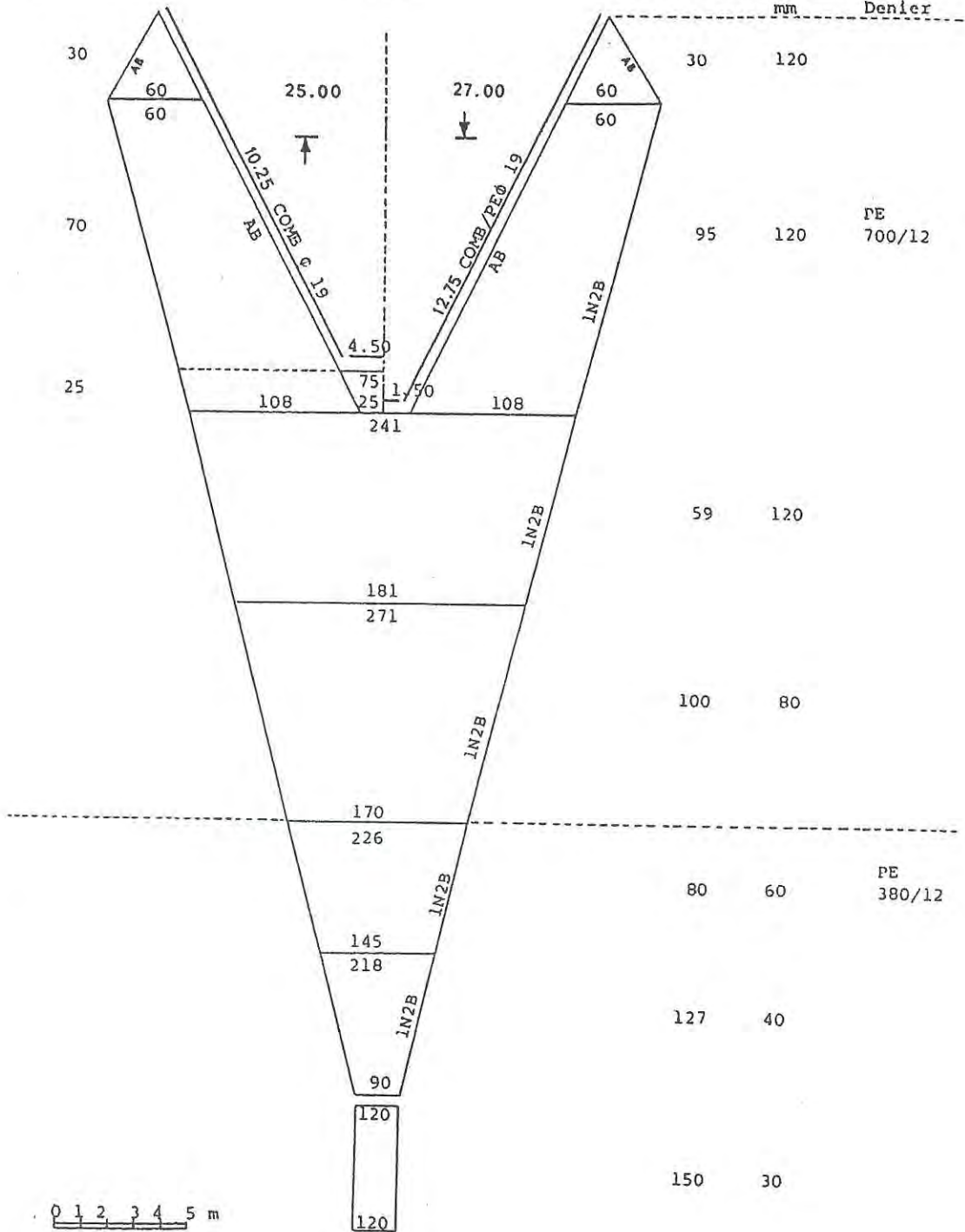
LOCATION
Samut Sakhon
Samut Sakhon



TRAWL
Bottom, otter
Bottom fishes

VESSEL
Kongnatee
hp 180

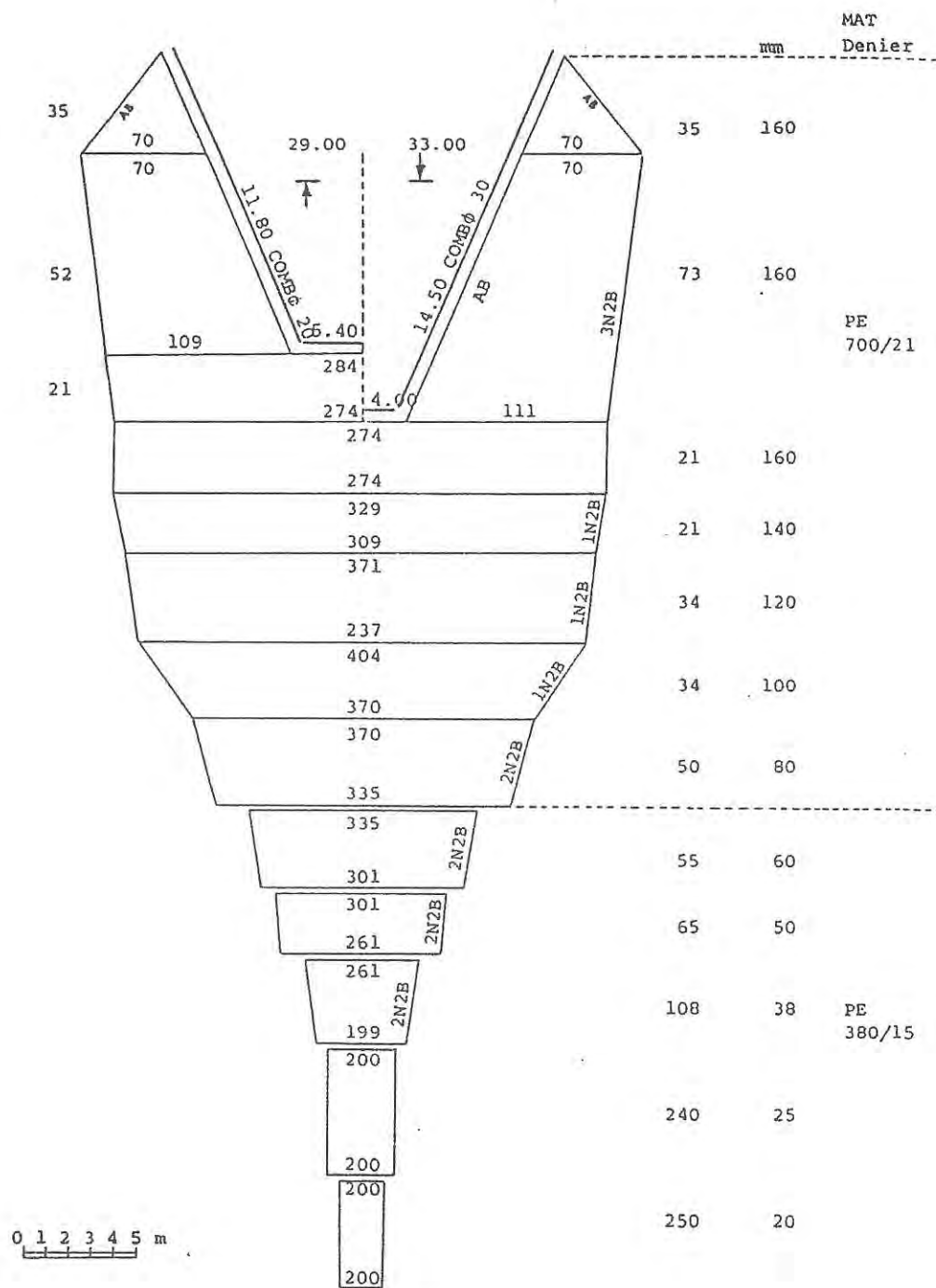
LOCATION
Kantang
Trang
mm
MAT
Denier



TRAWL
Bottom otter
Bottom fishes

VESSEL
hp 150-300

LOCATION
Samut Sakhon
Samut Sakhon

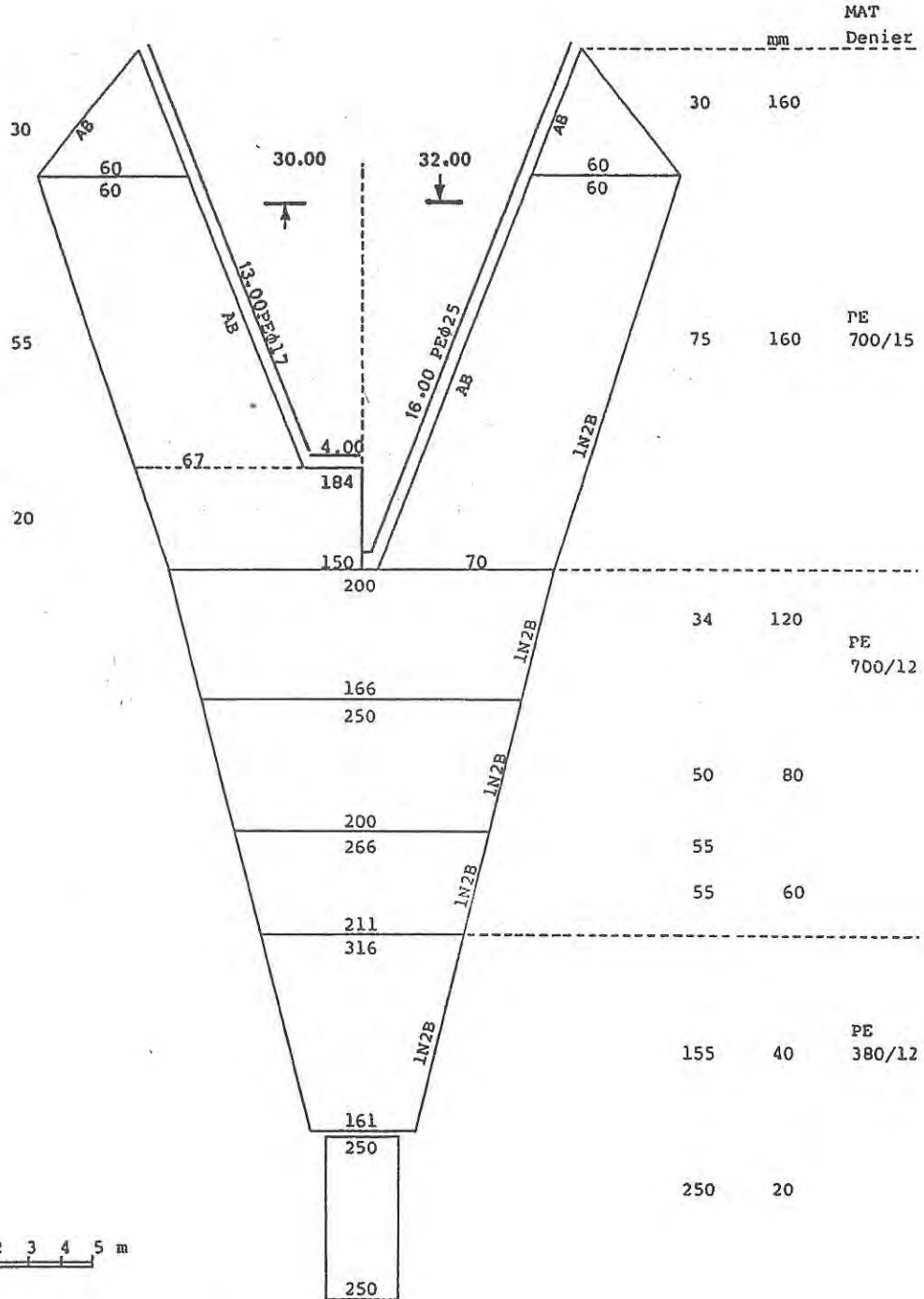


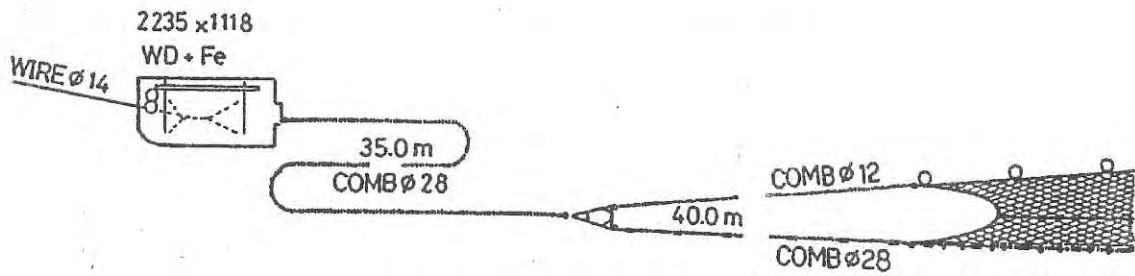
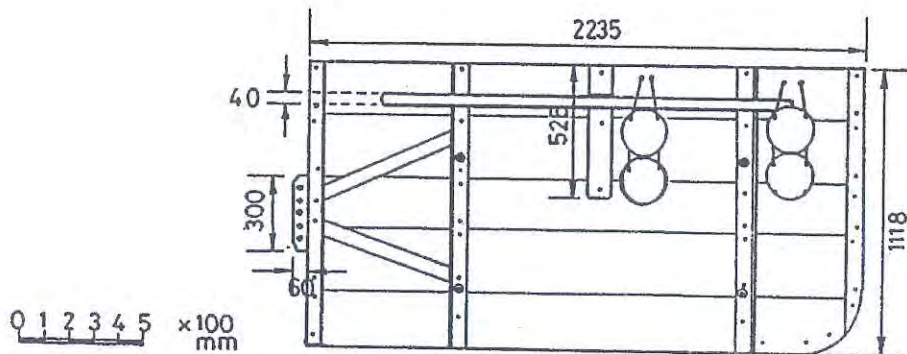
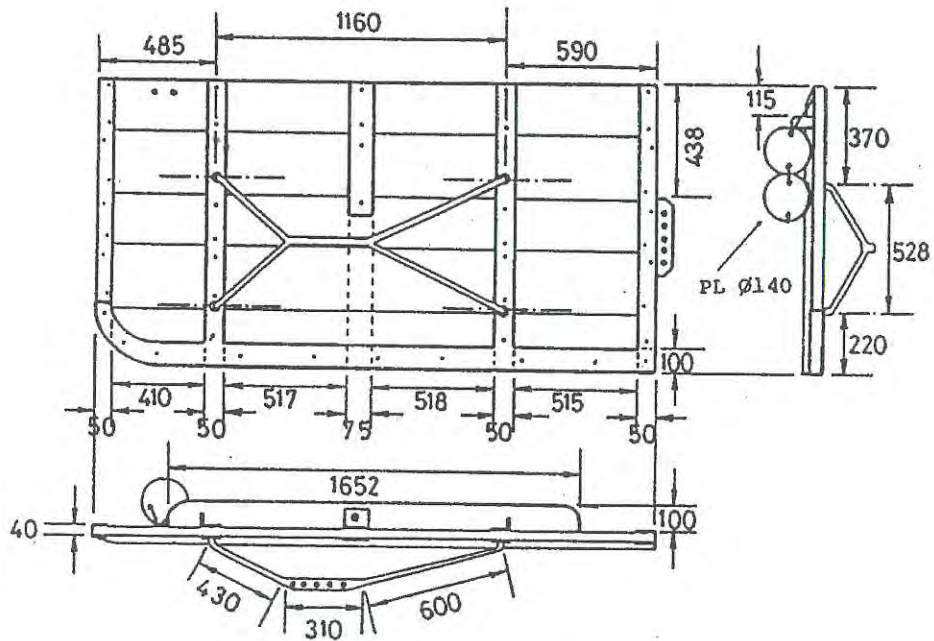


TRAWL
Bottom, otter
Bottom fishes

VESSEL
Montienthong
Loa 24 m
ph 250

LOCATION
Paknamchumphon
Chumphon

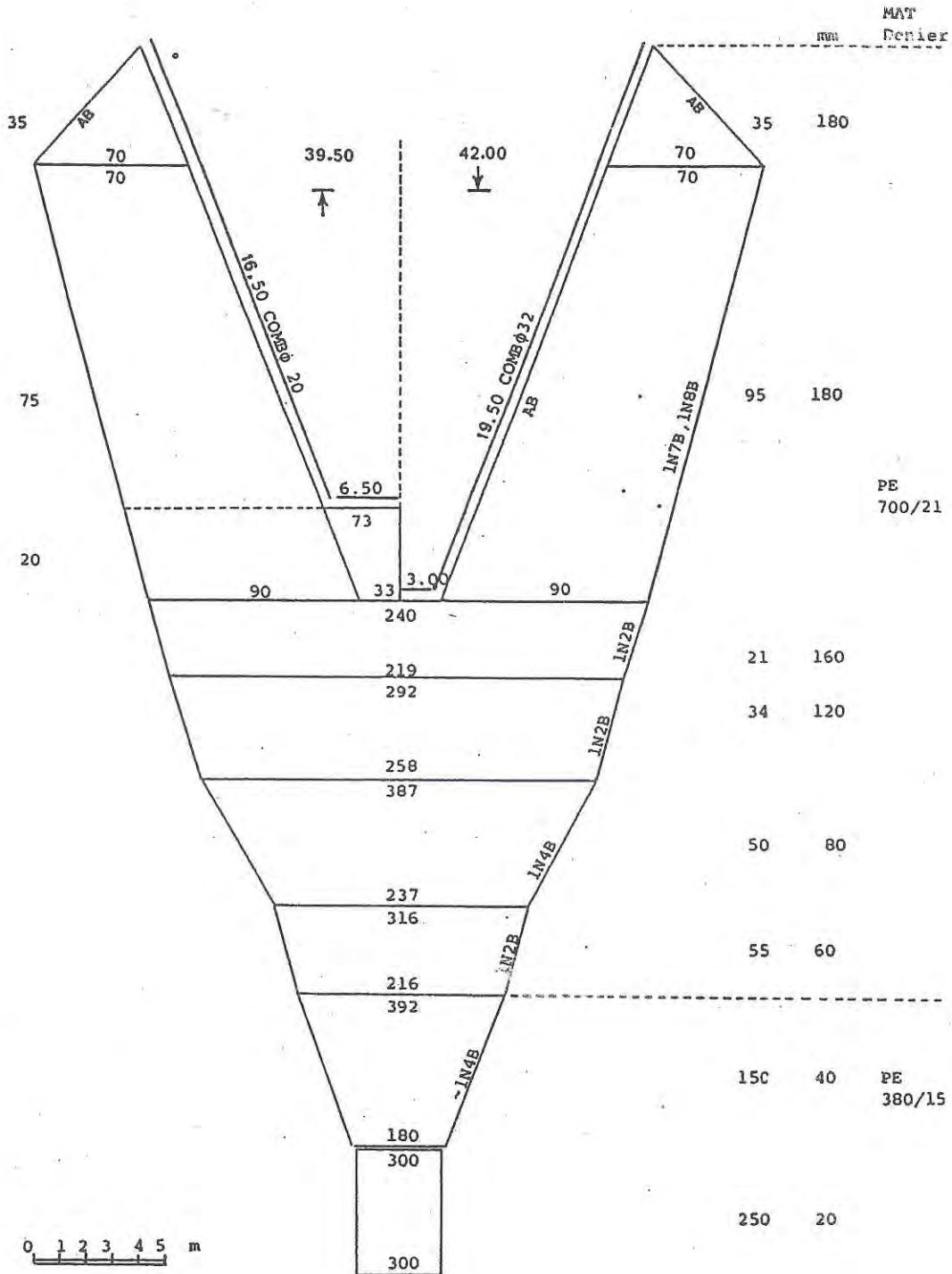


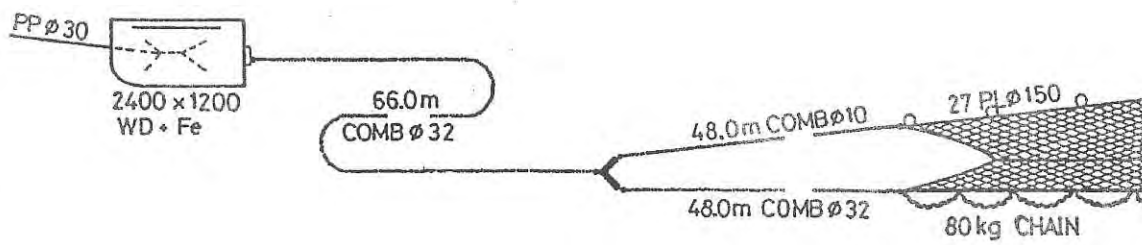
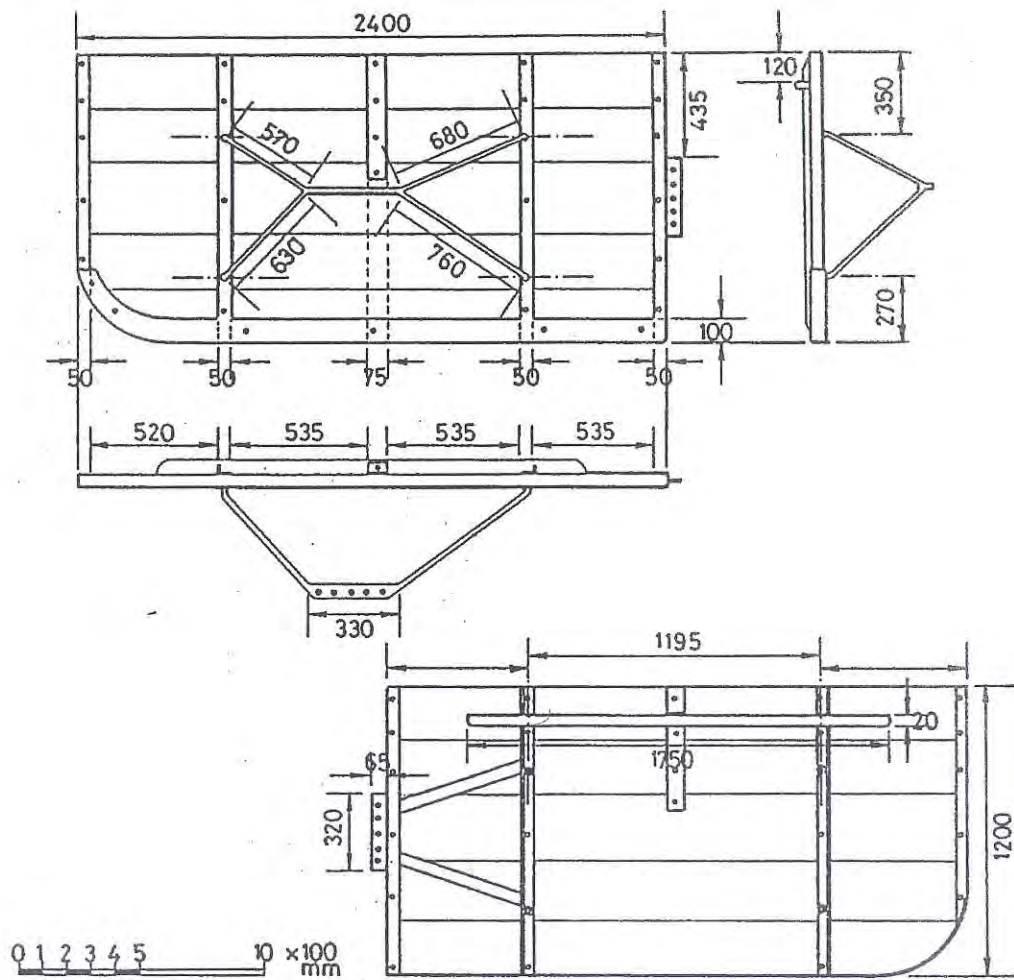


TRAWL
Bottom, otter
Bottom fishes

VESSEL
Karnjanapanich
Loa 28 m
hp 365

LOCATION
Maeklong
Samut Songkhram

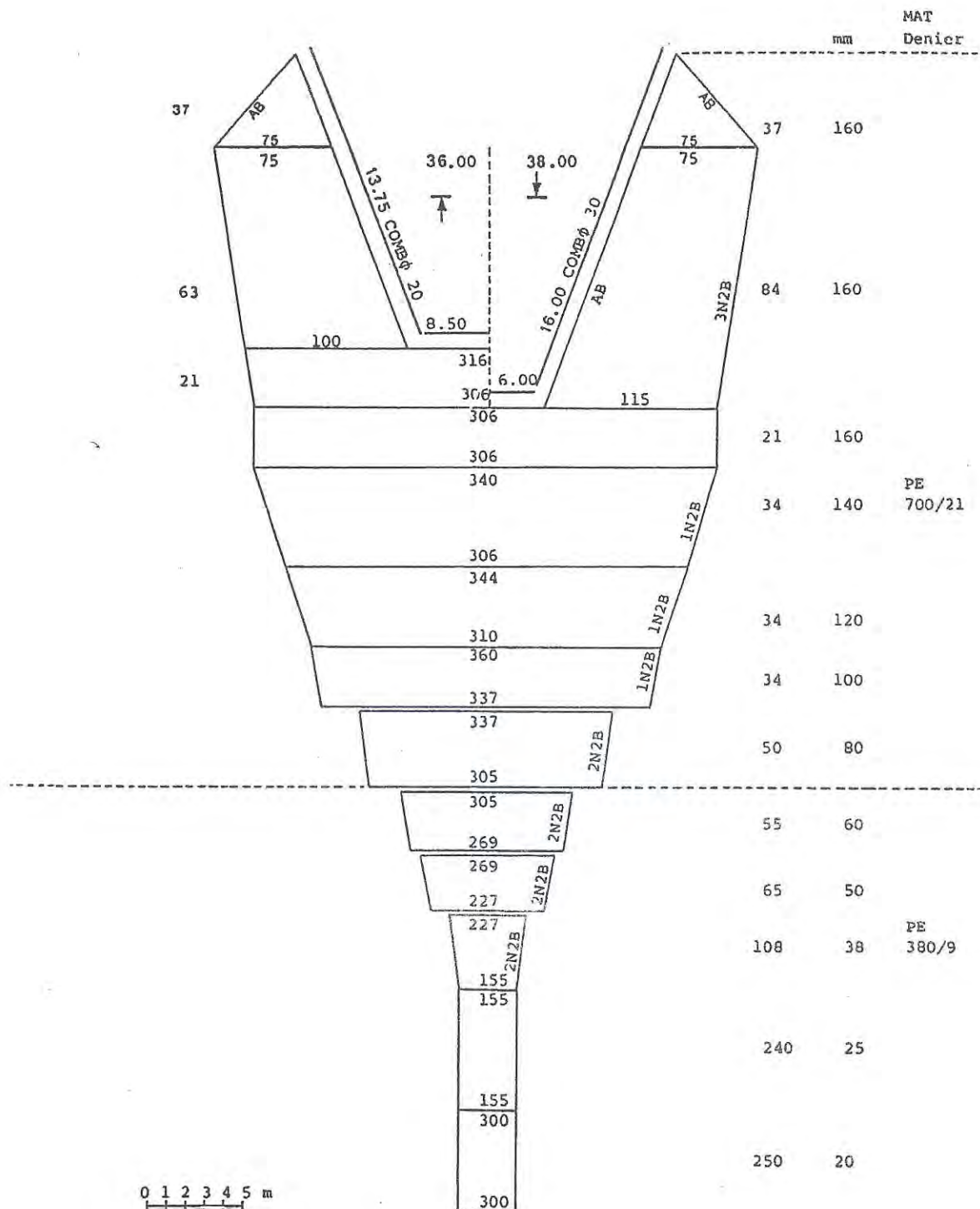


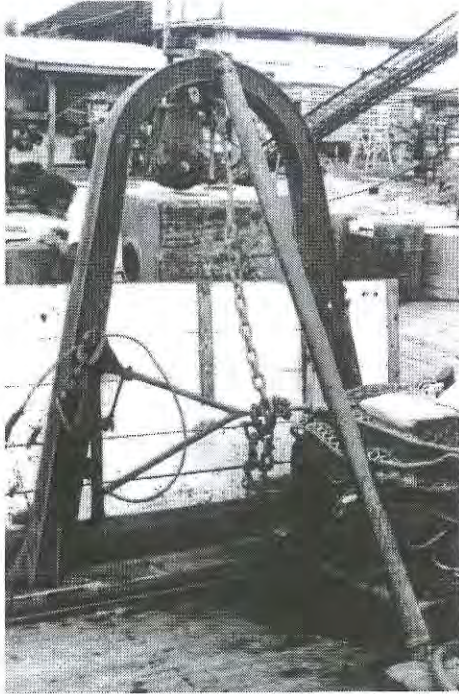
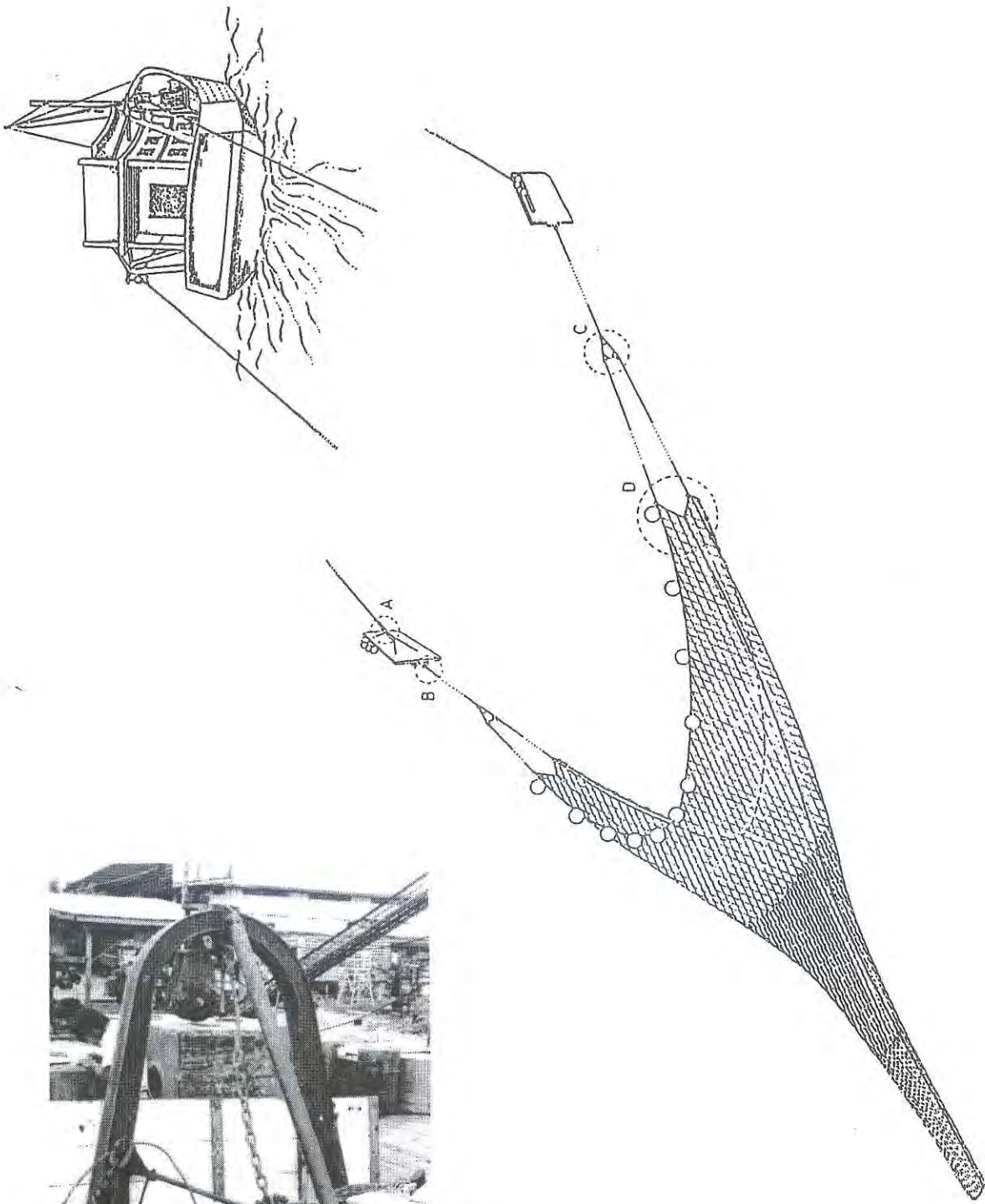


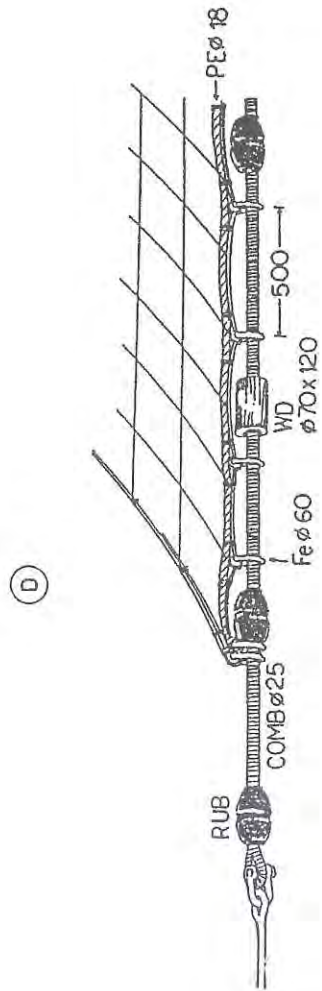
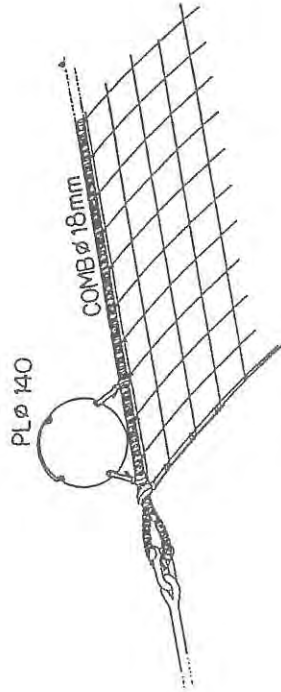
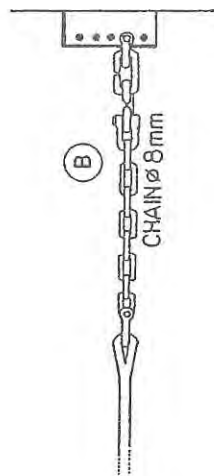
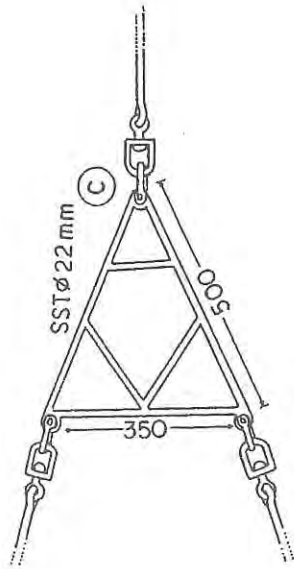
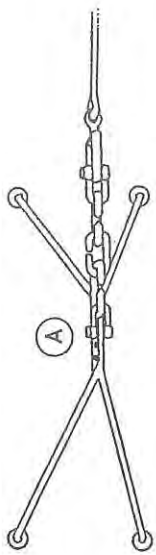
TRAWL
Bottom, otter
Bottom fishes

VESSEL
hp 200 ~ 400

LOCATION
Samut Sakhon
Samut Sakhon



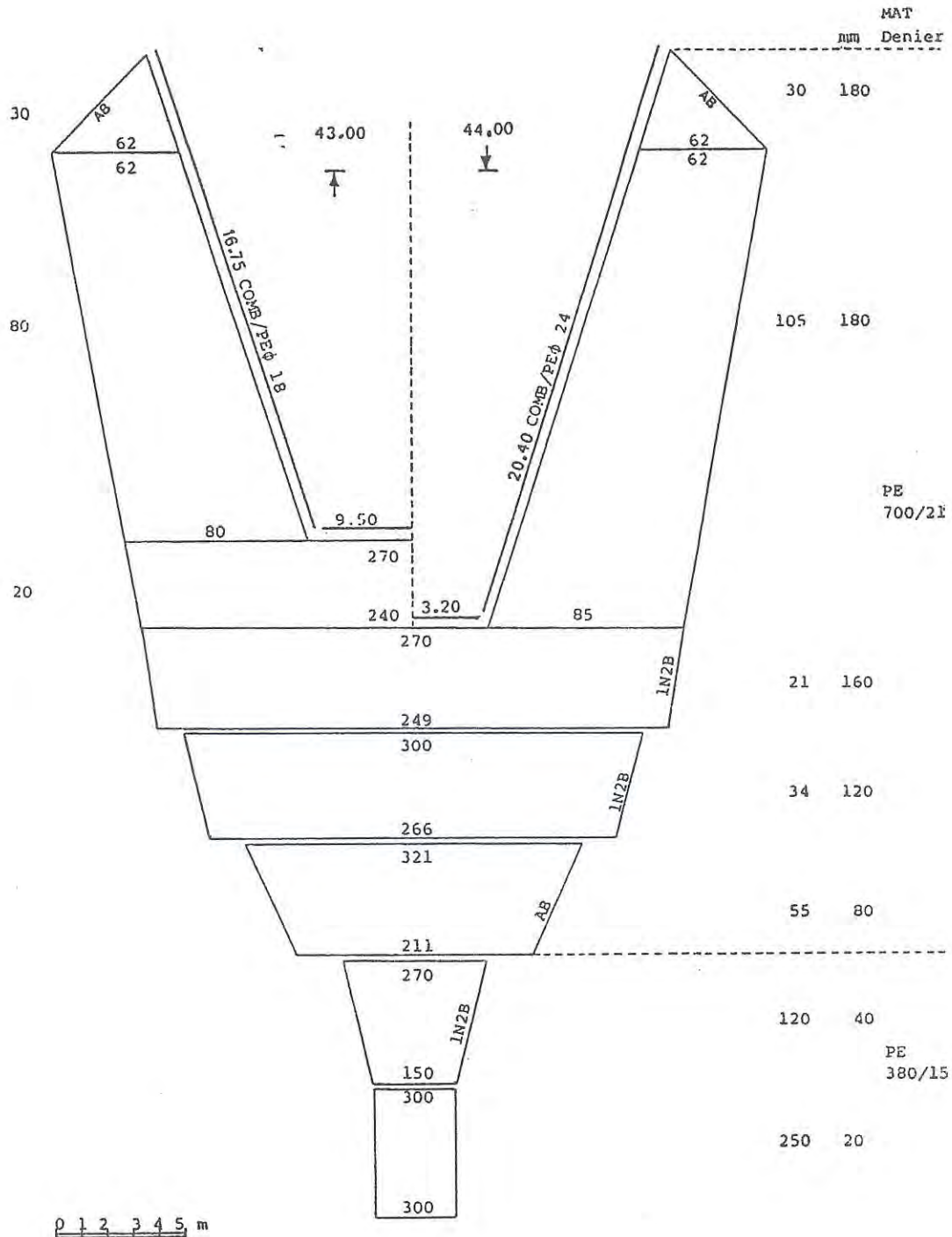


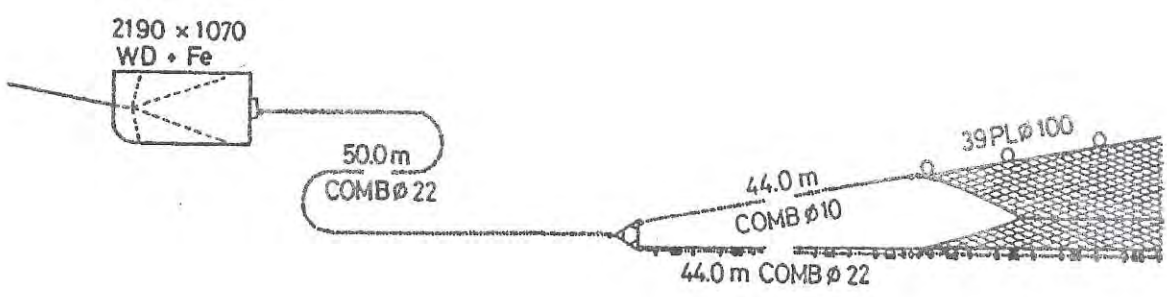
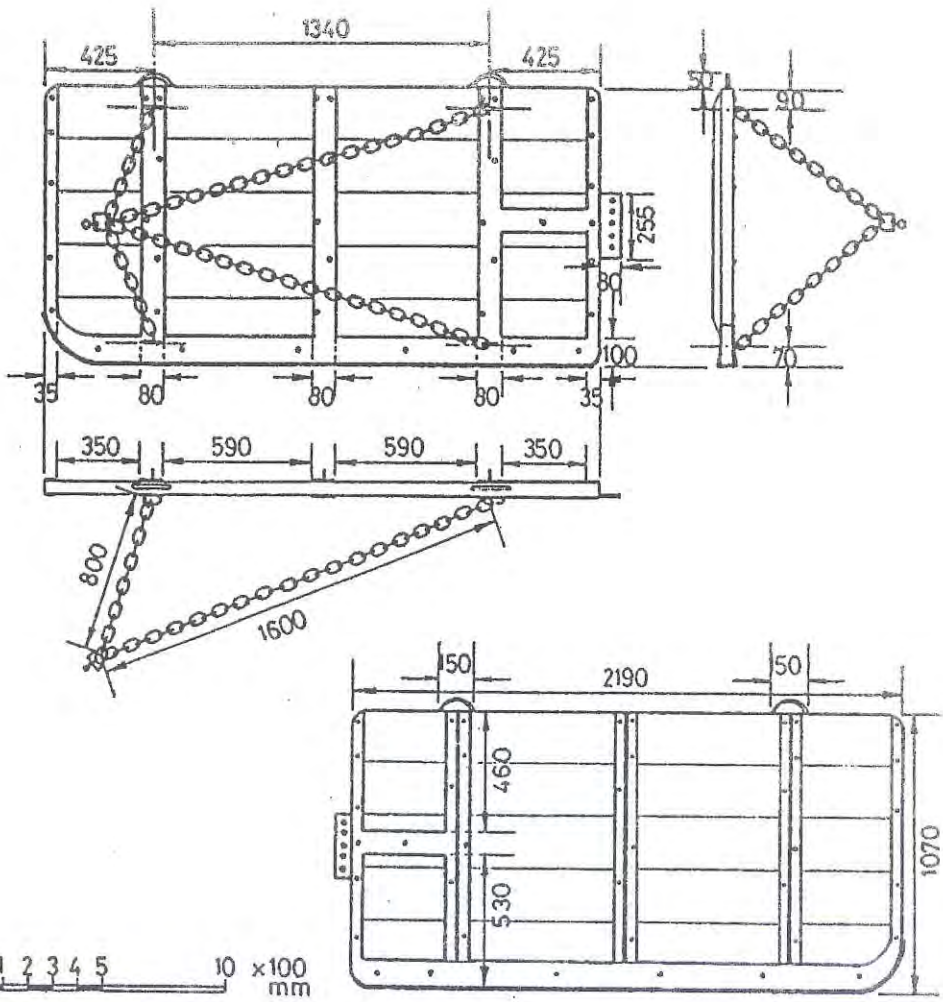


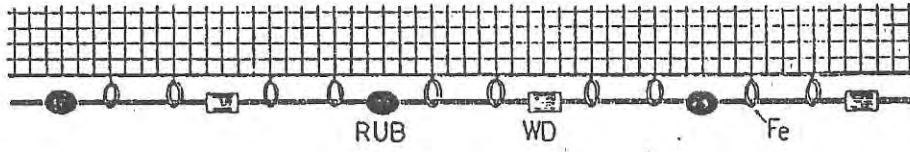
TRAWL
Bottom, otter
Bottom fishes

VESSEL
T. Sumrit
Loa 21.5 m
hp 350

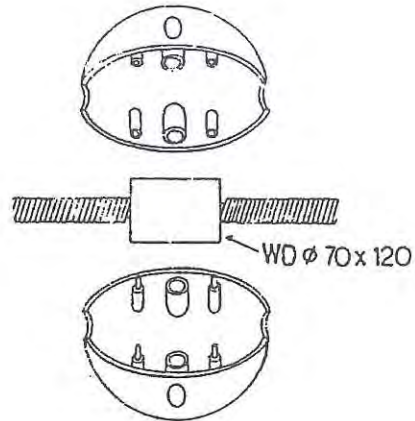
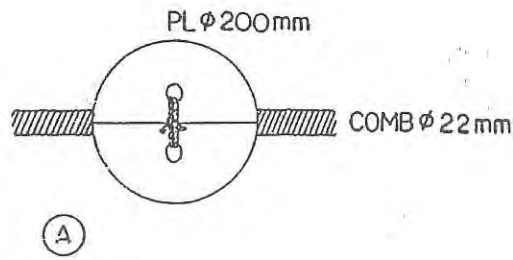
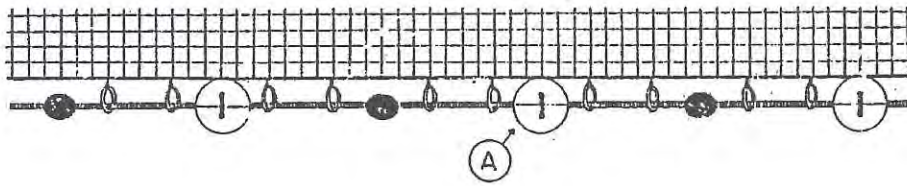
LOCATION
Samut Prakarn
Samut Prakarn

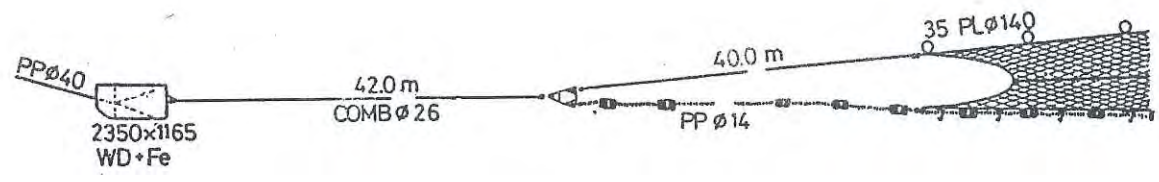
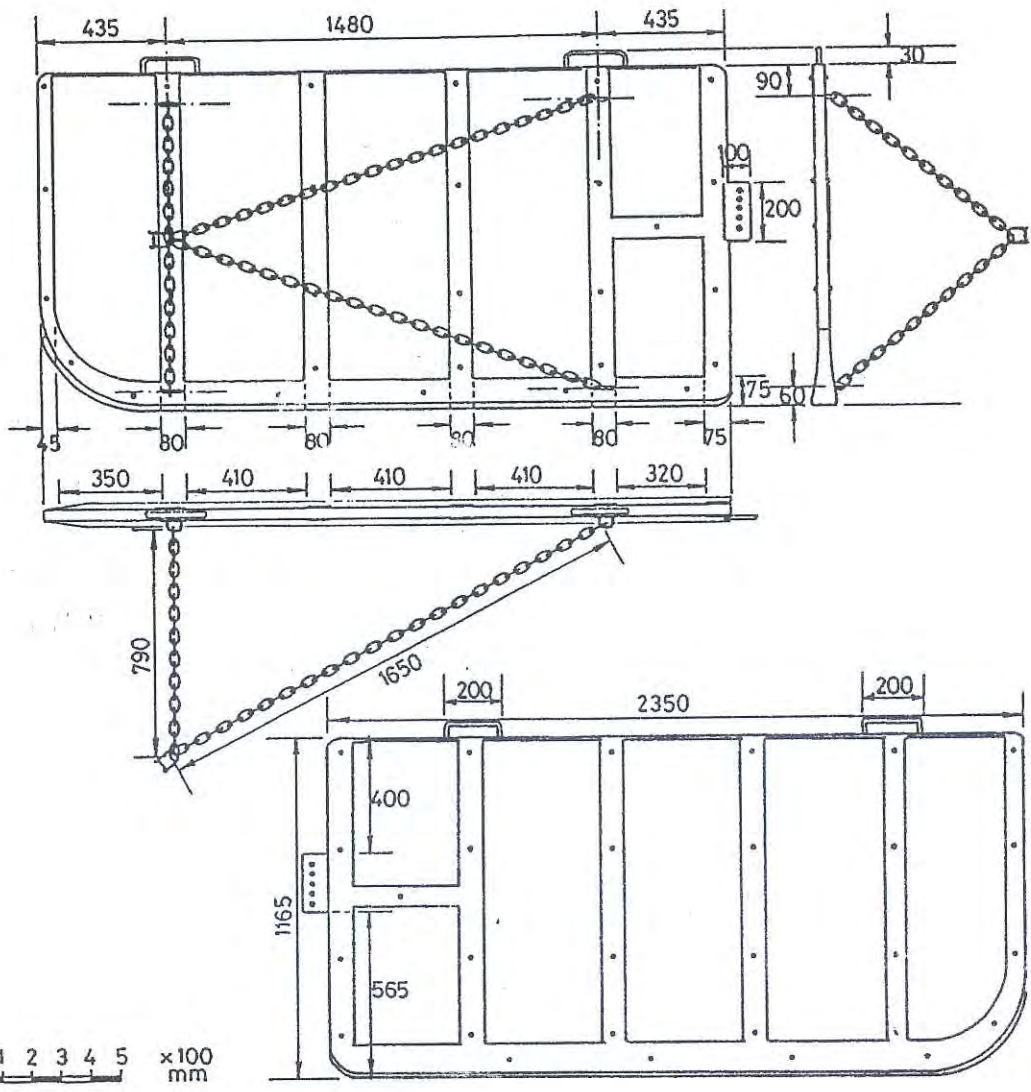






ALT

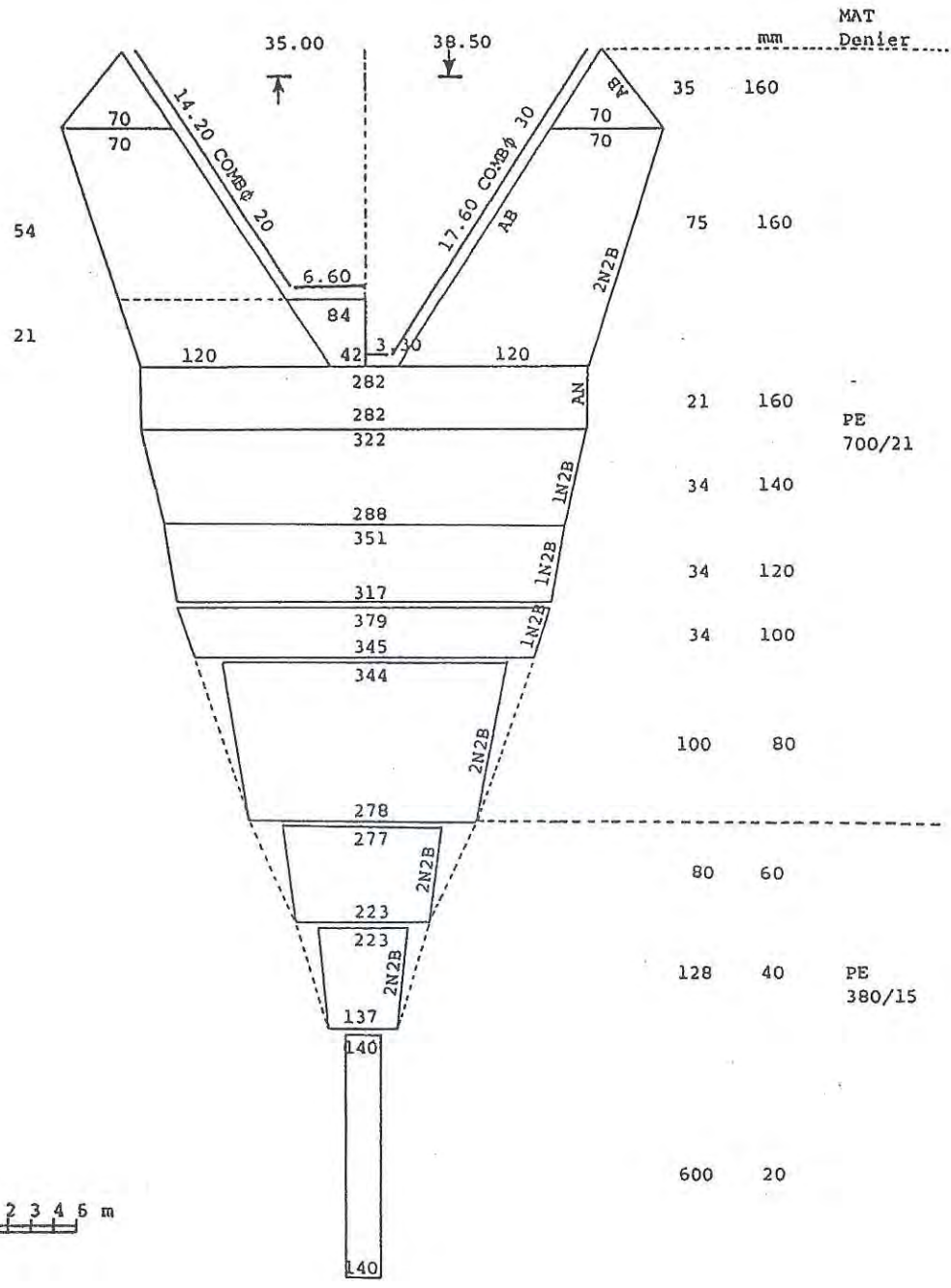


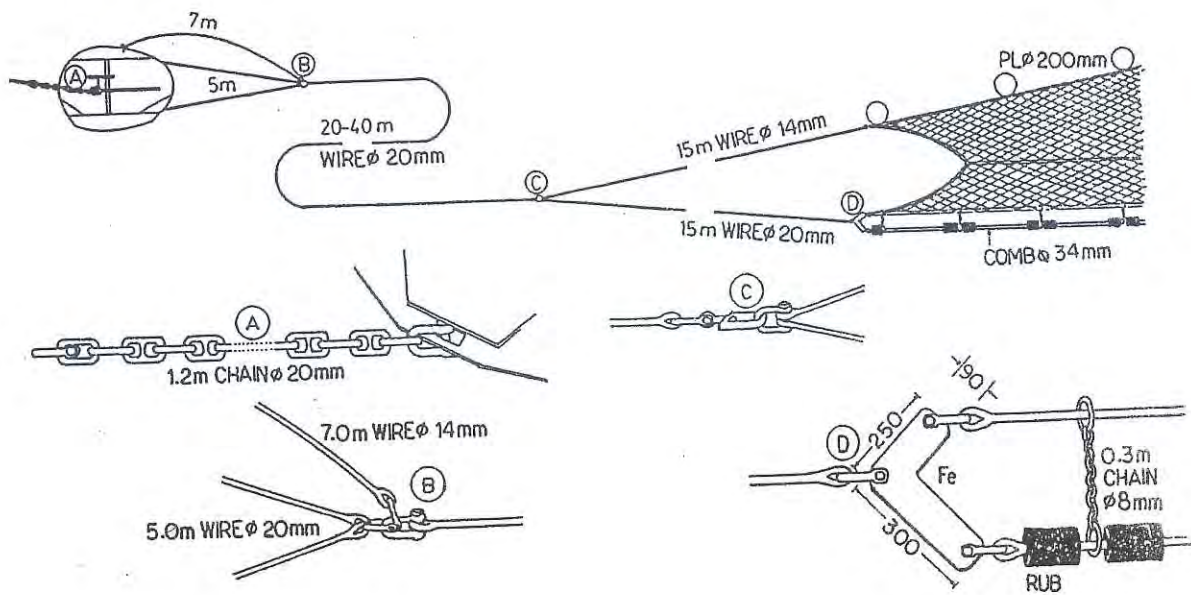
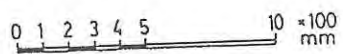
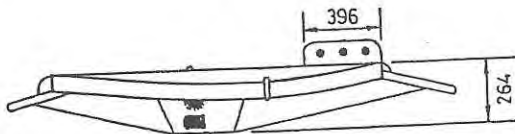
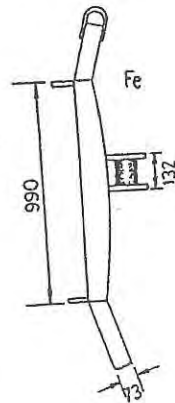
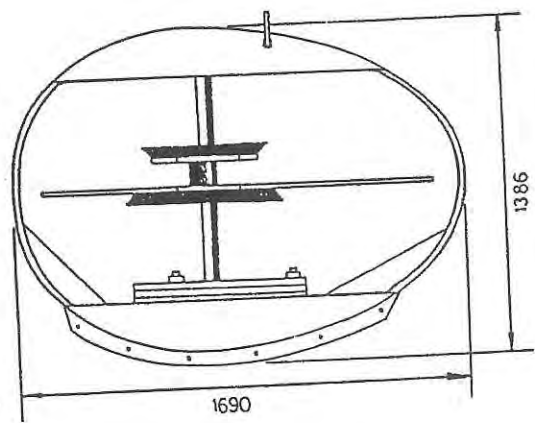


TRAWL
Bottom, otter
Bottom fishe

VESSEL
M.V. Paknam
hp 1000

LOCATION
Samut Prakarn
Samut Prakarn

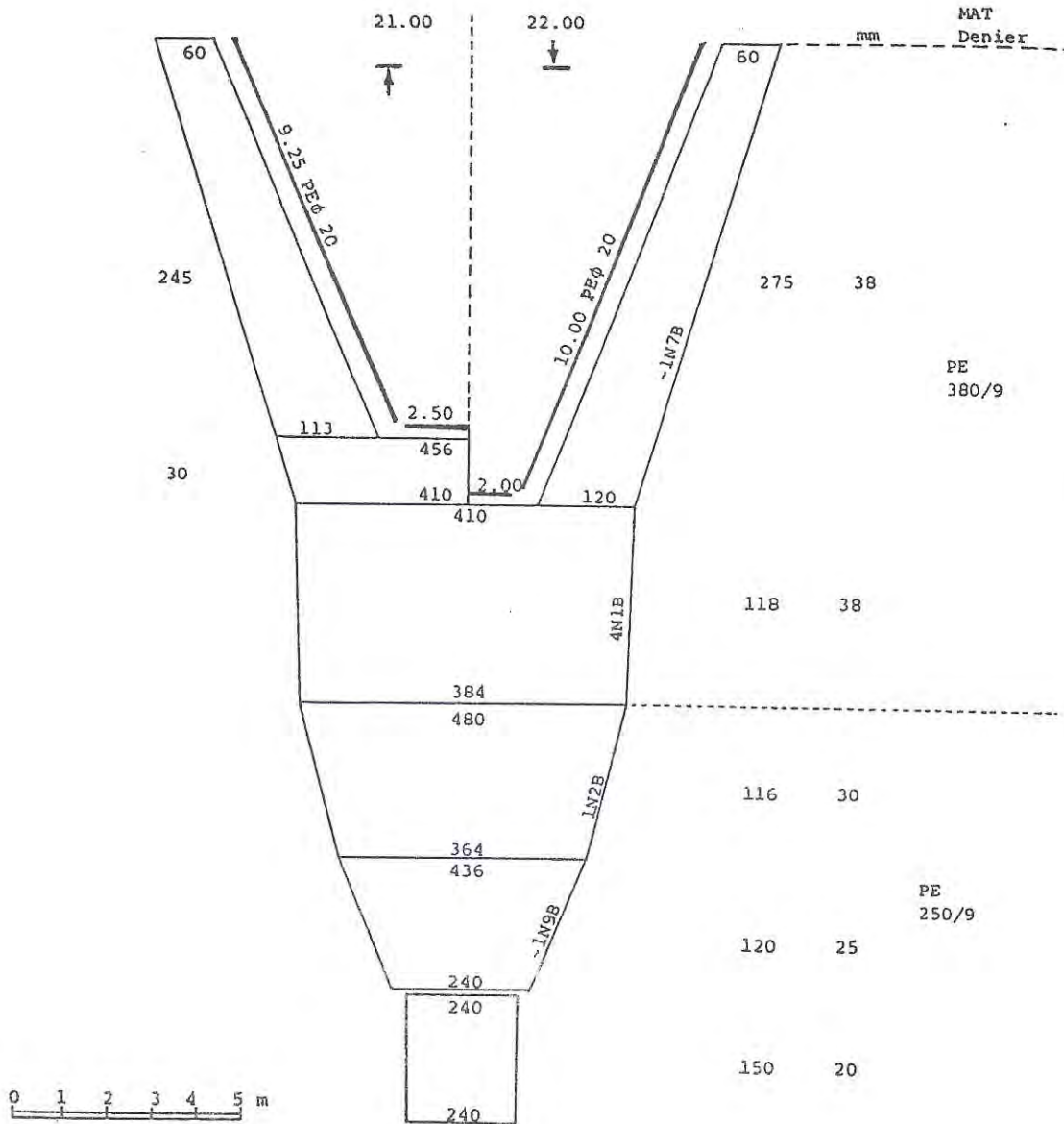


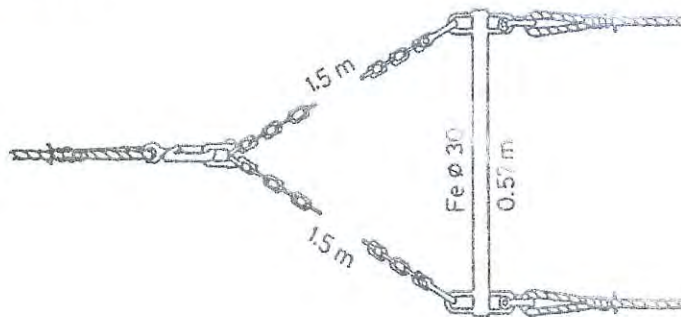
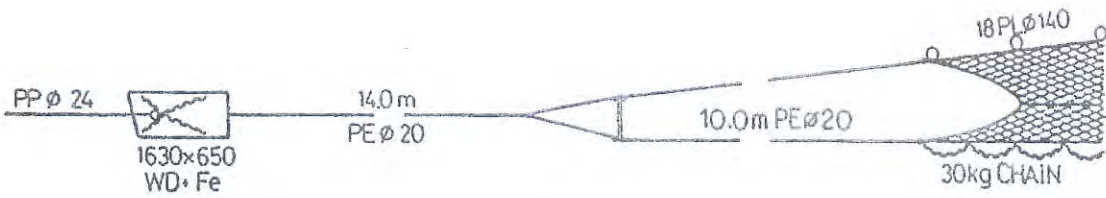
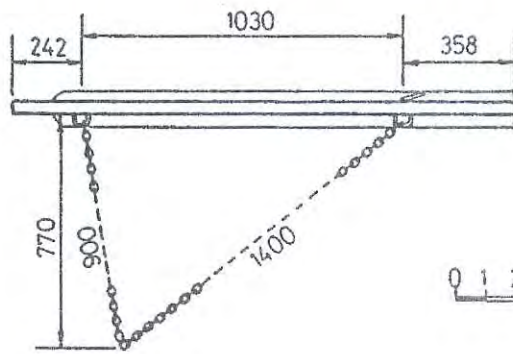
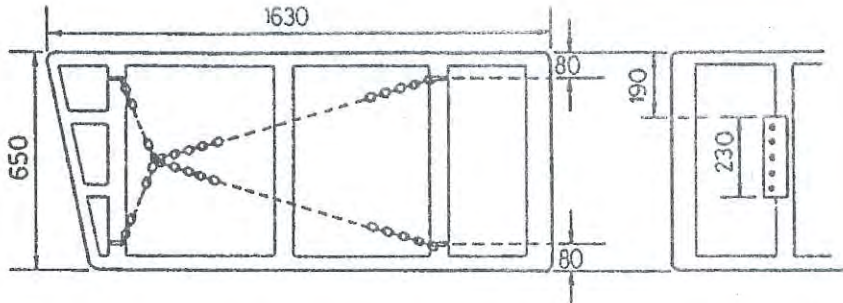


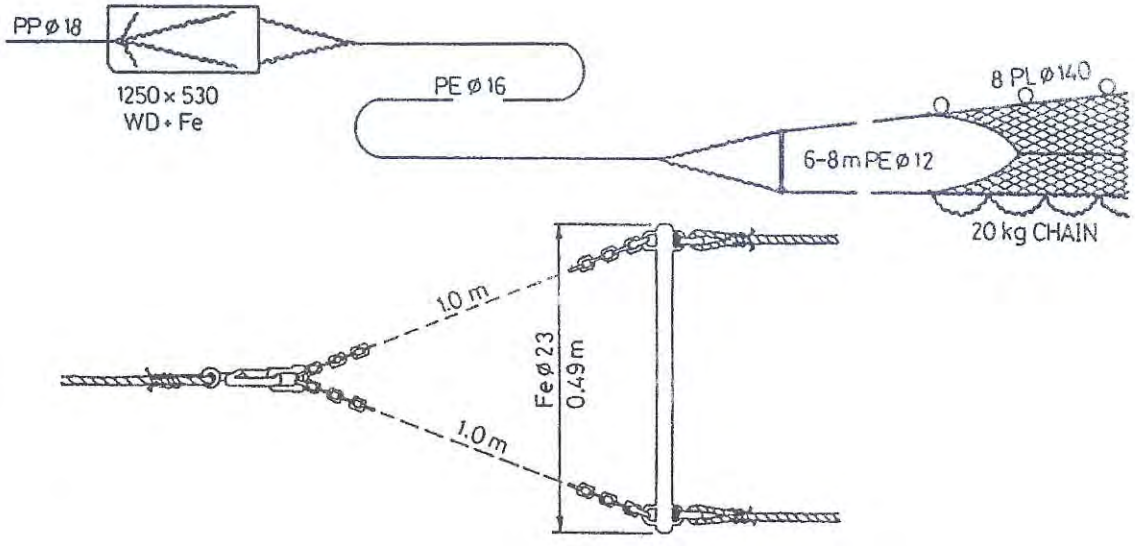
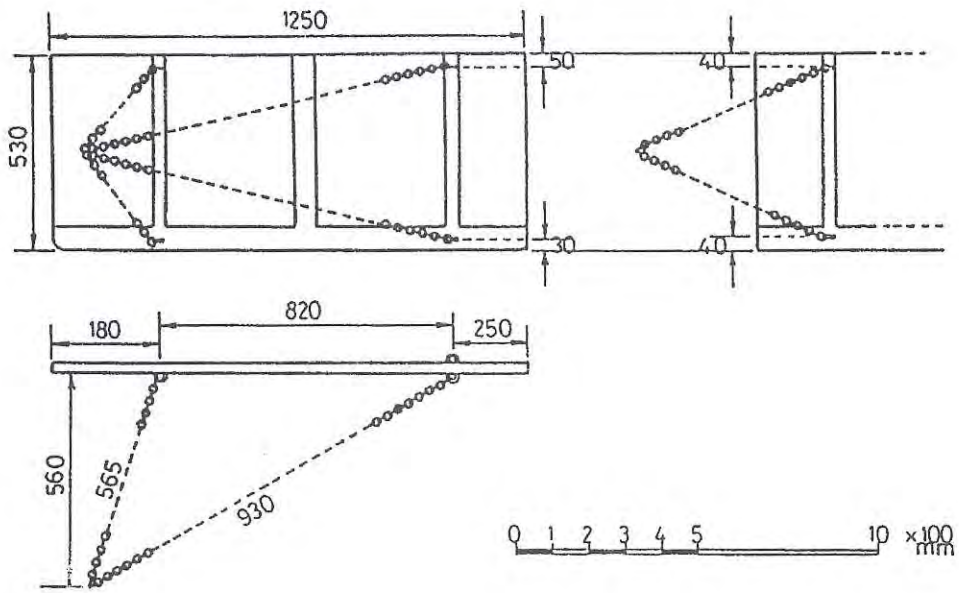
TRAWL
Bottom, otter boom
Shrimp

VESSEL
K. Chamruenras
Loa 10 m
hp 50

LOCATION
Samut Prakarn
Samut Prakarn



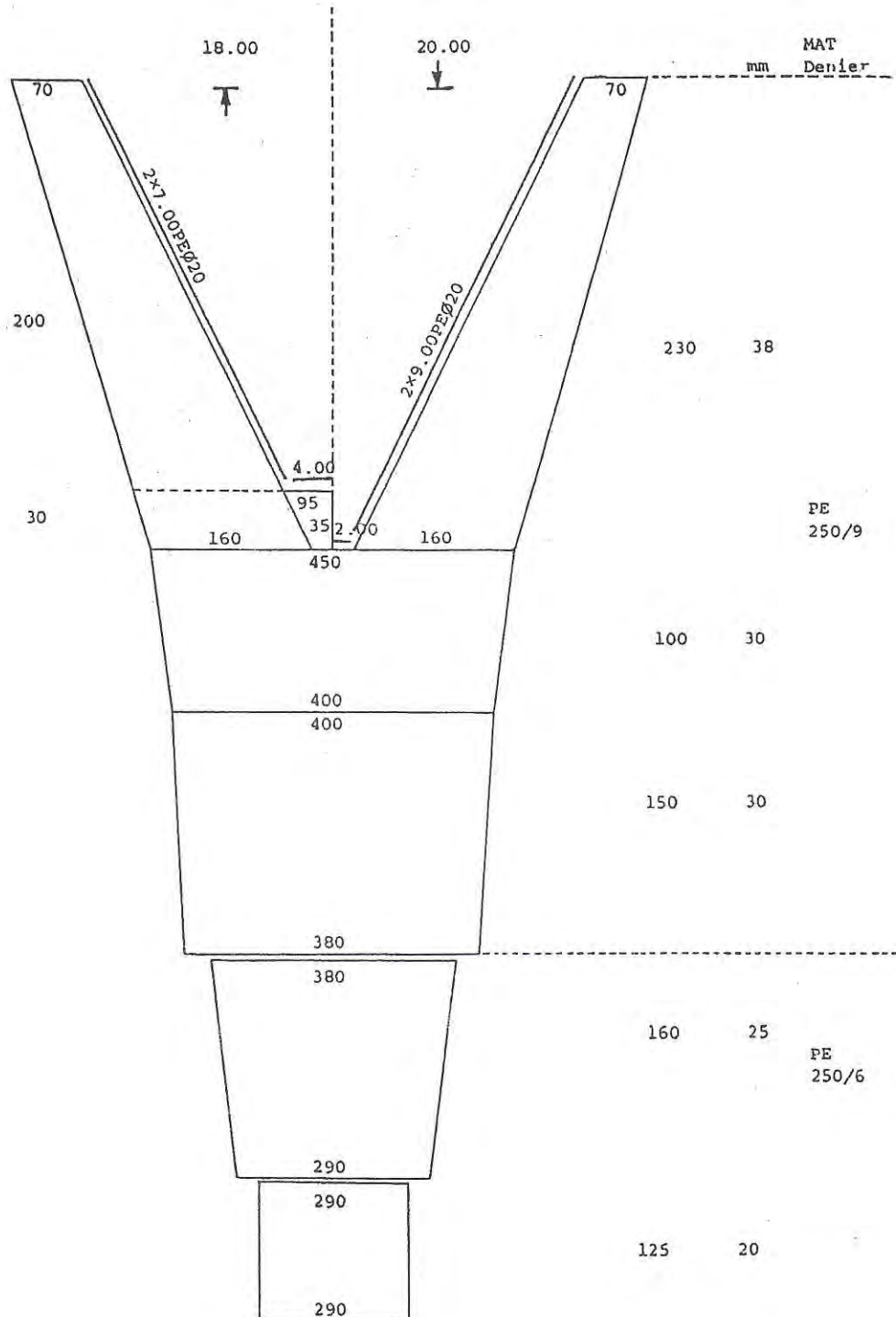


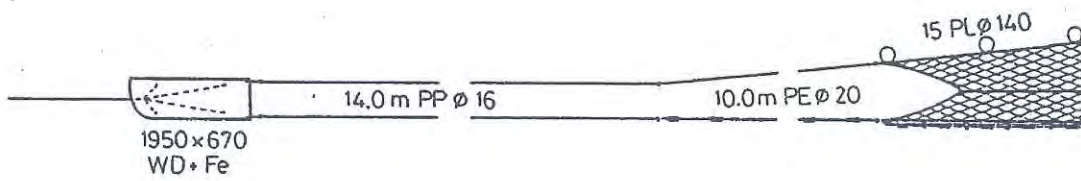
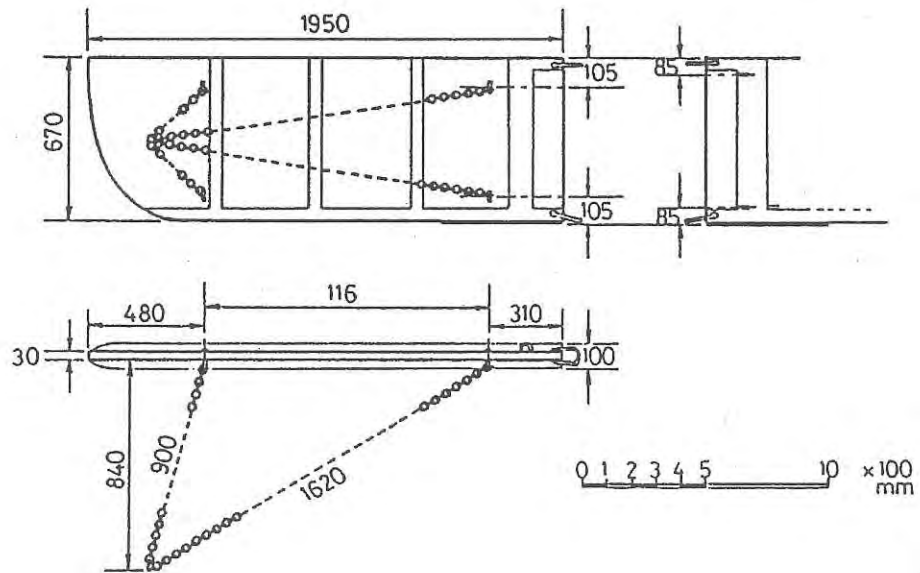


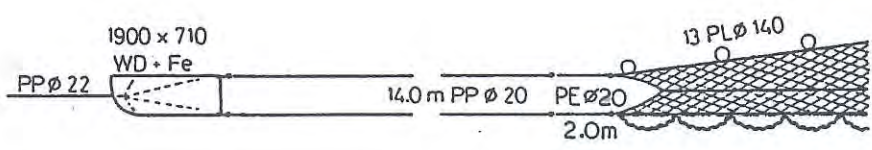
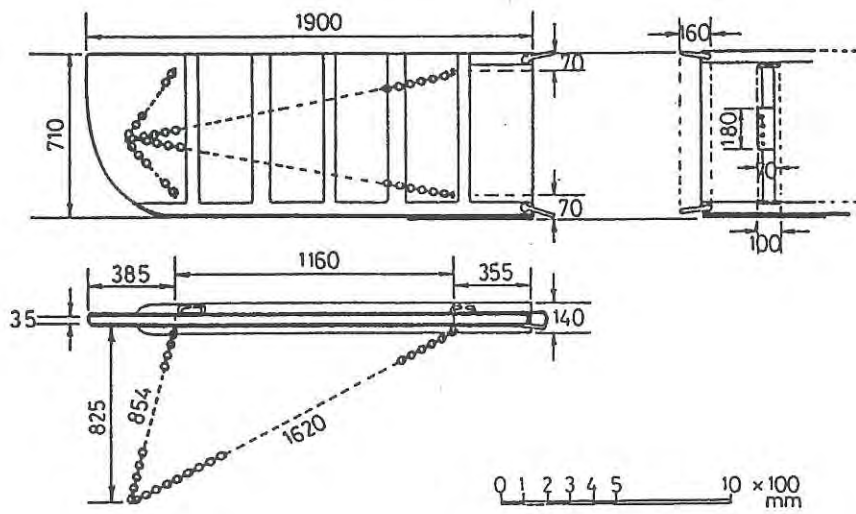
TRAWL
Bottom, otter boom
Shrimp

VESSEL
Supsrithong
Loa 13 m
hp 40

LOCATION
Khlongyai
Trat



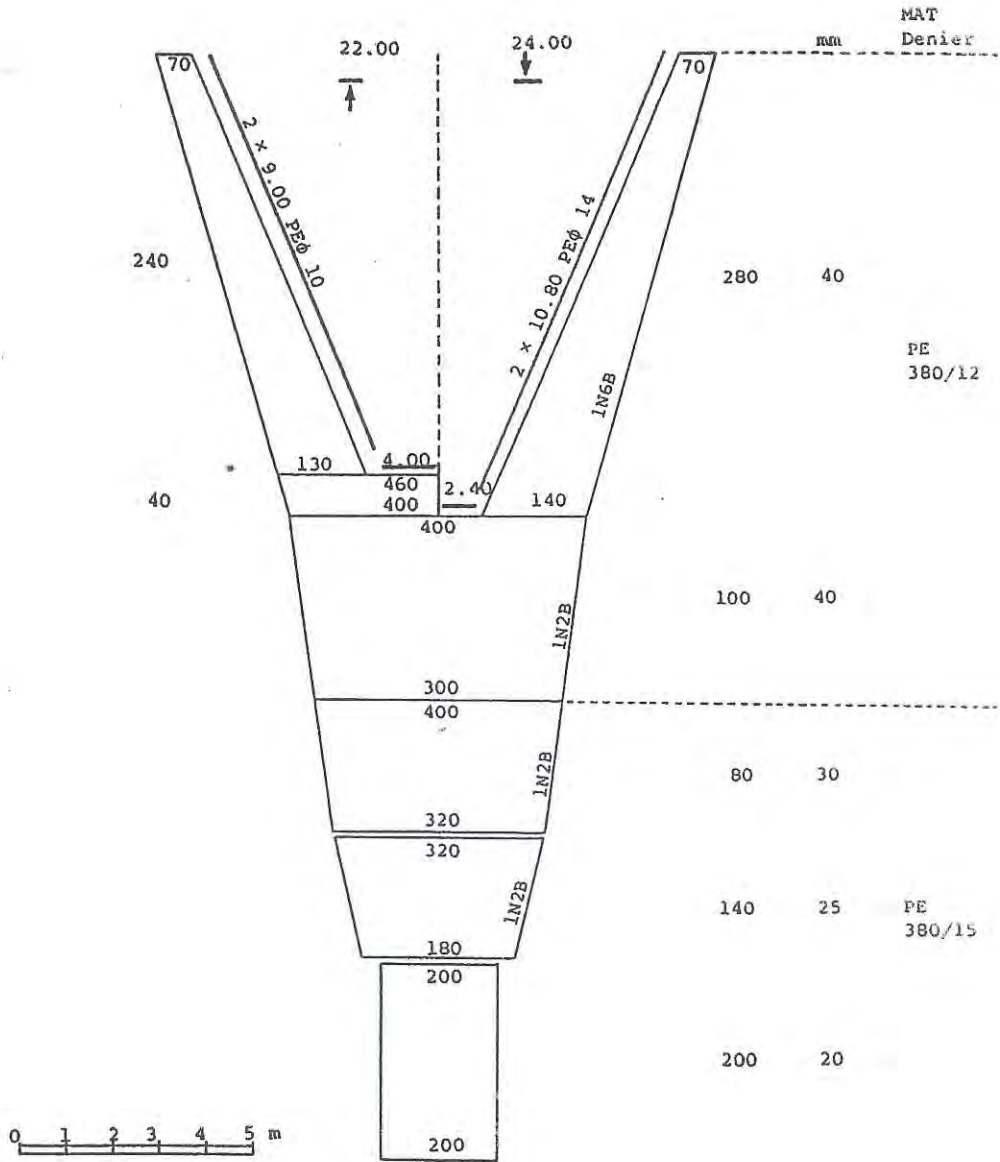




TRAWL
 Bottom, otter boom
 Shrimp

VESSEL
 Kukiet
 Loa 12 m
 hp 45

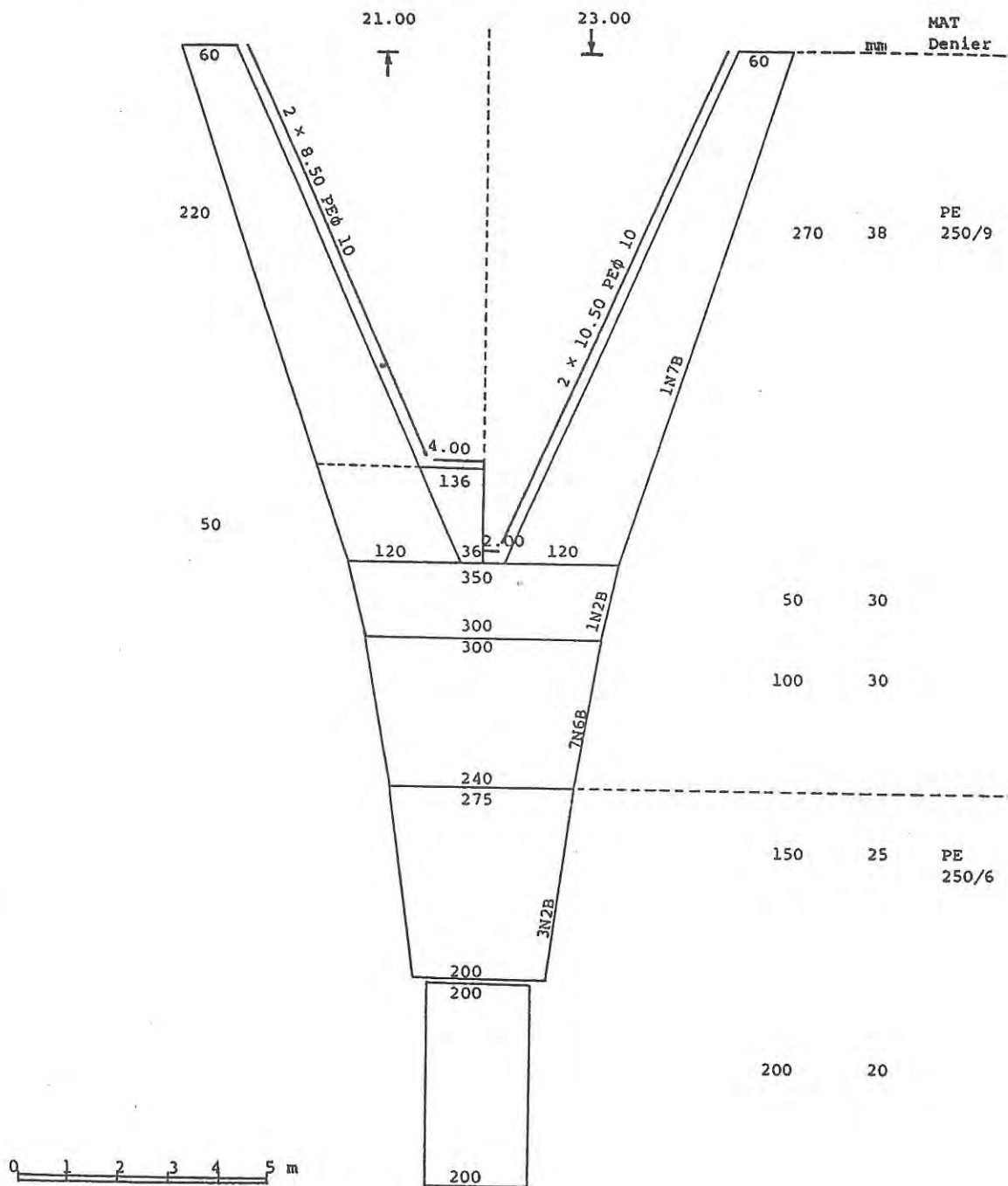
LOCATION
 Langsuan
 Chumphon



TRAWL
Bottom, otter boom
Shrimp

VESSEL
K. Chareunrat
Loa 11 m
hp 165

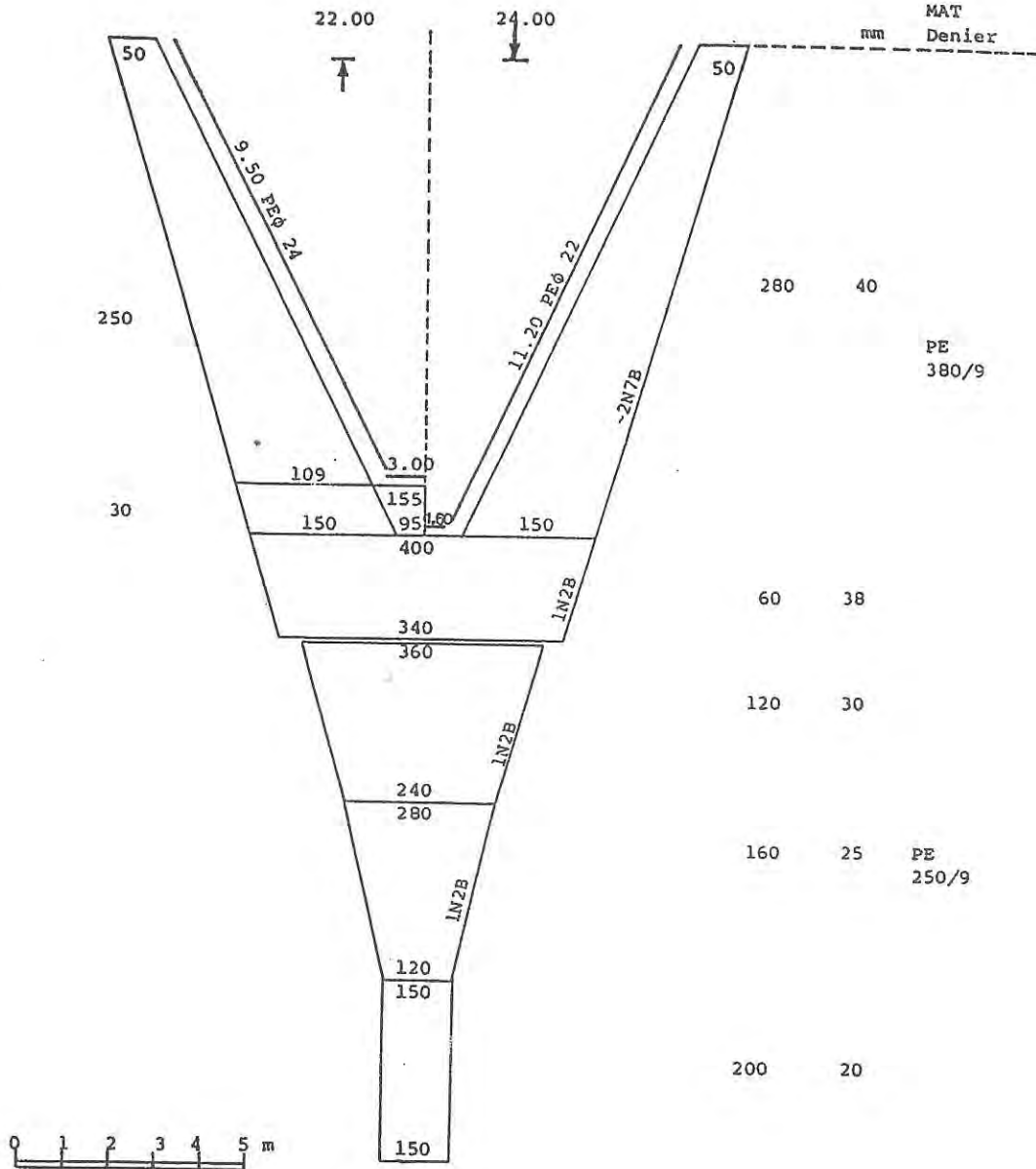
LOCATION
Khao Sannuk
Chon Buri

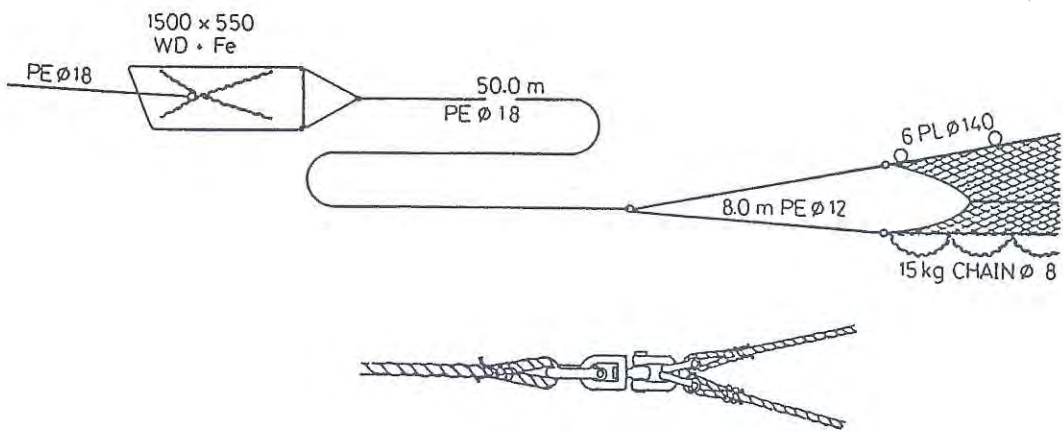
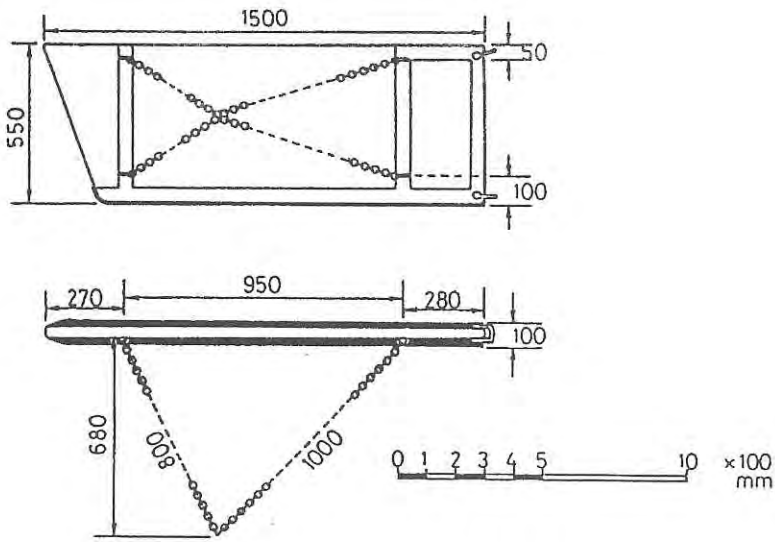


TRAWL
 Bottom, otter boom
 Shrimp

VESSEL
 Chokesomboon
 Loa 14
 hp 75

LOCATION
 Laem Ngop
 Trat

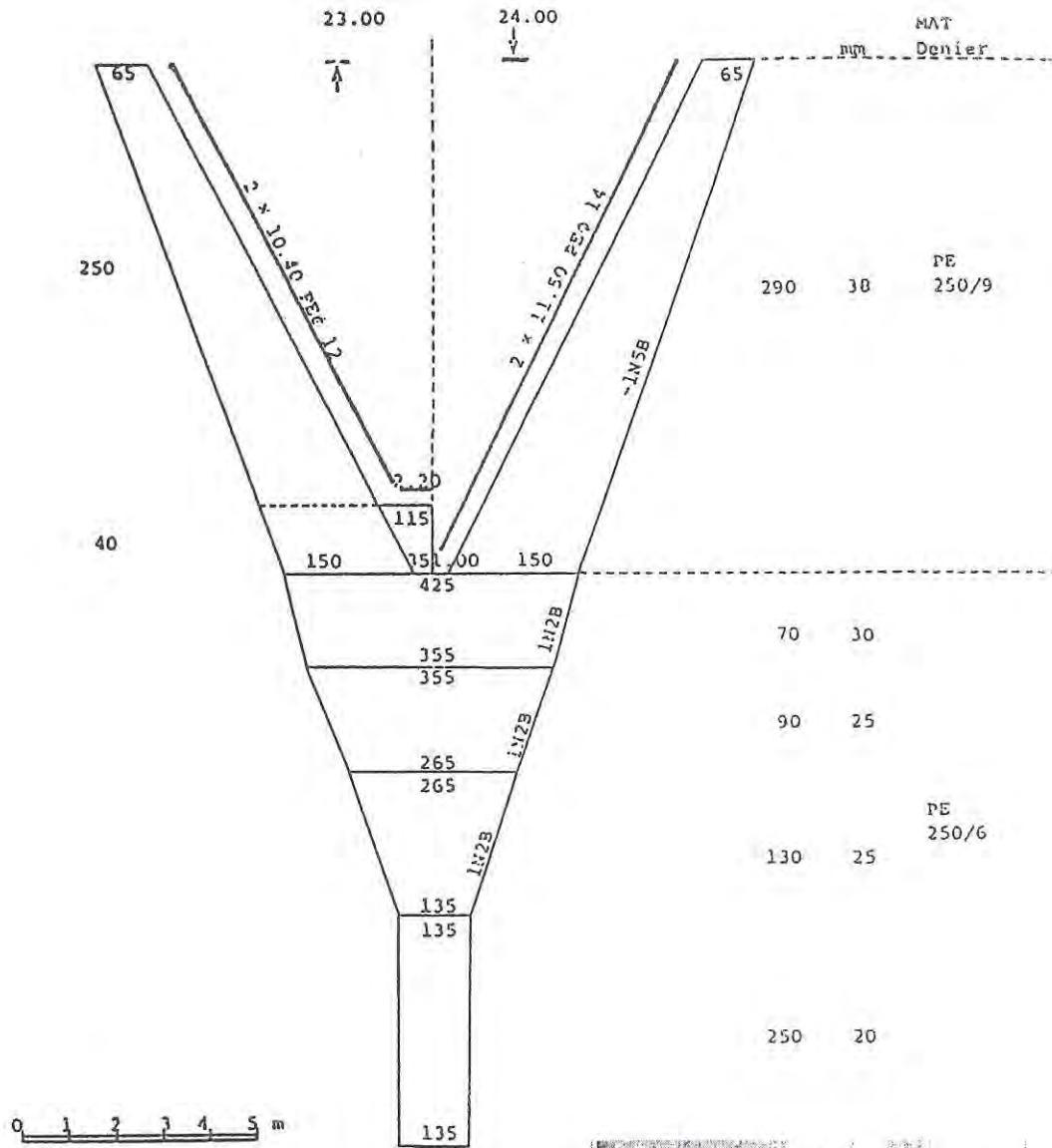




TRAWL
Bottom, otter boom
Shrimp

VESSEL
Netsamut
Loa 11 m
hp 50

LOCATION
Sri-racha
Chon Buri



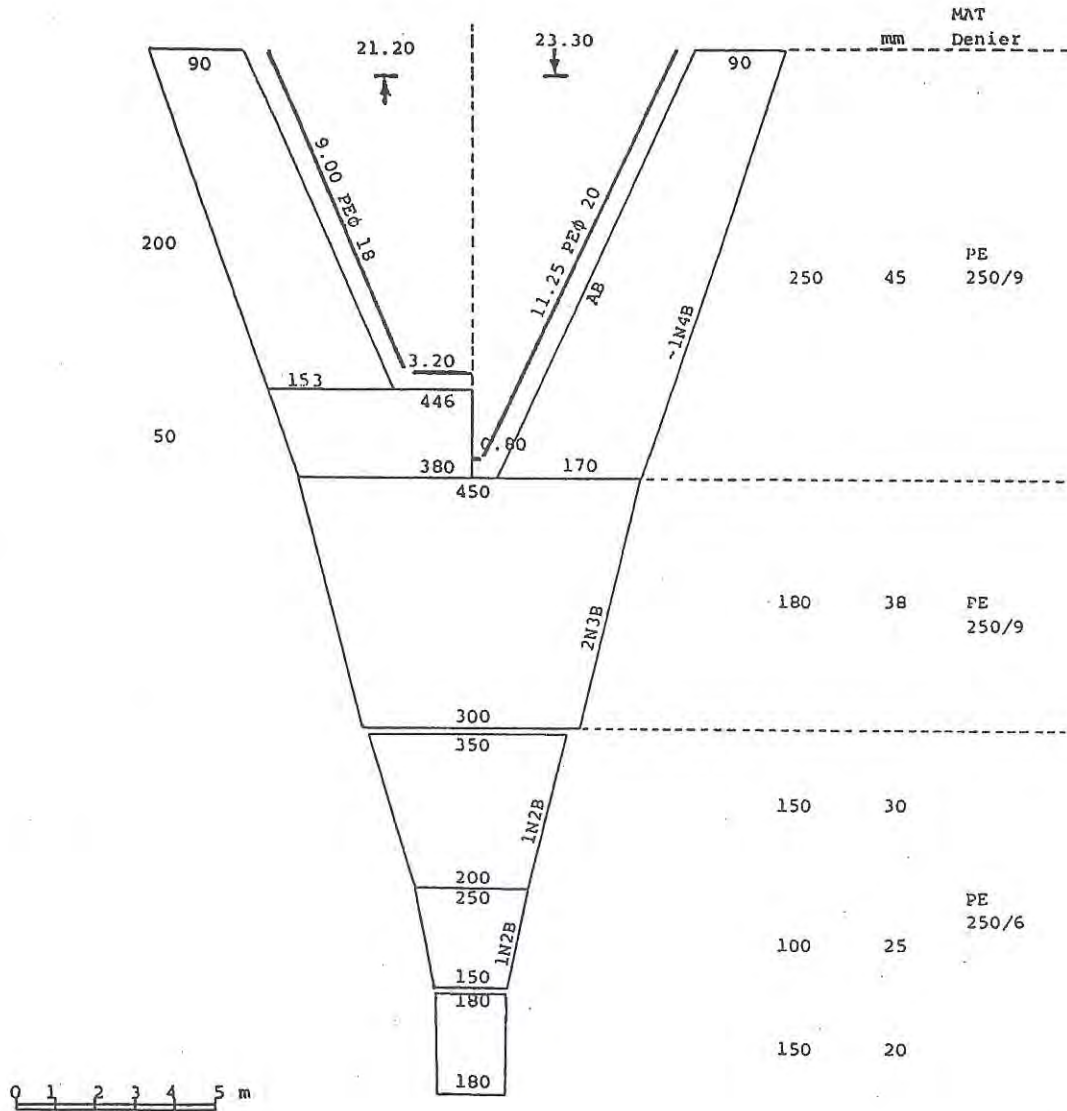
MAT Denier		PE
290	38	250/9
70	30	
90	25	
130	25	PE 250/6
250	20	



TRAWL
Bottom, otter boom
Shrimp

VESSEL
Panarai
Loa 20 m
hp 90

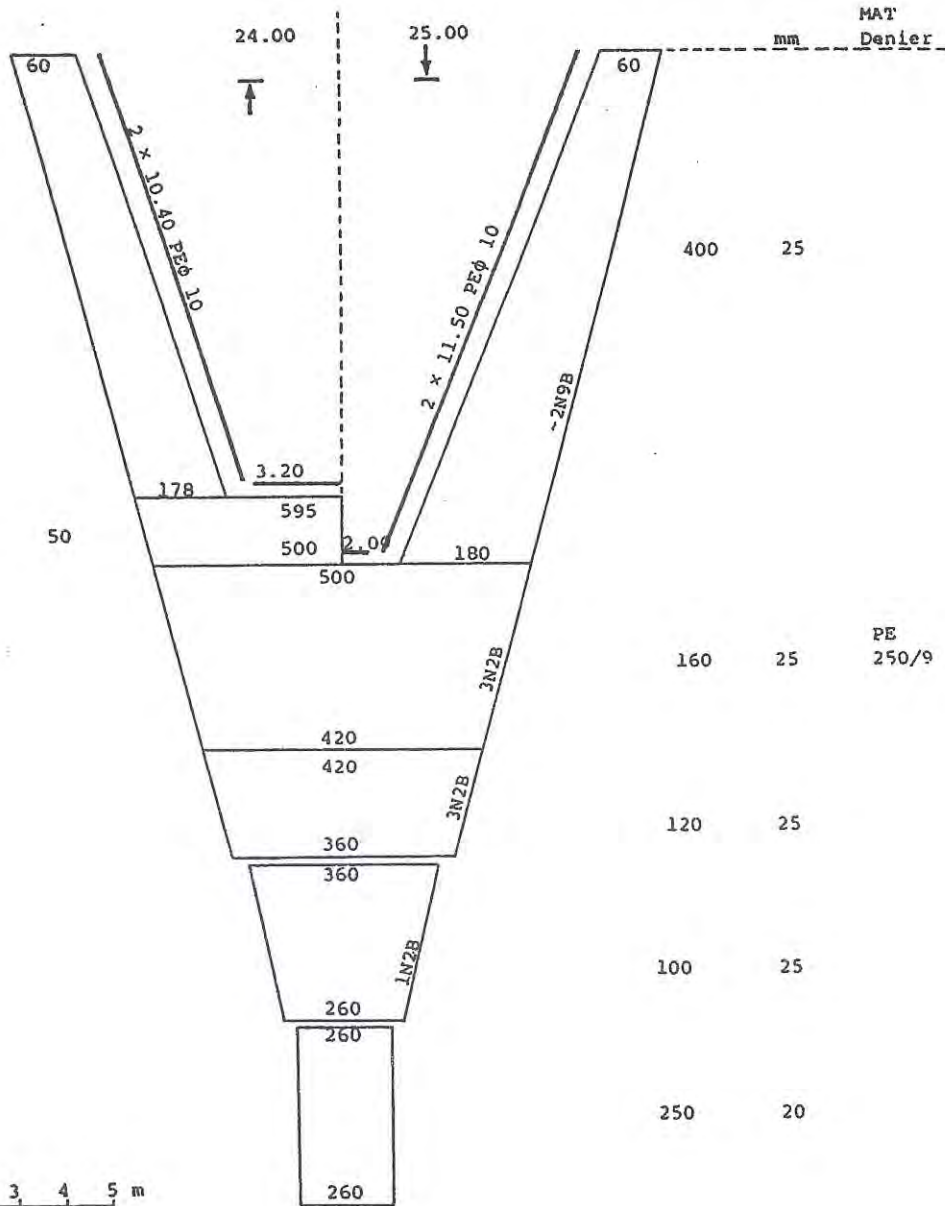
LOCATION
Khanorm
Nakhon Si Thammarat



TRAWL
Bottom, otter boom
Shrimp

VESSEL
Pornnavee
Loa 12 m
hp 75

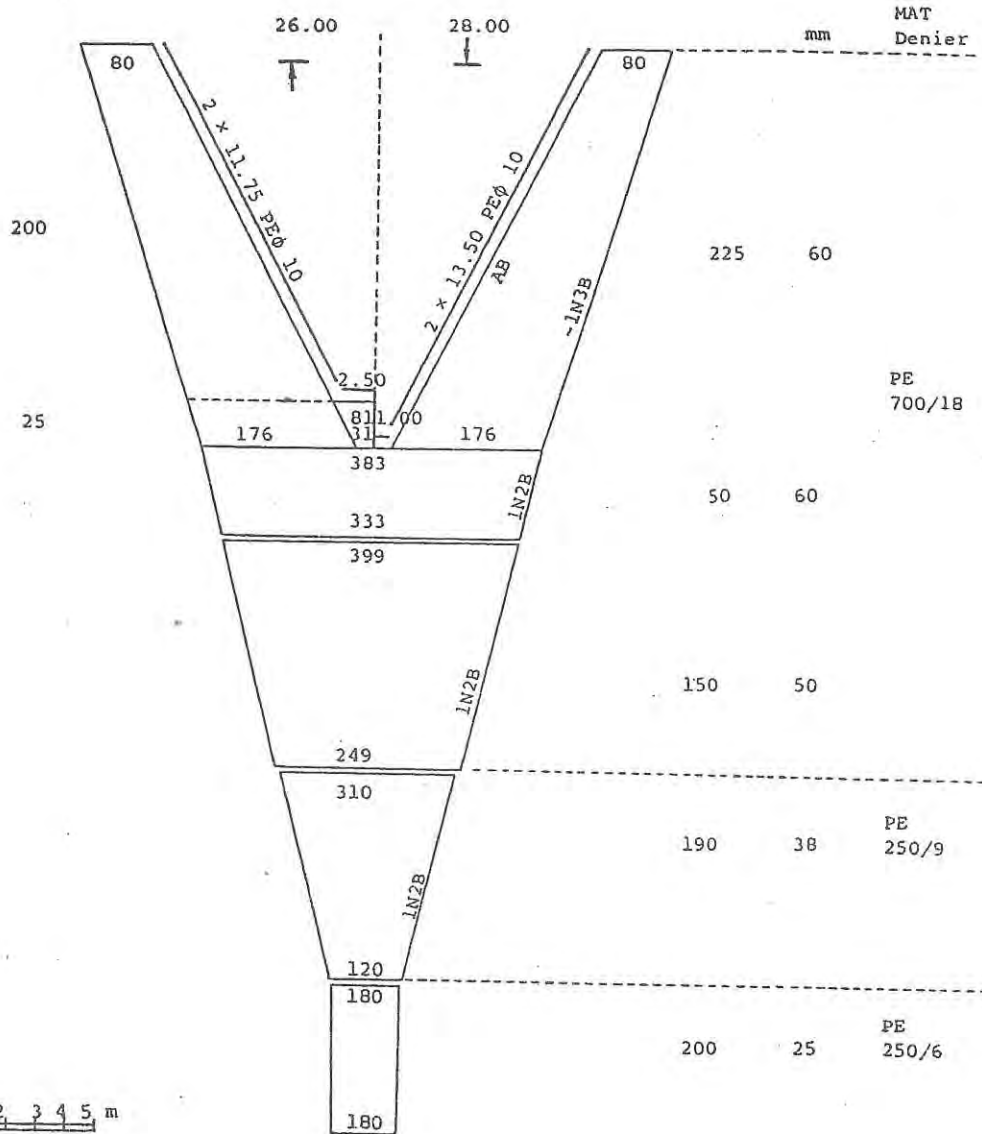
LOCATION
Khlongyai
Trat



TRAWL
Bottom, otter boom
Shrimp

VESSEL
Sinnumchai
Loa 15 m
hp 112

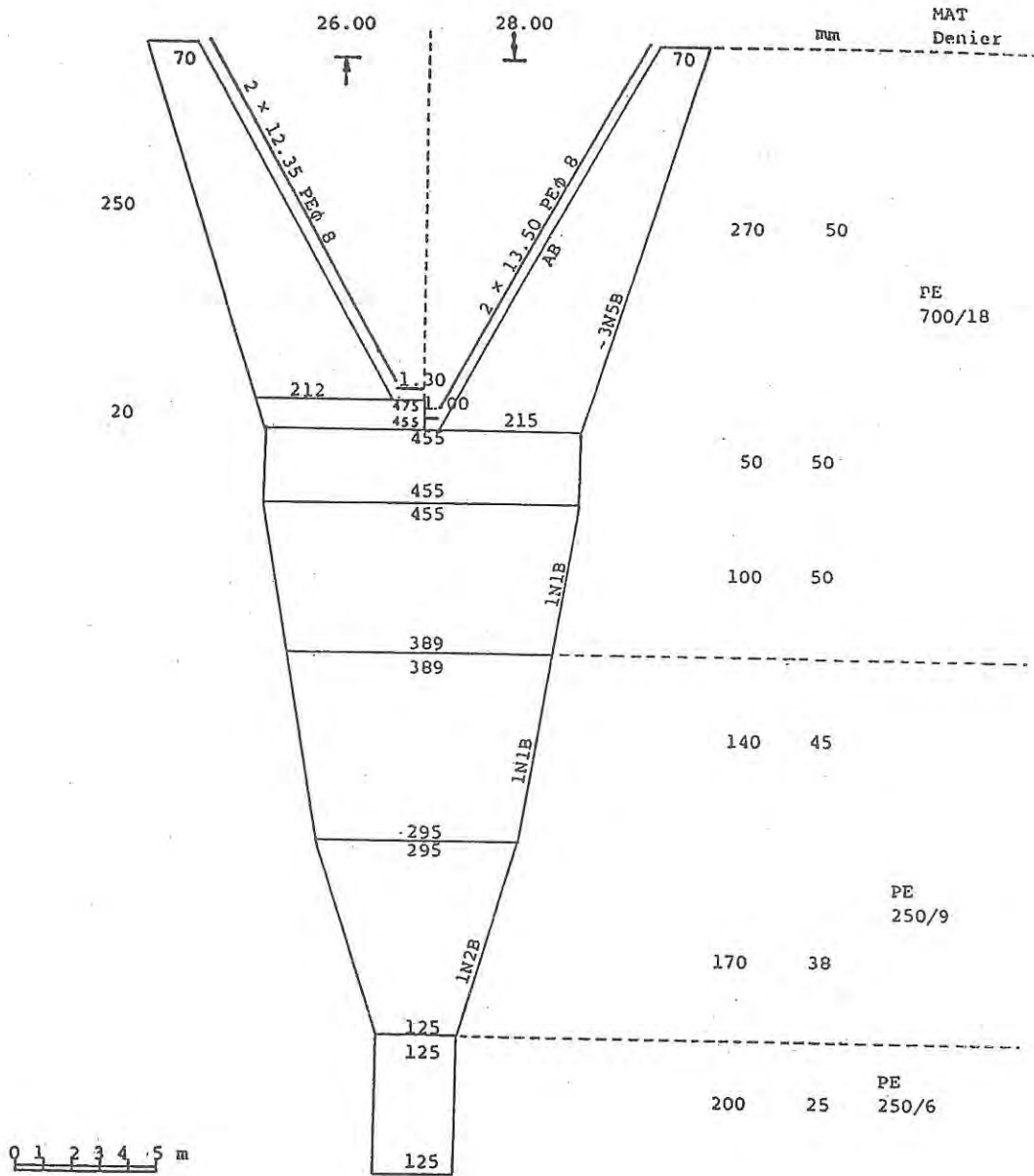
LOCATION
Kanhorm
Surat Thani

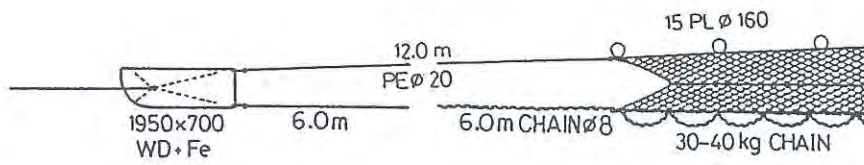
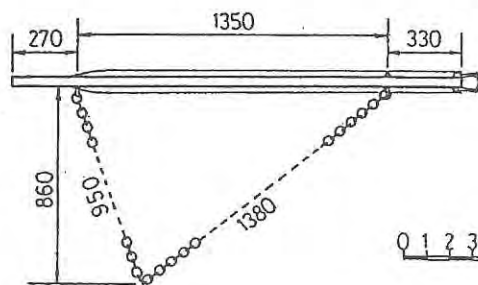
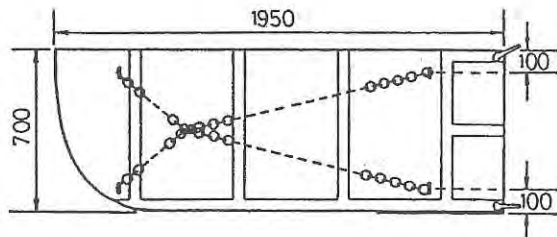


TRAWL
Bottom, otter boom
Shrimp

VESSEL
Navanop
Loa 11 m
hp 150

LOCATION
Angsila
Chon Buri

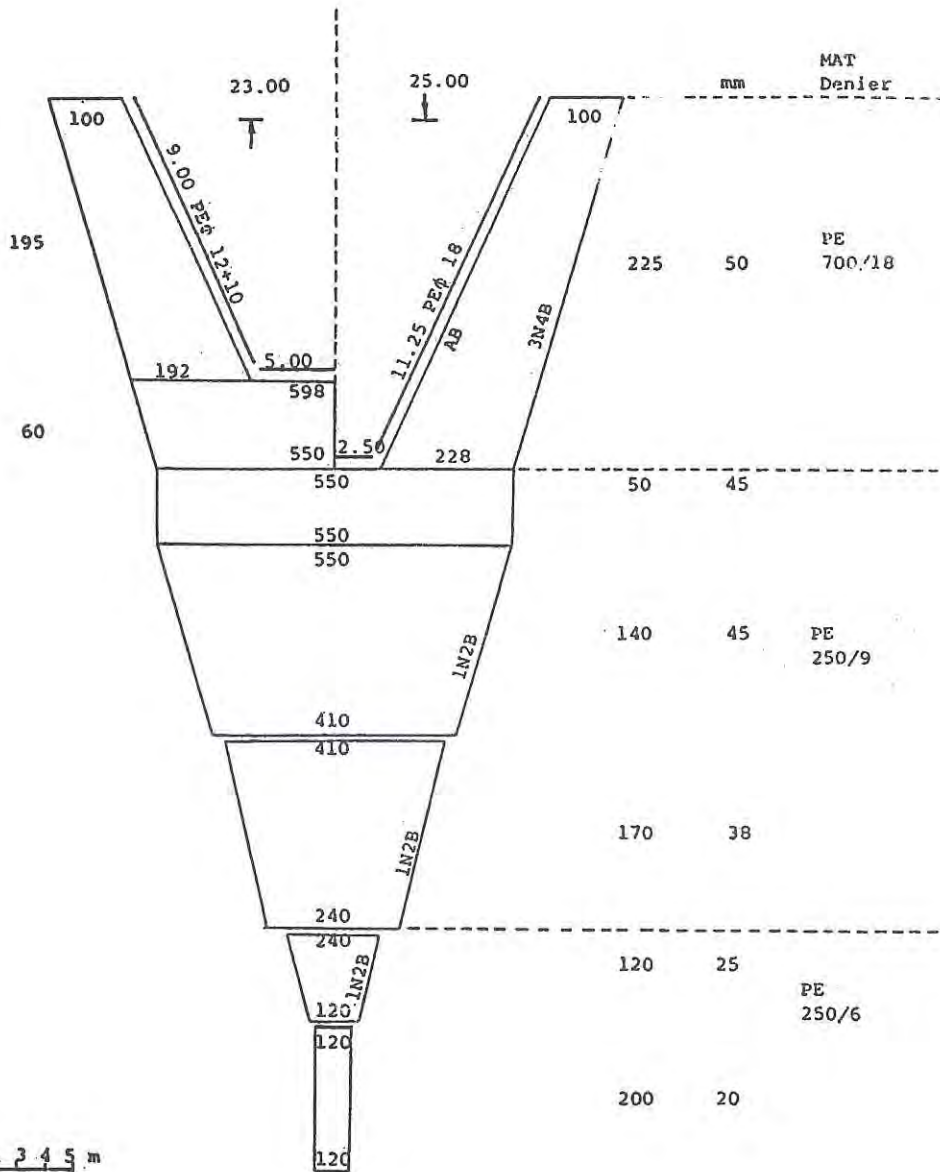


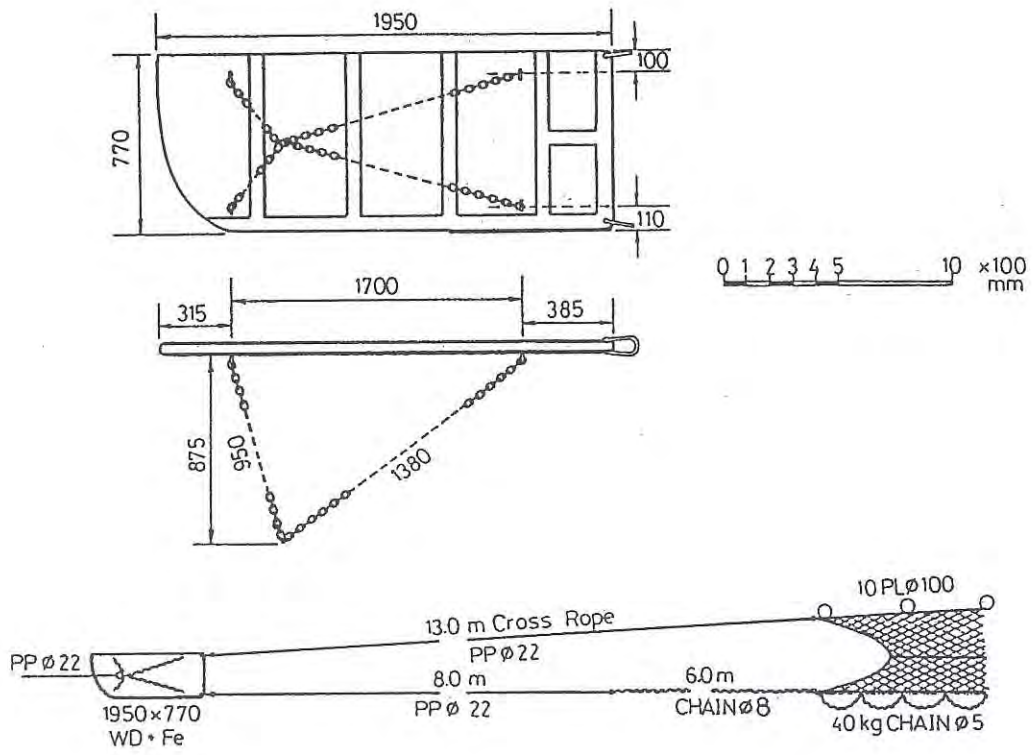


TRAWL
Bottom, otter boom
Shrimp

VESSEL
Chokesopar
Loa 12.5 m
hp 150

LOCATION
Sri Racha
Chon Buri

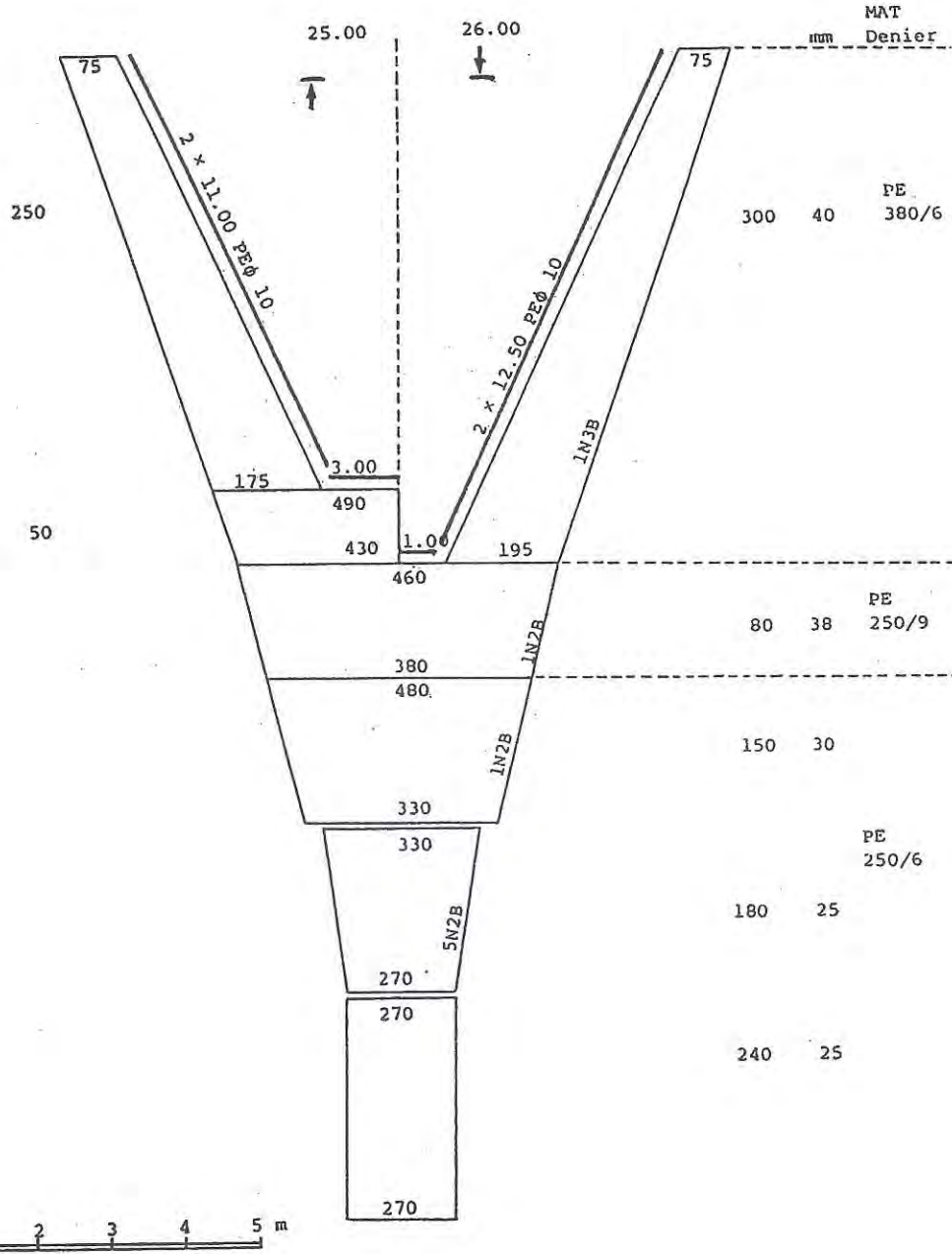


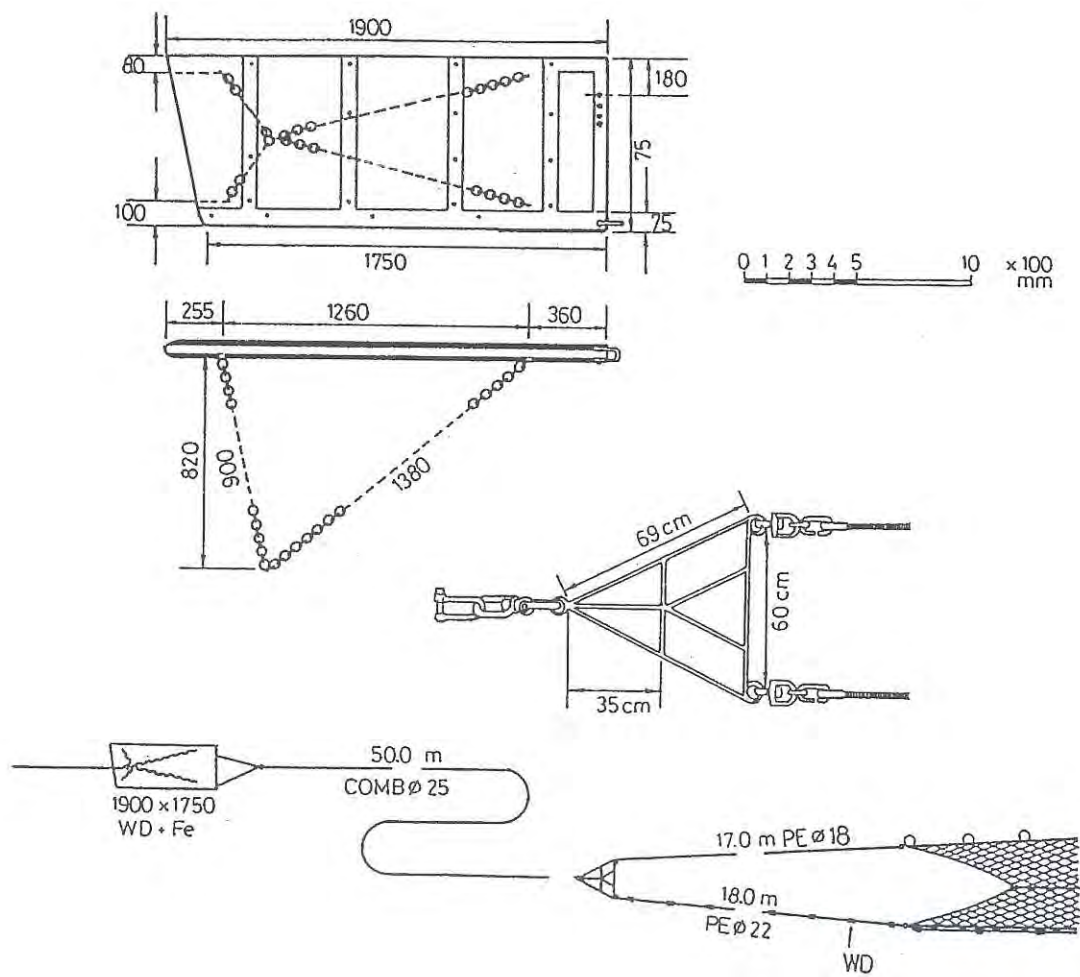


TRAWL
Bottom, otter boom
Shrimp

VESSEL
Hongnava
Loa 13.50 m
hp 100

LOCATION
Khlongyai
Trat

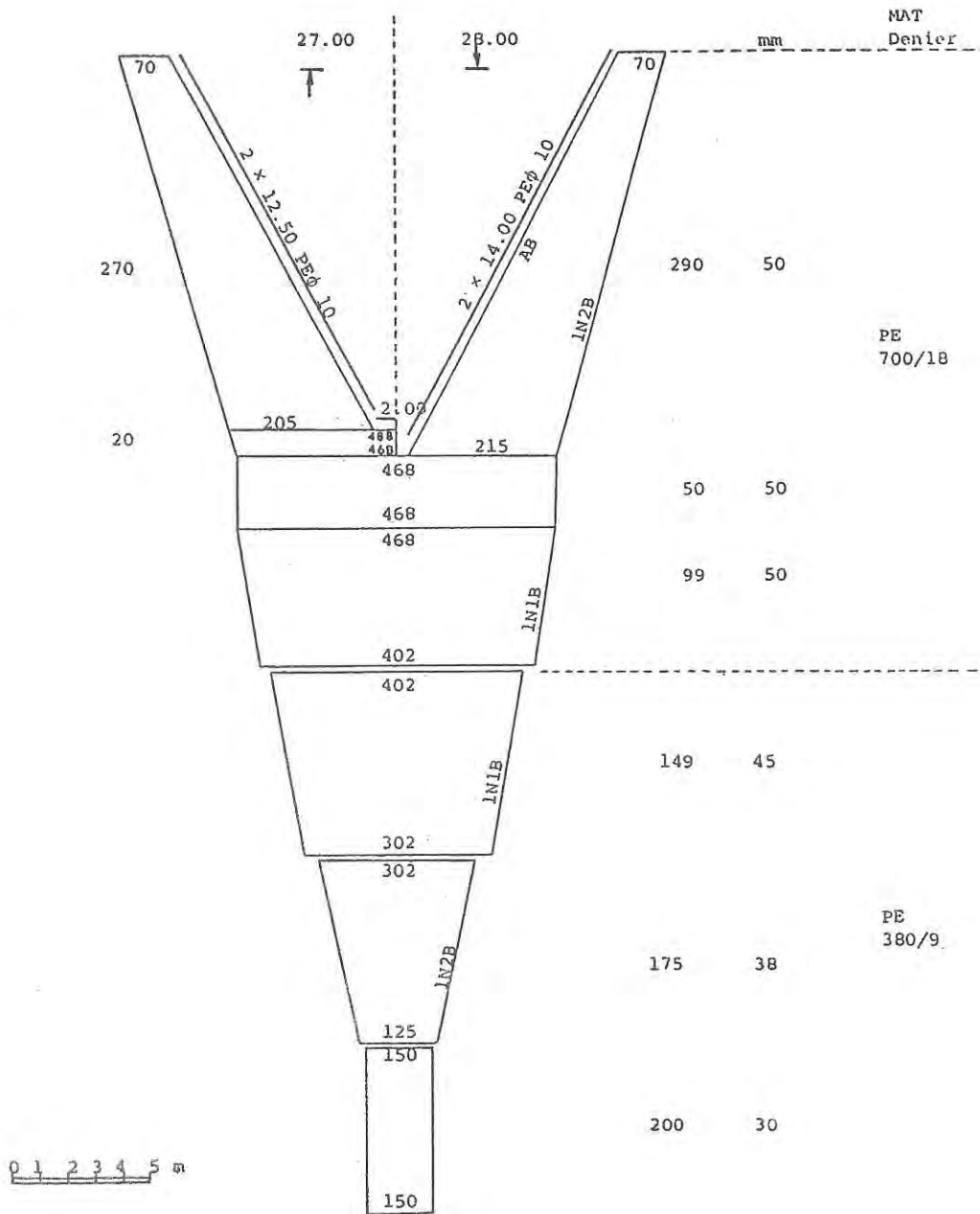


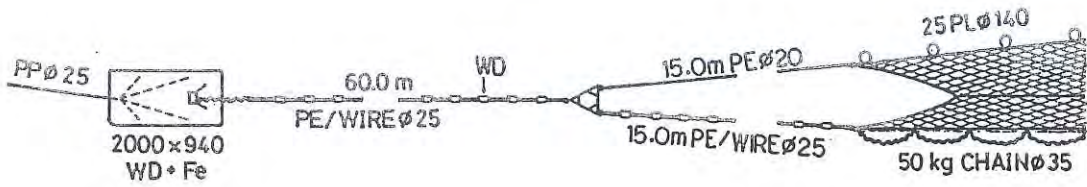
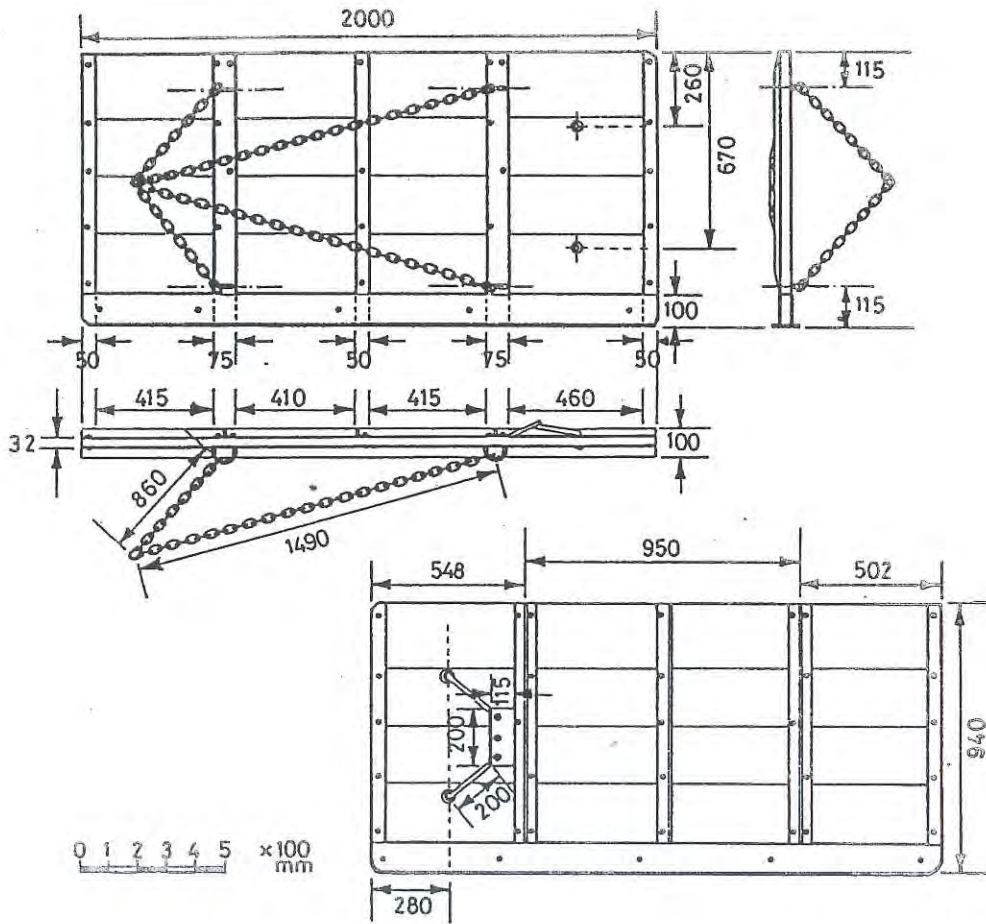


TRAWL
Bottom, otter boom
Shrimp

VESSEL
Sukharom
Loa 16 m
hp 150

LOCATION
Surat Thani
Surat Thani

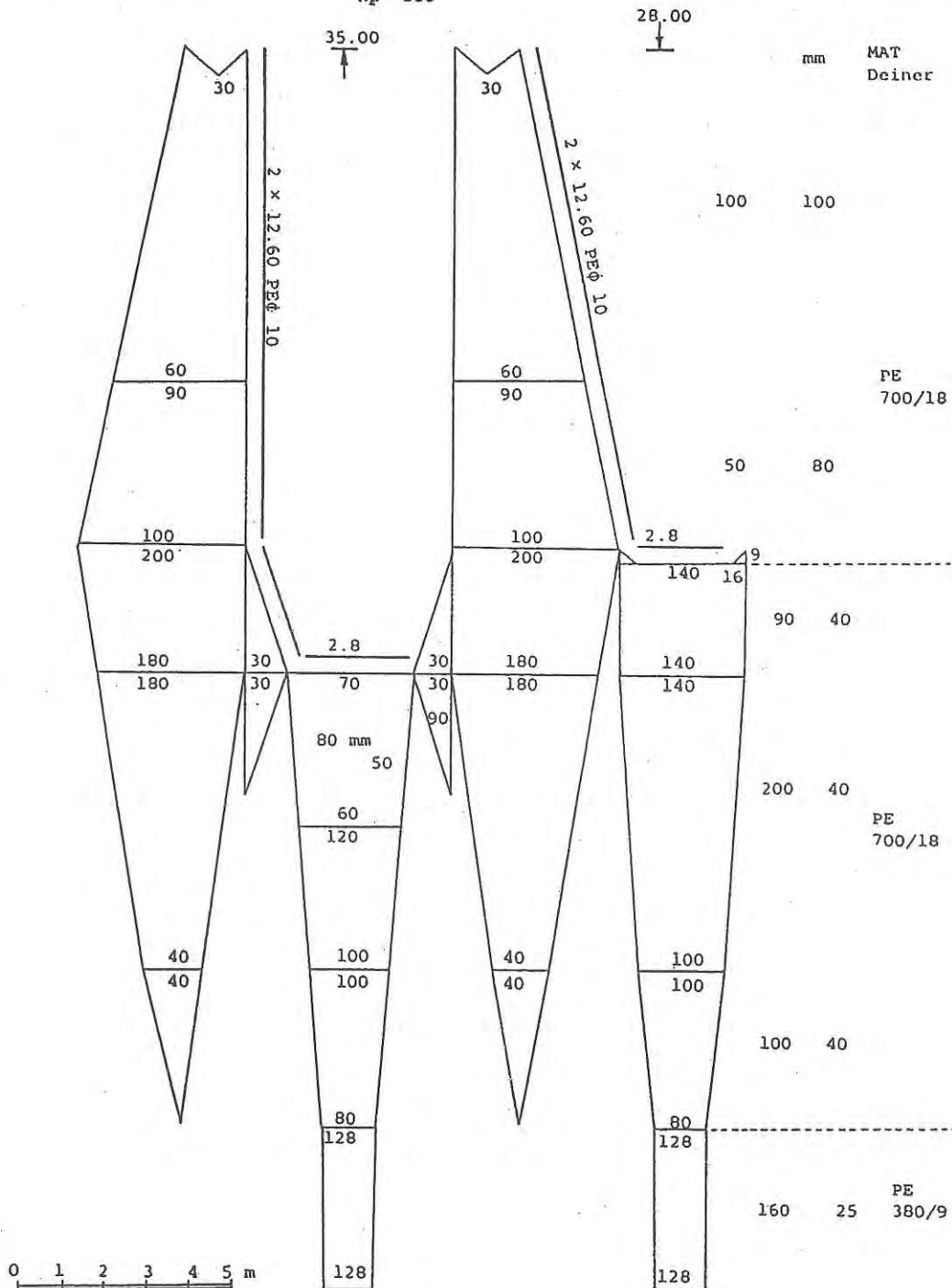


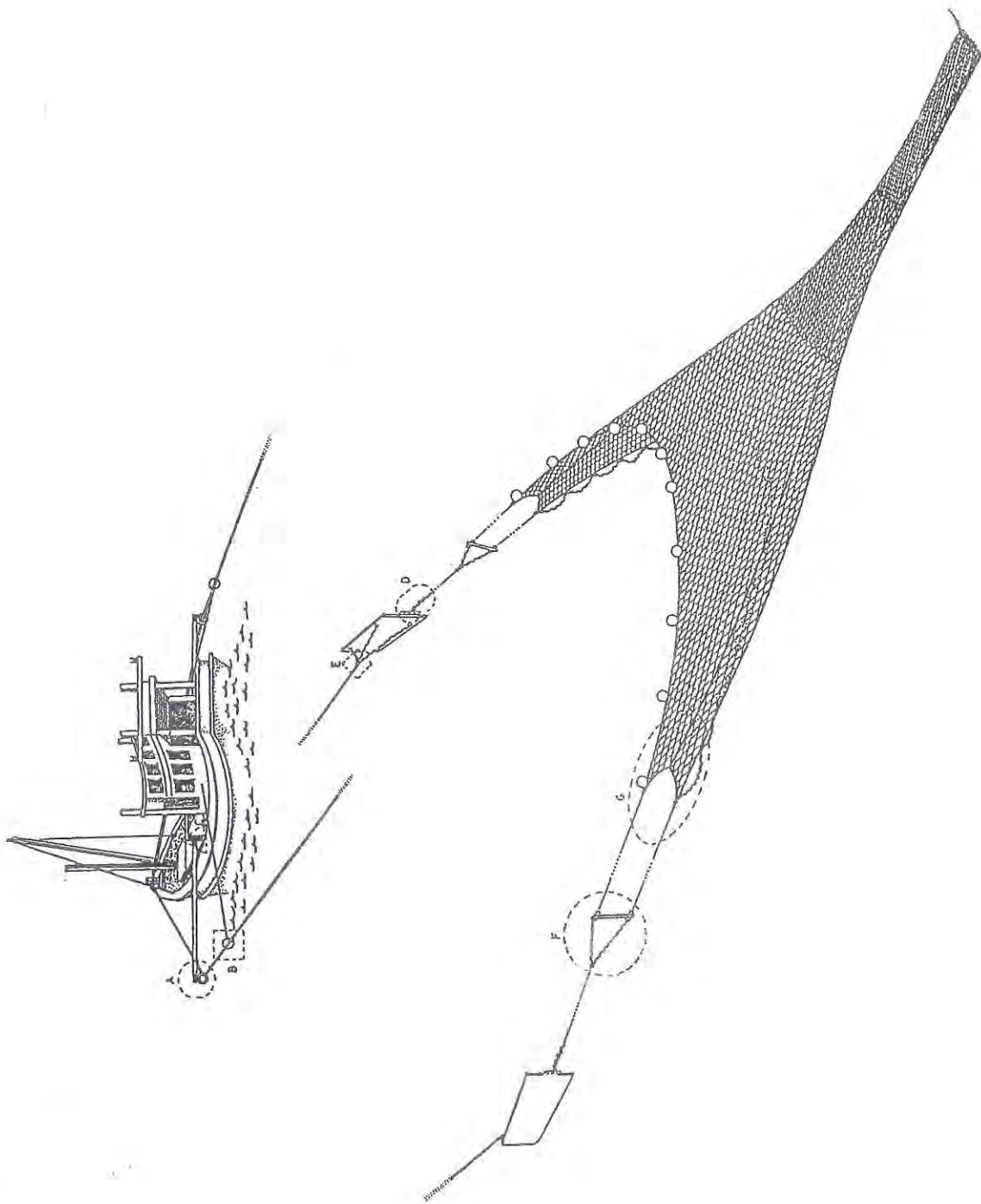


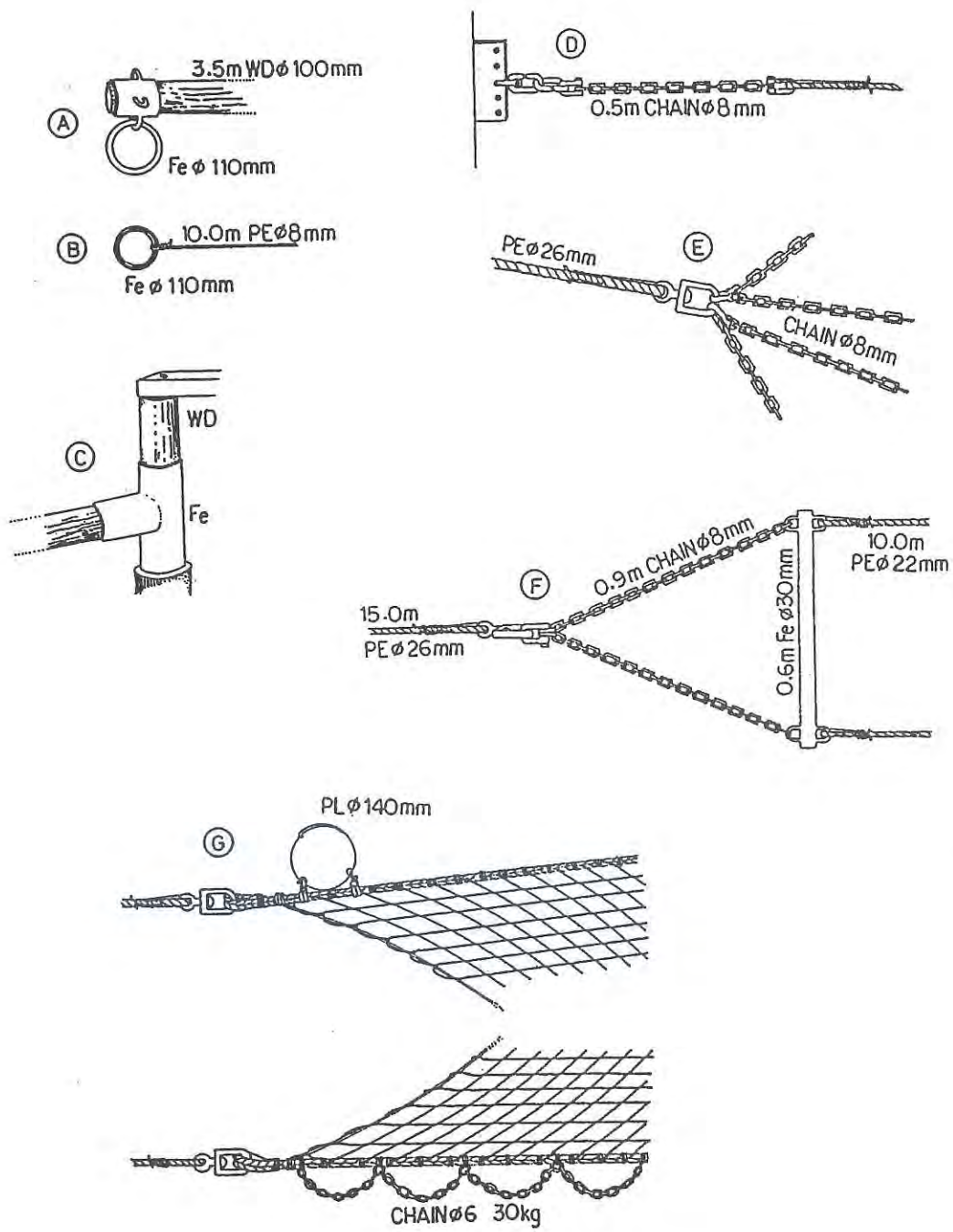
TRAWL
 Bottom, otter boom
 Bottom fishes

VESSEL
 Plalung
 Loa 17 m
 hp 235

LOCATION
 Samut Prakarn
 Samut Prakarn



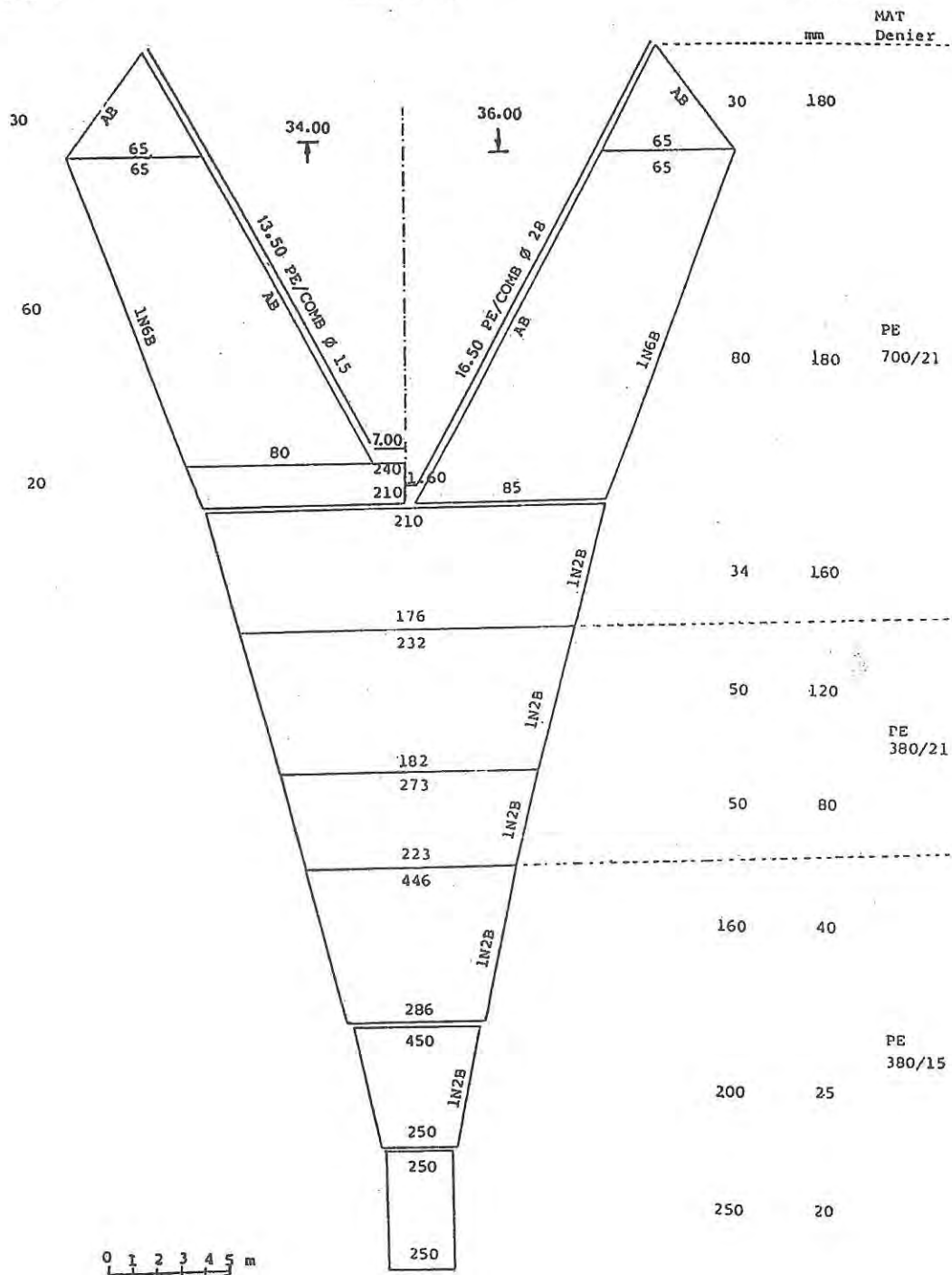


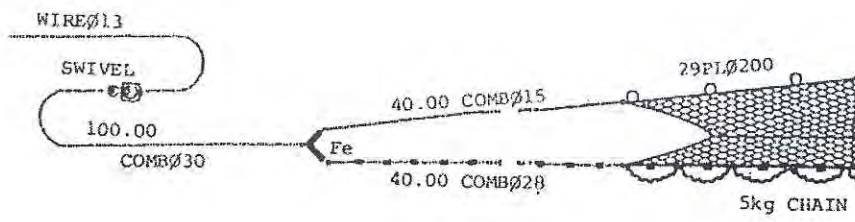
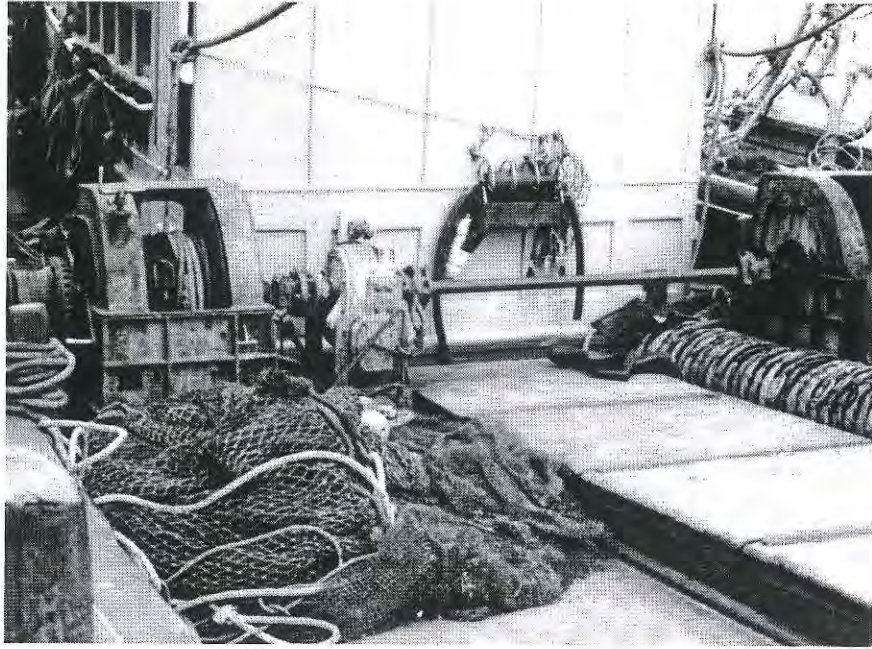


TRAWL
Bottom, pair
Bottom fishes

VESSEL
Srinoparat
250, 250 hp.

LOCATION
Songkhla
Songkhla

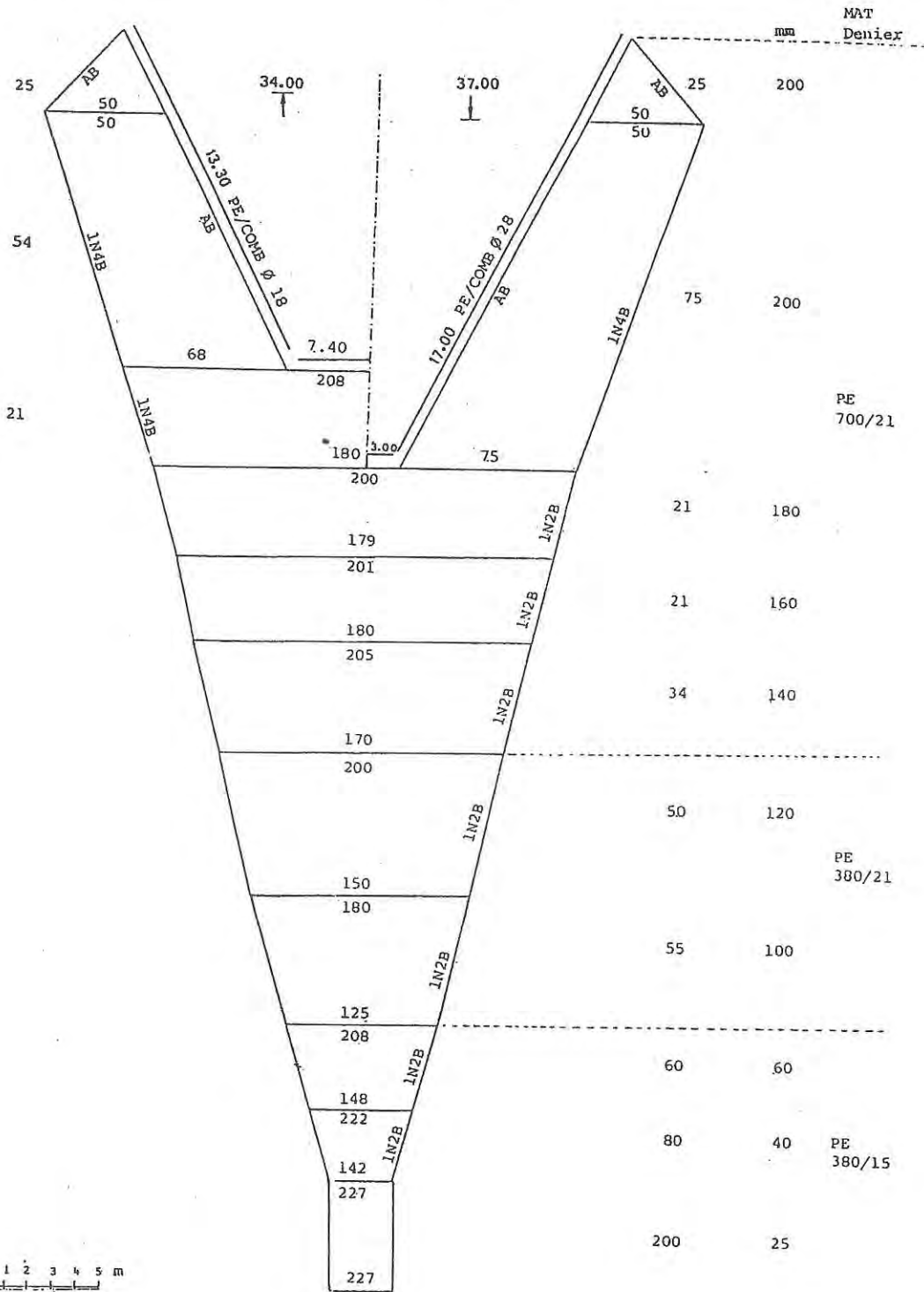


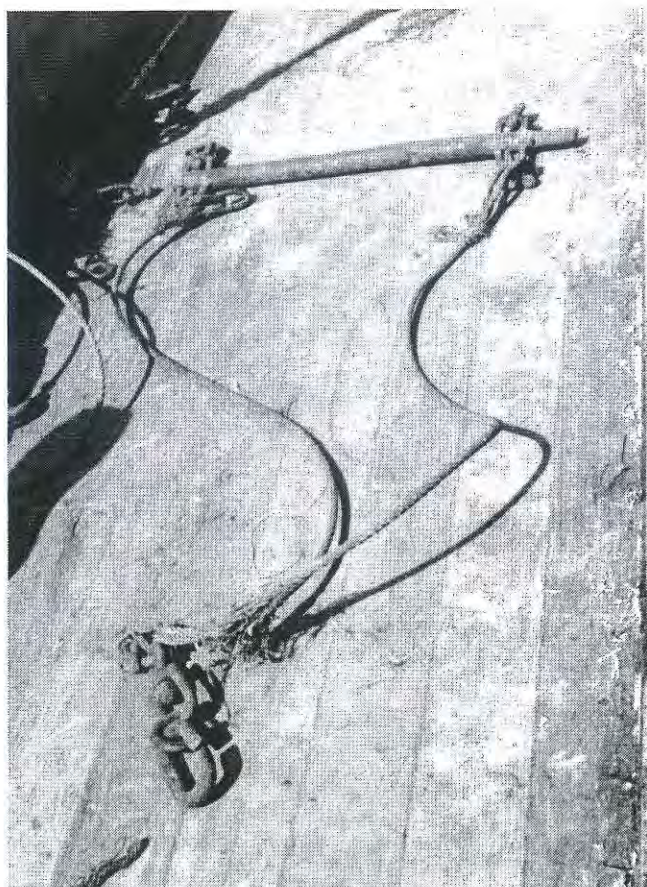
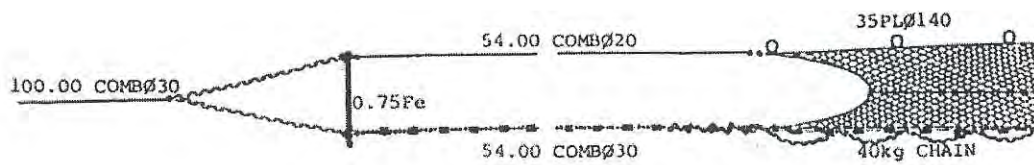


TRAWL
Bottom, pair
Bottom fishes

VESSEL
Pitiporn 260 hp.
Yukoltorn 260 hp.

LOCATION
Samut Sakhon
Samut Sakhon

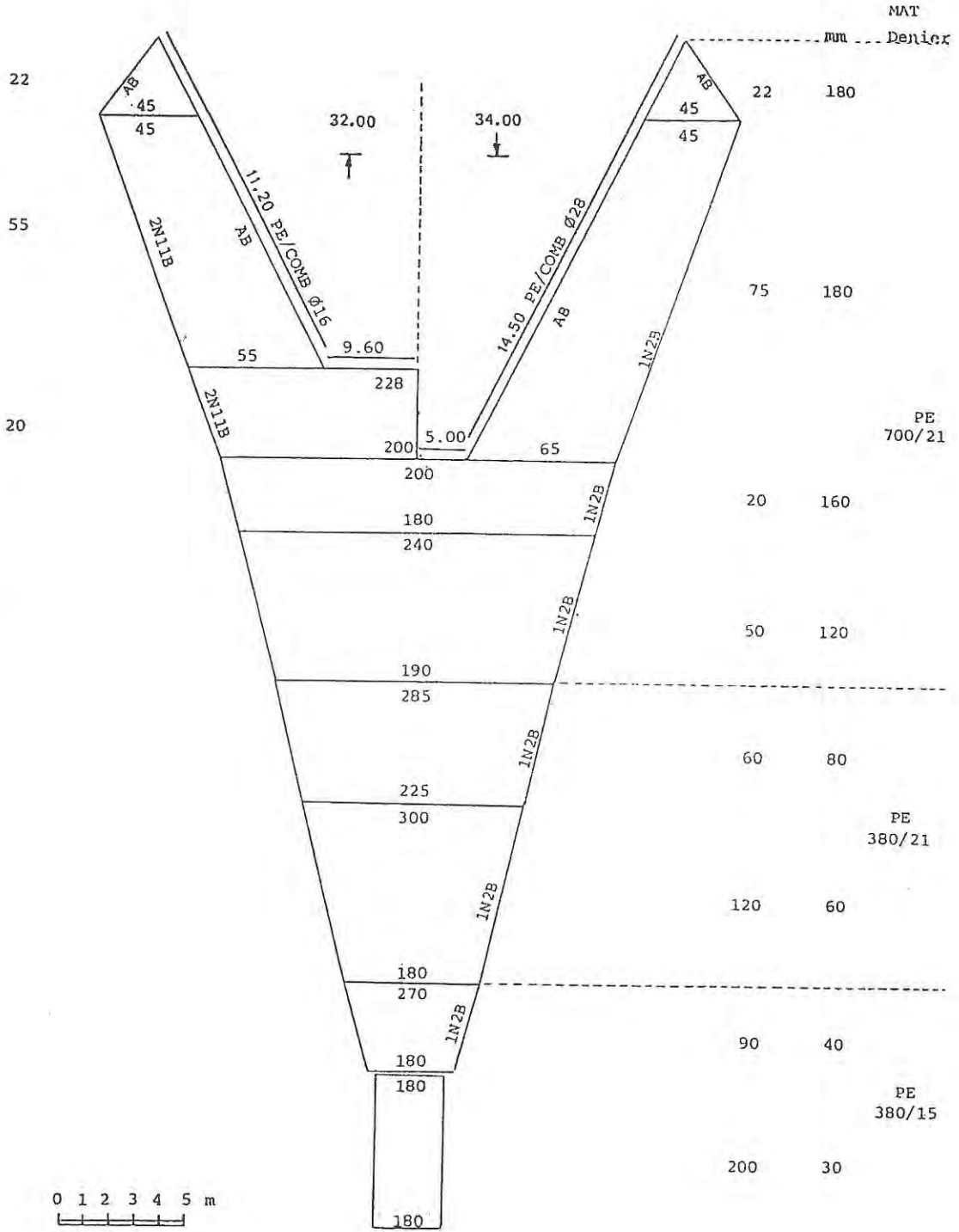


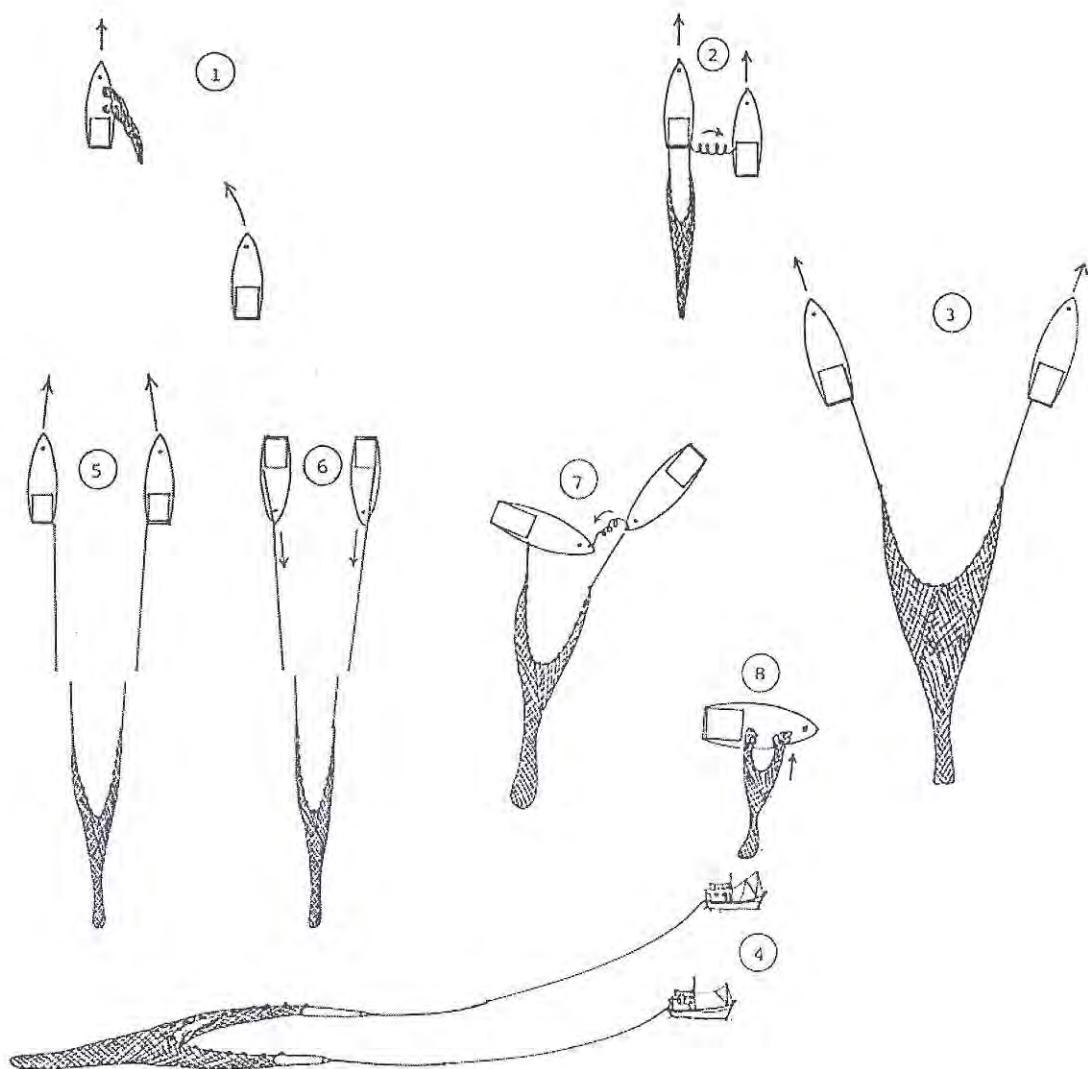


TRAWL
 Bottom, pair
 Bottom fishes

VESSEL
 Kunchonchainavee I 180 hp
 Kunchonchainavee II 150 hp

LOCATION
 Mae Klong
 Samut Songkhram

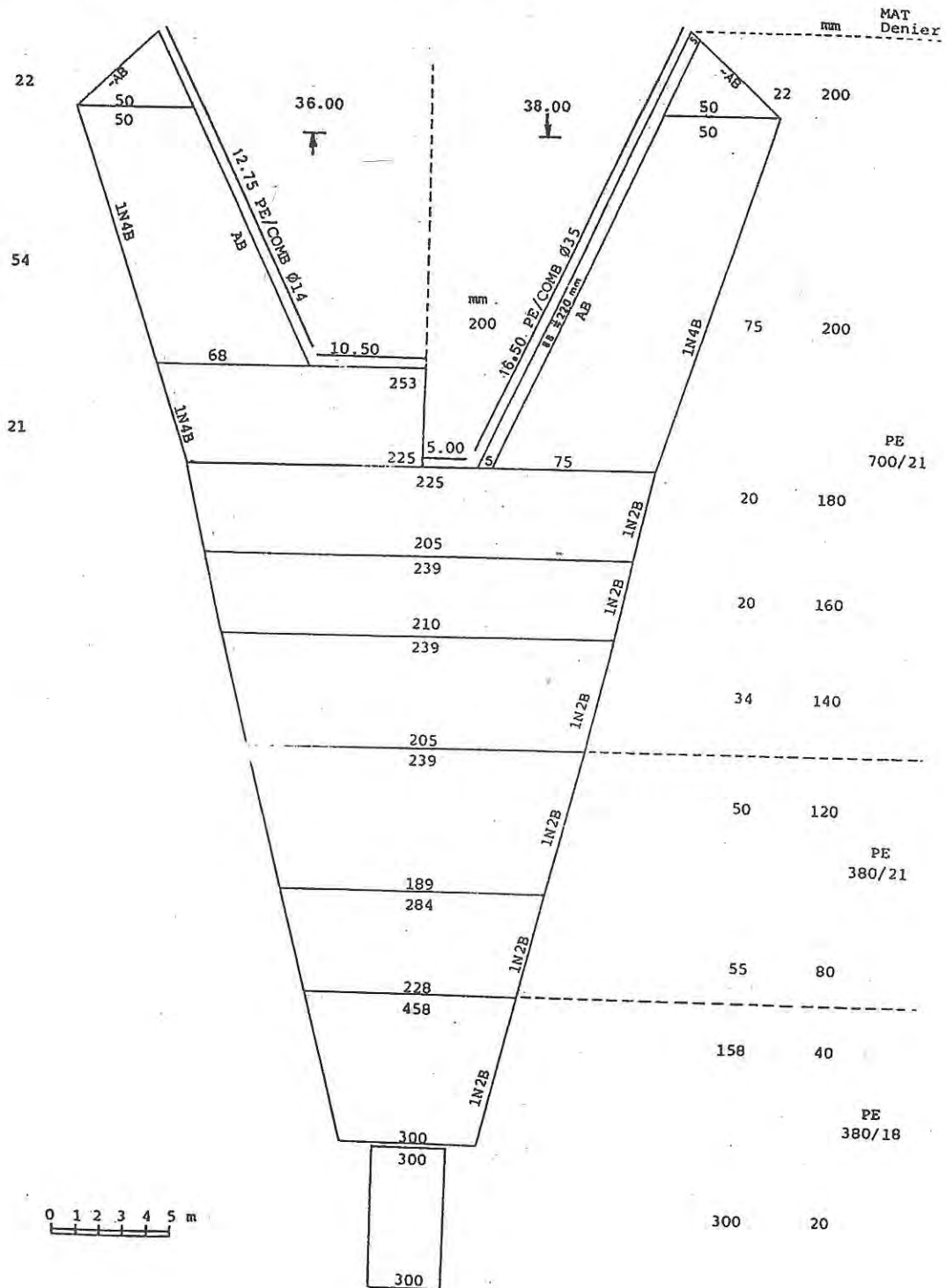


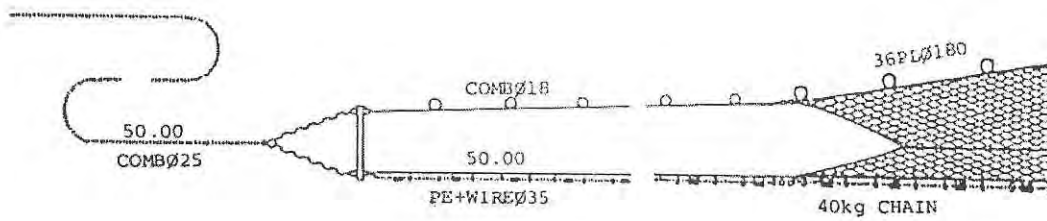
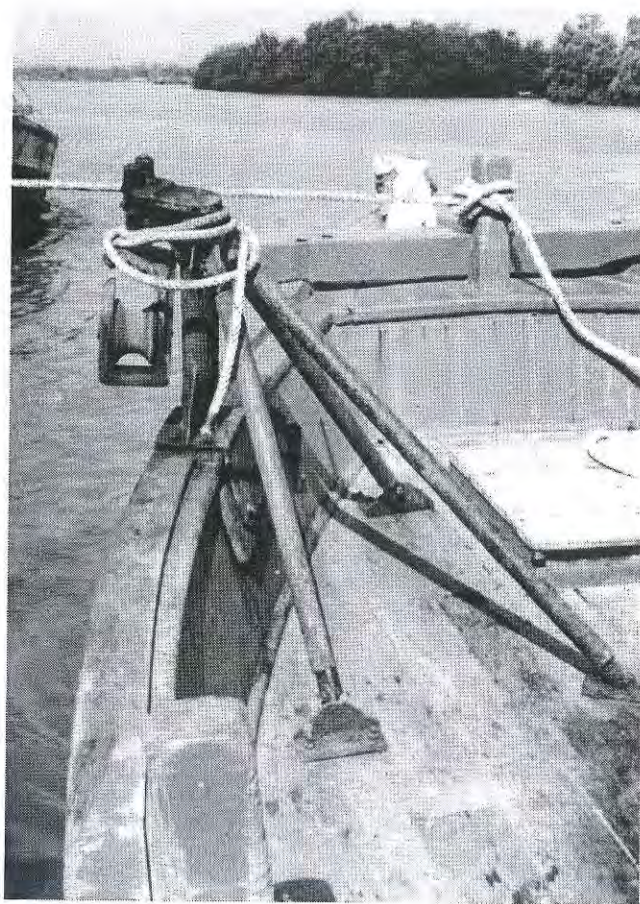


TRAWL
Bottom, pair
Bottom fish

VESSEL
Chewchanchai
270, 270 hp

LOCATION
Maeklong
Samut Songkhram

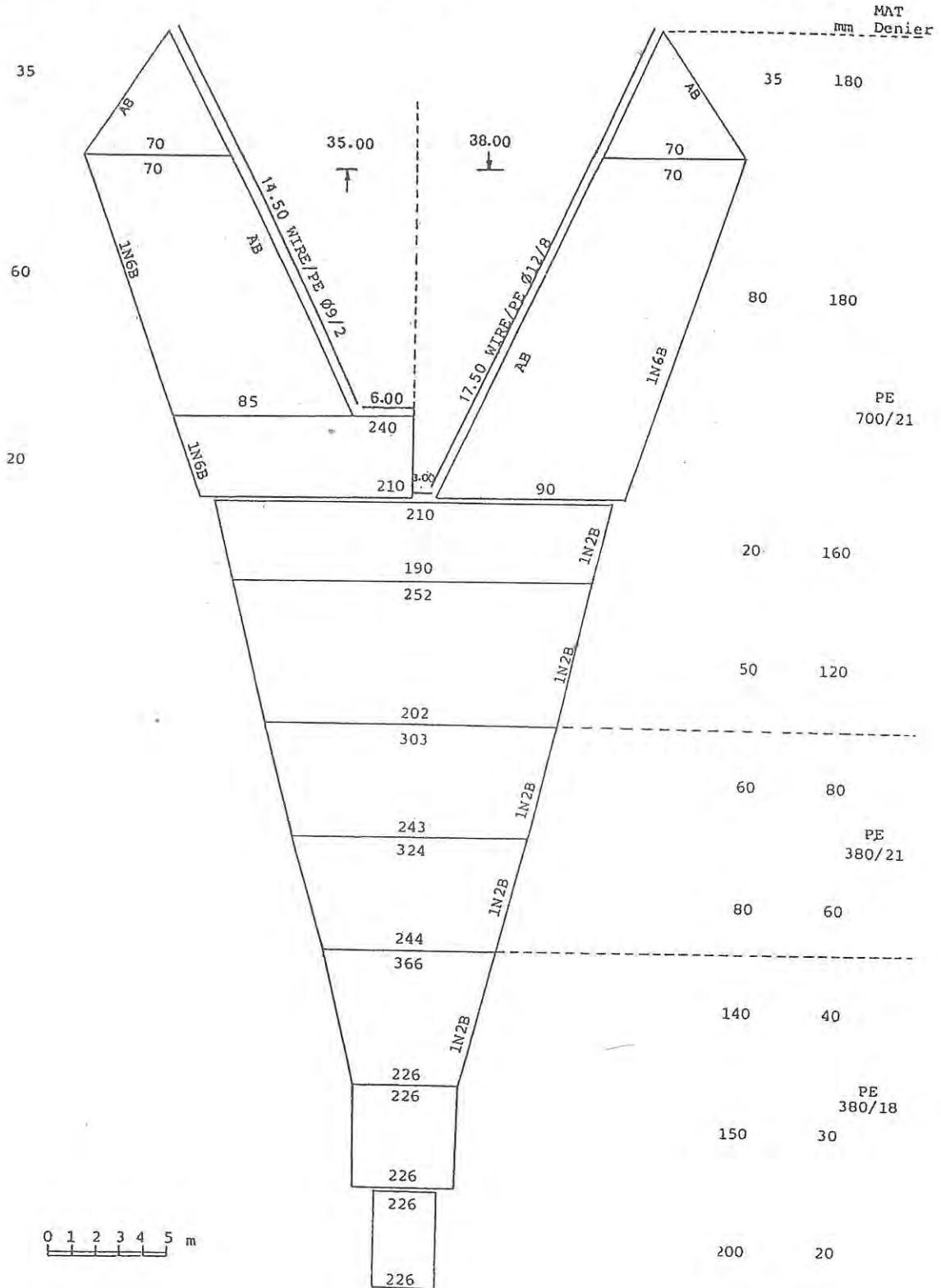


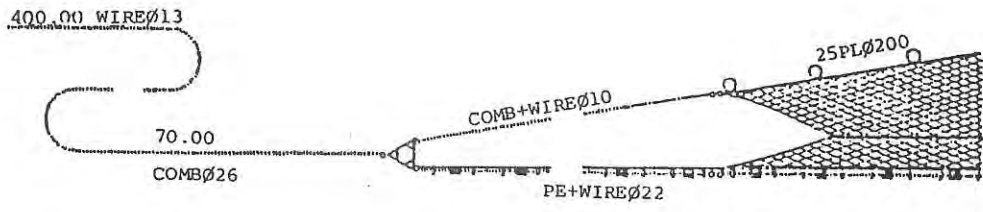


TRAWL
Bottom, pair
Bottom fishes

VESSEL
Narongchainavee
350, 240 hp

LOCATION
Ranong
Ranong

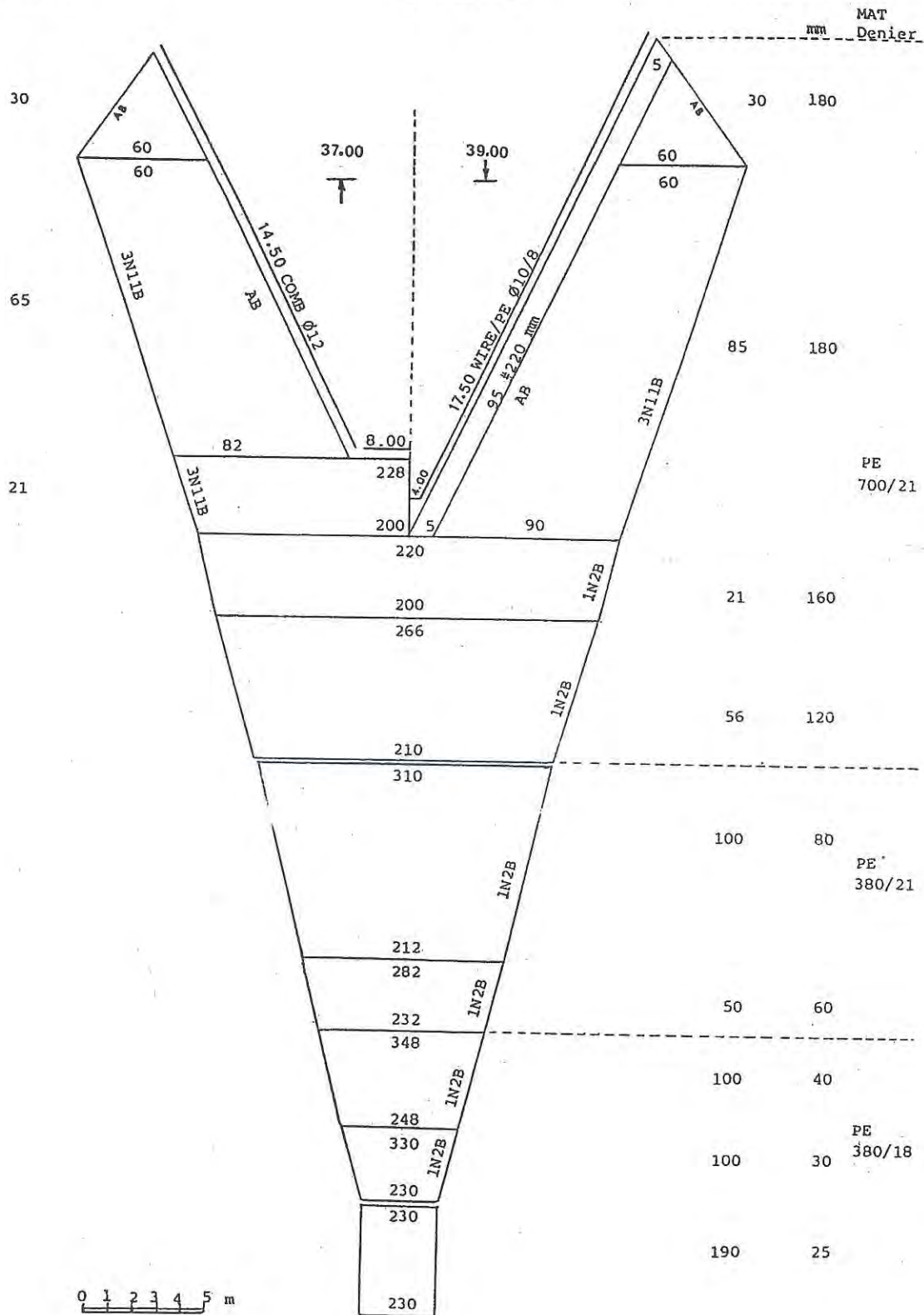


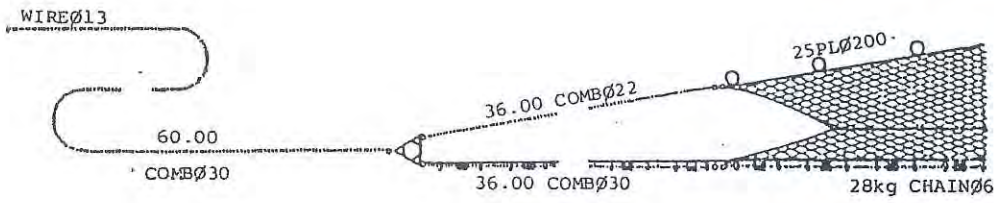
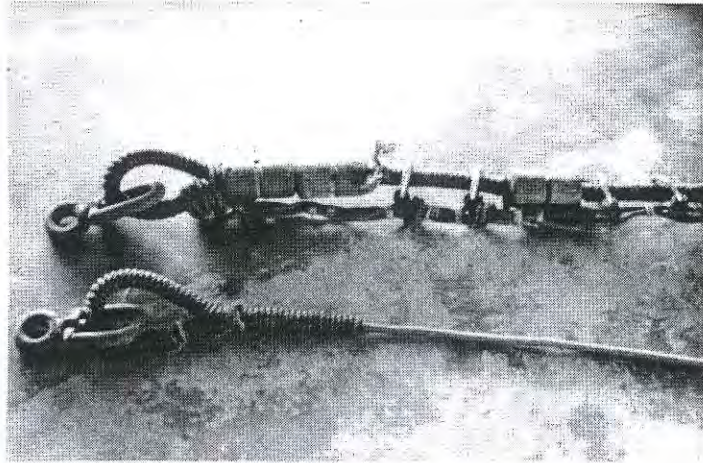


TRAWL
Bottom, pair
Bottom fishes

VESSEL
Pattana
260, 260 hp

LOCATION
Phuket
Phuket

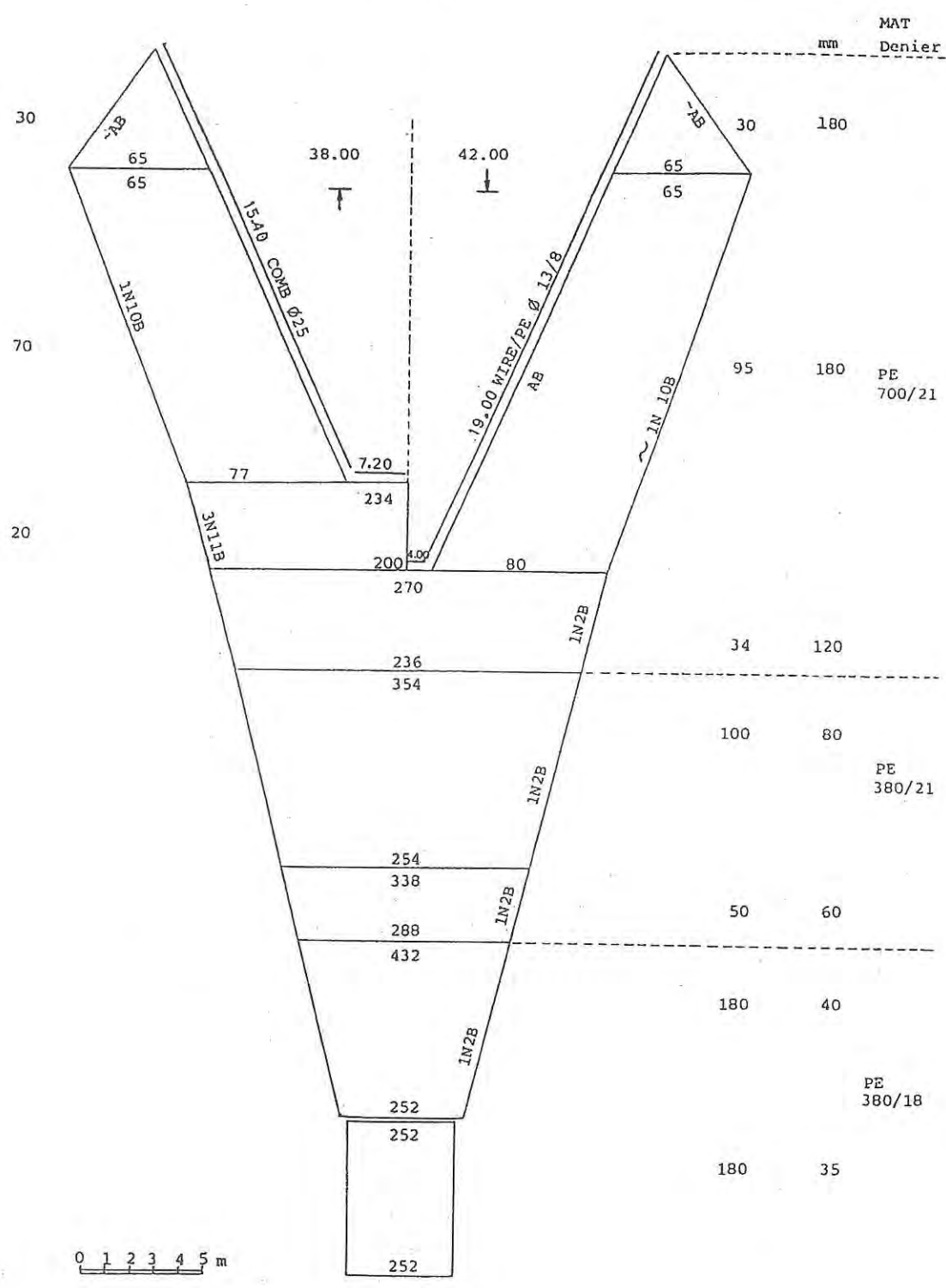


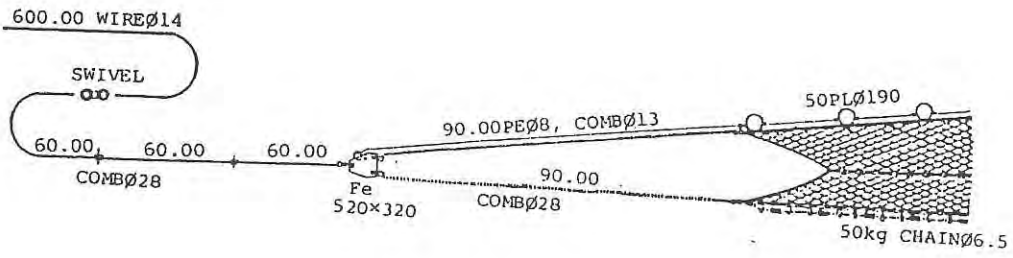


TRAWL
Bottom, pair
Bottom fishes

VESSEL
W. Supaporn
300, 300 hp

LOCATION
Phuket
Phuket





4. LIFTNETS

Aussanee Munprasit

CONTENTS

	Page
Liftnet fishing	181
Fishing gear and methods	181
4.1 Crab liftnets	
4.2 Fish liftnets	
4.3 Stationary liftnet	
4.4 Stick-held dip net	
Designs and specifications	183
Crab liftnets	183
□ Mangrove crab, blue swimming crab	
Fish liftnets	186
□ Planktonic shrimp	
□ Rabbit fish, marine catfish	
Stationary liftnets	188
□ Shrimp	
□ Mullet	
Stick-held dip net	193
□ Squid	
□ Anchovy	

LIFTNET FISHING

The liftnet is traditionally a small-scale fishing gear that has been used in all coastal areas for catching crabs, planktonic shrimp and shallow-water fishes. In the late 1970s and the early 1980s, a modified lifenet, better known as the stick-held dip-net, became very popular for squid and anchovy fishing with luring lights.

There are no independent statistical records for lift net fishing. The data appear either as a part of the general small-scale fisheries, or else they are inseparable from the records of the squid castnet fishery, classify lift nets into four basic types:

- (i) Crab liftnet,
- (ii) Fish liftnet,
- (iii) Stationary lifenet,
- (iv) Stick-held dip-net.

FISHING GEAR AND METHODS

4.1 Crab liftnet

This is one of the oldest fishing gears in Thailand, as well as in other parts of the world. The materials of which the gear is made may have changed, but the shape and the technique of use have remained

The gear consists of a bamboo or metal frame for the net, and a bamboo pole or a rope with a buoy. The frame is usually round, 40-50 cm in diameter, or square with 45 cm long sides. The height of the frame is 15 cm. Nowadays, the net is polyethylene or nylon, with 70-140 mm mesh-size. The fisherman can use this gear in very shallow water, from a rowing-usually mangrove crab and blue swimming crab. Fishing is done in the day or night-time, all the year round.

4.2 Fish liftnet

This gear is a modification of the crab liftnet. The metal frame is round, 50-80 cm in diameter, and contains a 1 m deep nylon net that looks like a scoop net, with 25 mm mesh size. A rope is attached to the frame, for lifting the gear to the surface. Before the net is lowered to the bottom, a small piece of fish or crab is hung in the center of the frame as bait. The net is lifted frequently to check if there is catch, which may be a rabbit fish, marine catfish and sometimes a young grouper. One often sees this gear used by children or occasional fishermen, in fishing ports.

A kind of fish lifenet is used for catching planktonic shrimp. The net in this case is either cotton, nylon or polyethylene minnow or rachel net, mesh size 2 x 2 mm or 6-8 mm. A bamboo handle, 2-3 m long, is commonly used for gear with a square frame, whereas a round frame has a rope attached for lifting. The net is operated so that it is placed at the bottom in very shallow water, and the fisherman waits until he sees a school of planktonic shrimp pass; then he lifts the net. No bait is required.

4.3 Stationary liftnet

This is a comparatively large liftnet, rarely used in Thailand. The type of stationary liftnet found in Songkhla has a leader net or a fence to guide the fish into the main net, which is suspended on a wooden frame in the water 0.5-2 meters deep. An observation platform, 8-10 meters high, is built so that the fisherman can see a passing fish school and operate the net from a good vantage point. The net is made of nylon 210d/6 with 25 mm mesh-size. Fishing can be done by a single person, in the day-time between high and low tide. The catch is mostly mullet. Similar gear can be found in Nakhon Sri Thammarat province. The Shrimp liftnet consists of two bamboo leaders, funnel-shaped, and a net hung on two poles which are tied like a see-saw on a vertical wooden frame, so that the net can easily be lifted out of the water. The net is polyethylene 250d/6, 15 mm mesh-size, the size of net is 4 x 7 square meters. The net is set so as to face the current.

The mullet net, also found in Nakhon Sri Thammarat, is rather larger: 10.7 x 15.3 square meters. It is hung on four stilts. There is a platform at each corner, from which the net is raised or lowered through a system of pulleys. A leader net is set on wooden stakes between the beach and the liftnet. Five men are required to operate the net.

4.4 Stick-held dip-net

Derived from the stationary liftnet, the stick-held dip-net is smaller and simpler to operate. Fishing takes place on board a small to medium-sized vessel (8-14 m) equipped with electric luring lamps. The gear itself consists of a square or rectangular net, two bamboo poles, sinkers and ropes. The size of gear depends on the size of the fishing vessel. The net is usually black nylon 210d/3-6, 20-30 mm mesh-size, and 0.4-0.5 hanging ratio. Fishing is done on moonless nights. During the operation the boat is allowed to drift with the current; a drift gill-net is used as a parachute anchor. The lift net is operated either by "pulling" or "pushing", depending on how it is hung on the bamboo poles at the start of operation. The main catch are squids and cuttlefishes. Anchovies are caught by the same gear and a similar method, except that the main net must have a smaller mesh-size and it is customary to operate a "pulling type" net.

The number of fishing vessels still engaged exclusively in squid stick-held dip-net fishing has been declining ever since the more effective squid stick-held castnet appeared. This kind of fishing, however, still continues along the eastern seaboard in Chonburi and Rayon province.

LIFTNET

Crap liftnet, portable
Raew Poo

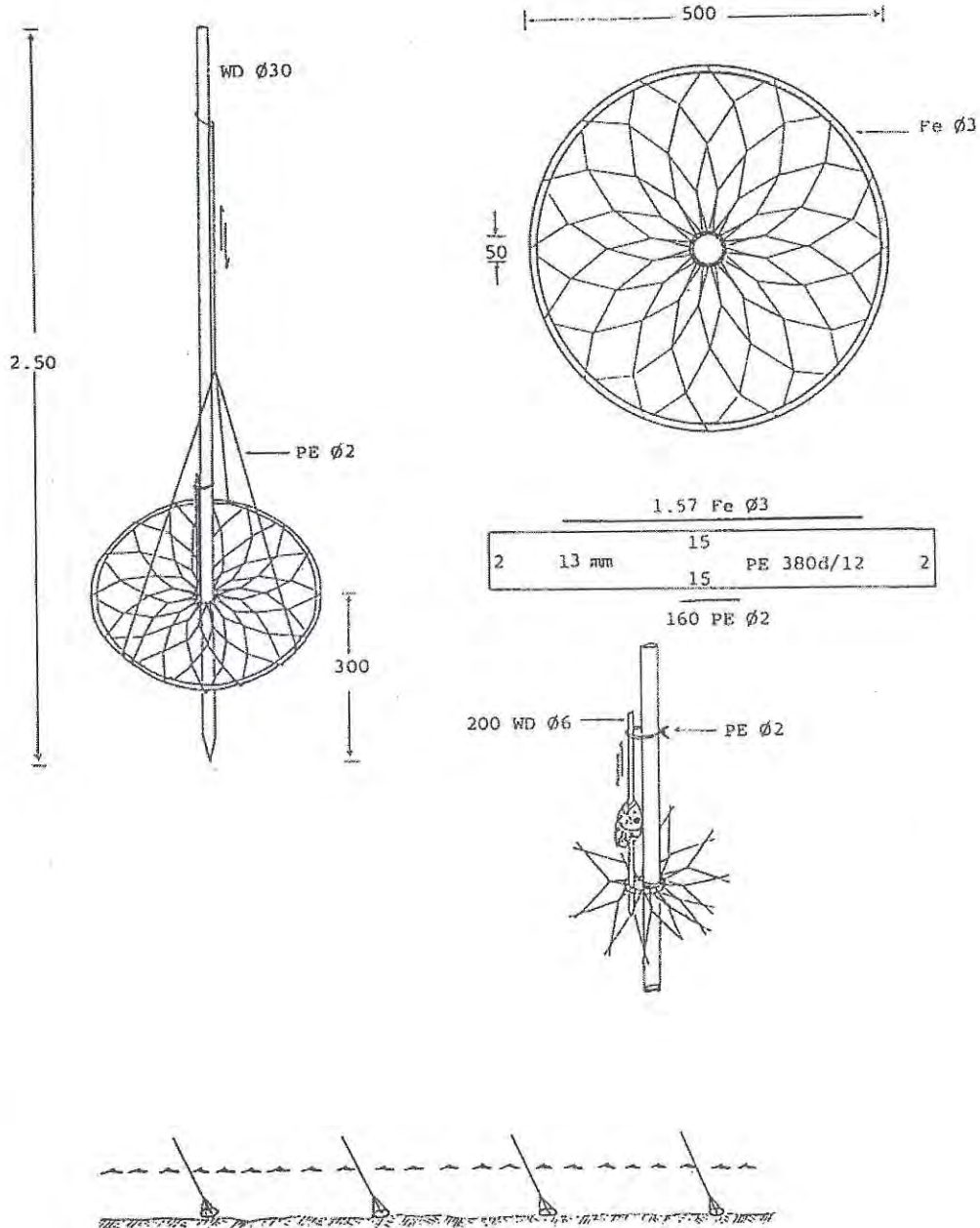
VESSEL

Loa 3-5 m
hp 1-3 LT

LOCATION

Paknamchumphon
Chumphon

Mangrove crab, Blue swimming crab



LIFTNET

Crab liftnet, portable
Chan Poo

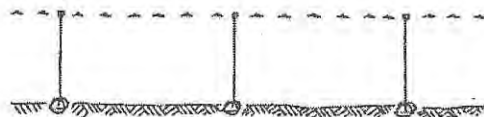
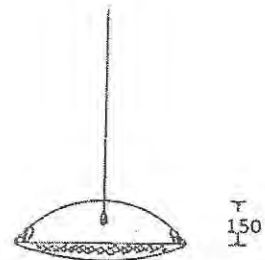
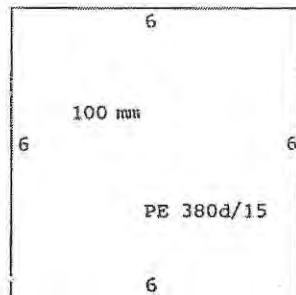
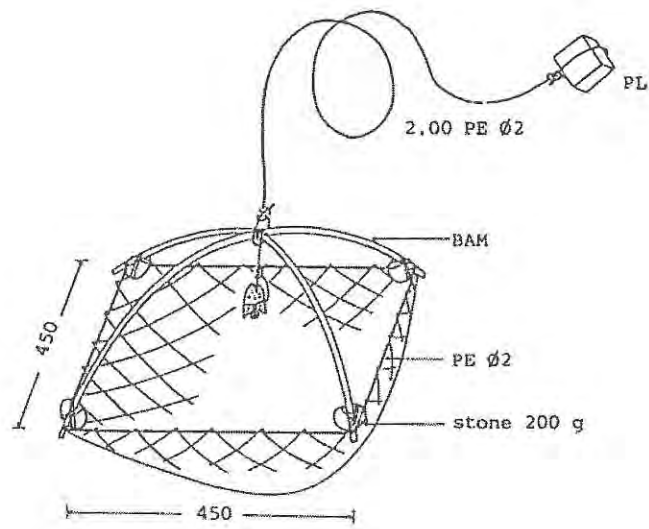
Mangrove crab, Blue swimming crab

VESSEL

Loa 3-5 m
hp -

LOCATION

Khokkhai
Phangnga



LIFTNET

Crab liftnet, Portable
Chan Poo

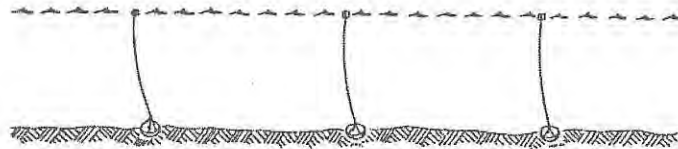
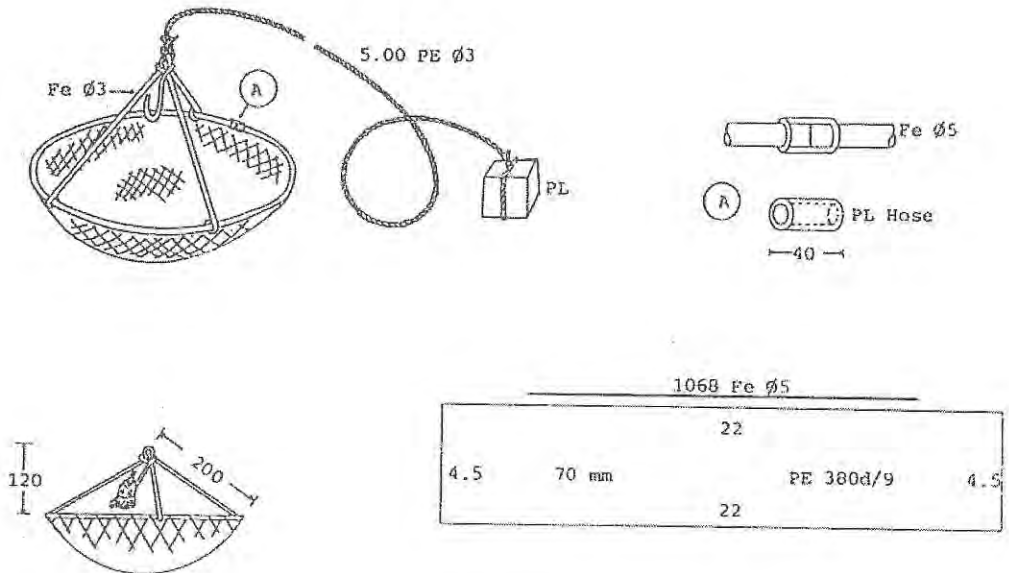
Mangrove crab, Blue swimming crab

VESSEL

Loa 3-5 m
hp 1-3 LT

LOCATION

Bangchagrang
Samut Songkhram



LIFTNET

Fish liftnet, portable

Rabbit fish, striped sea catfish

VESSEL

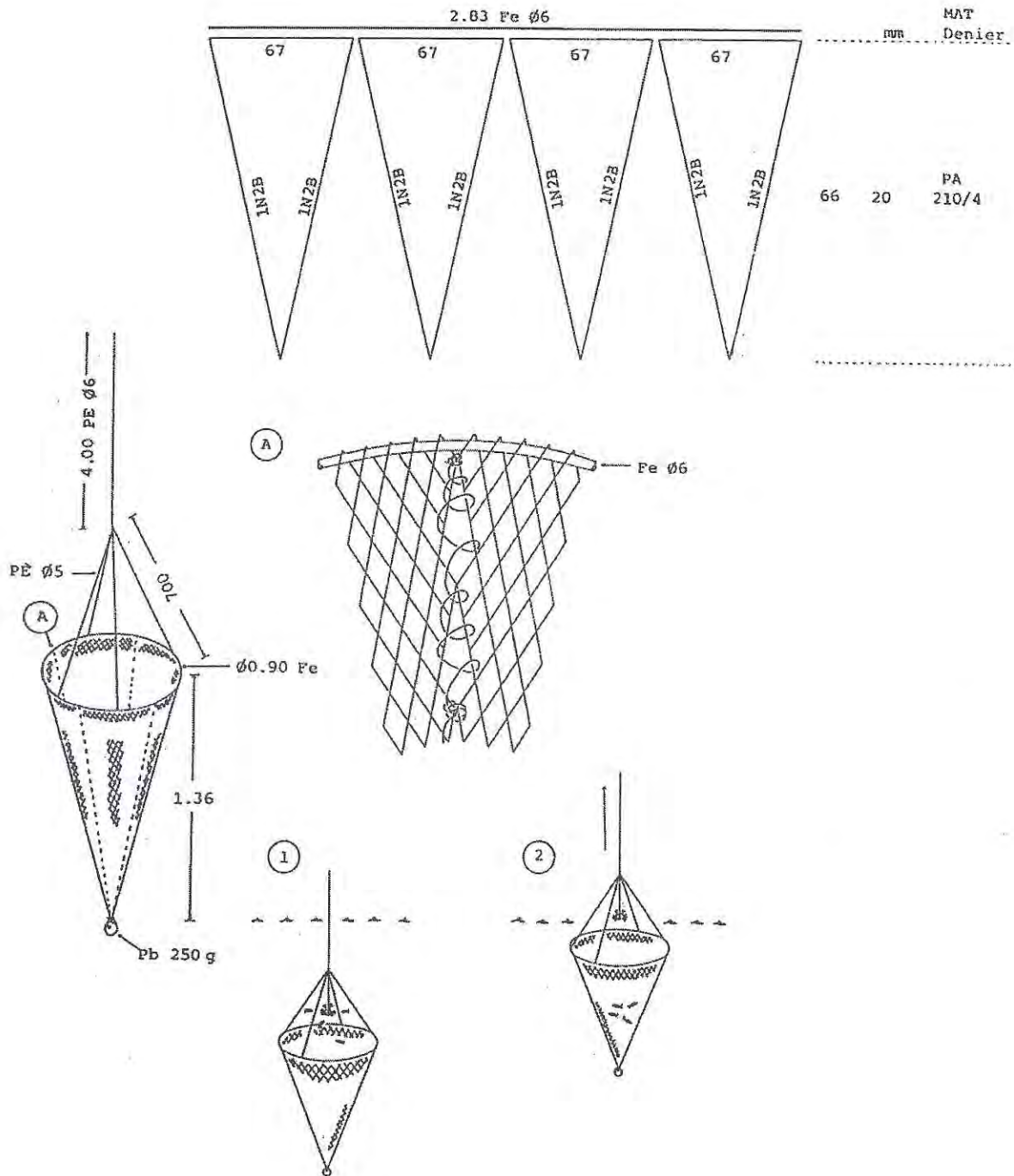
Loa -

hp -

LOCATION

Lanqsuan

Chumphon



LIFTNET

Acetes liftnet, portable

Planktonic shrimp

VESSEL

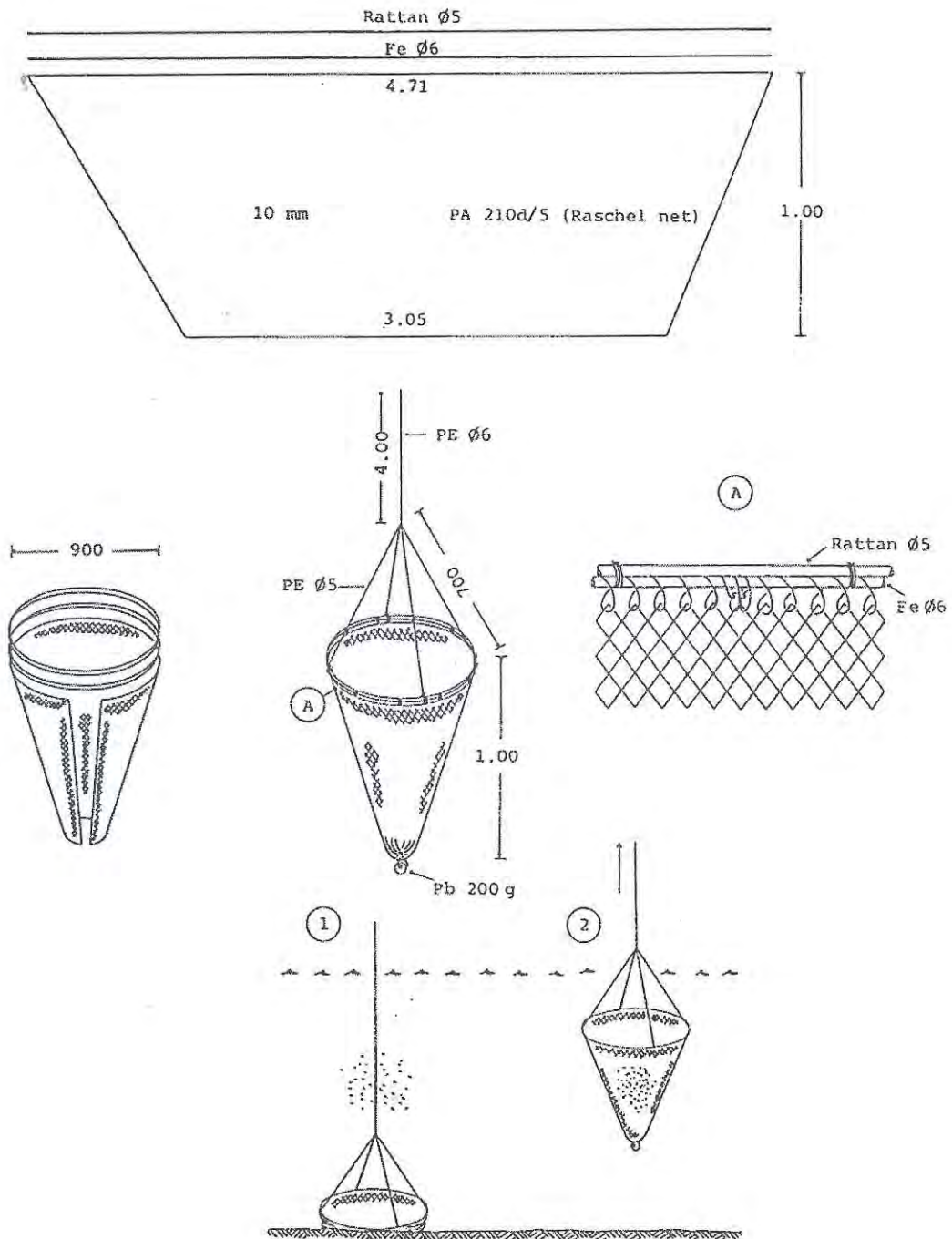
Loa -

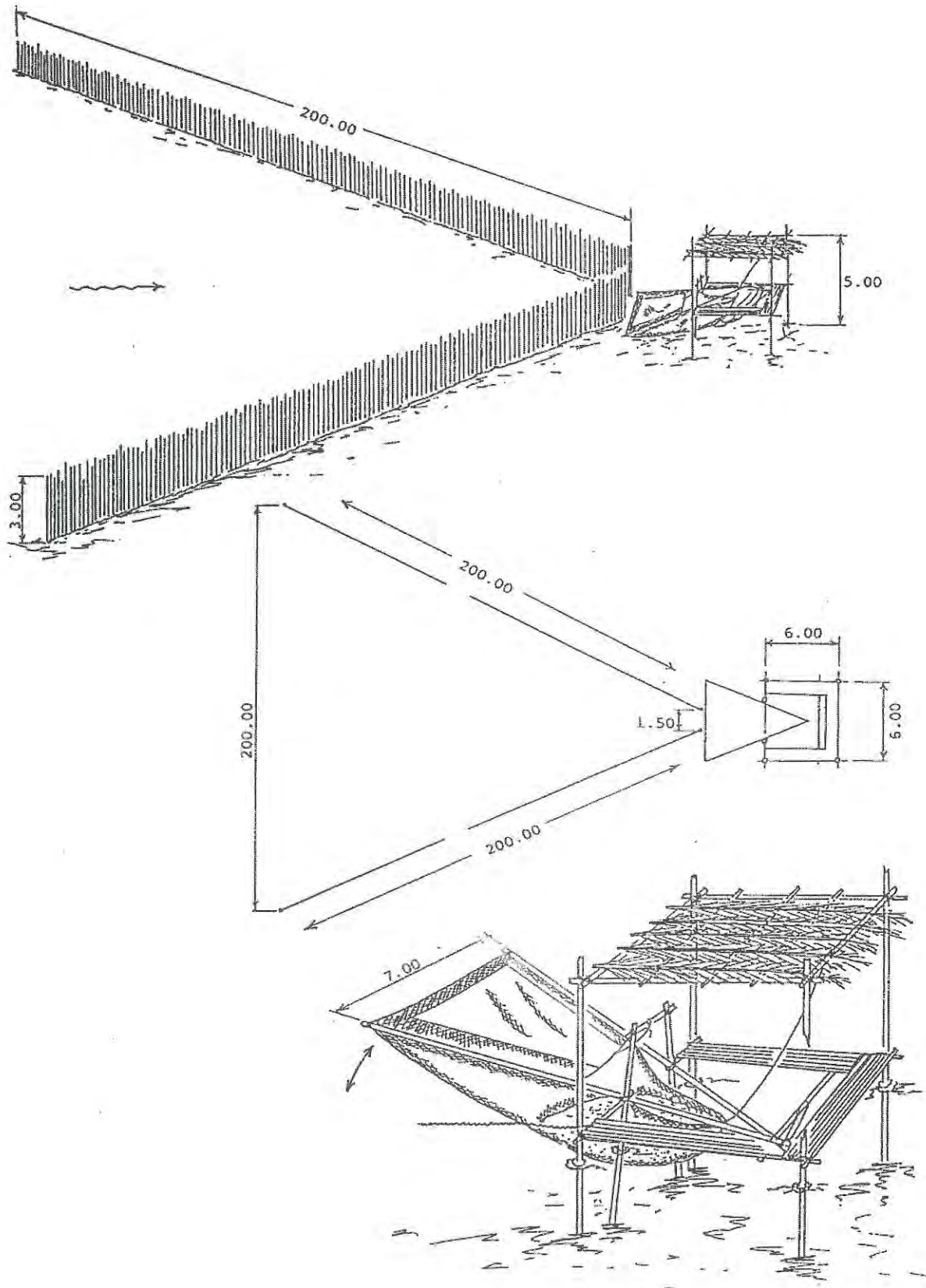
hp -

LOCATION

Langsuan

Chumphon





LIFTNET

Stationary Liftnet
 Barn Pla Kabong

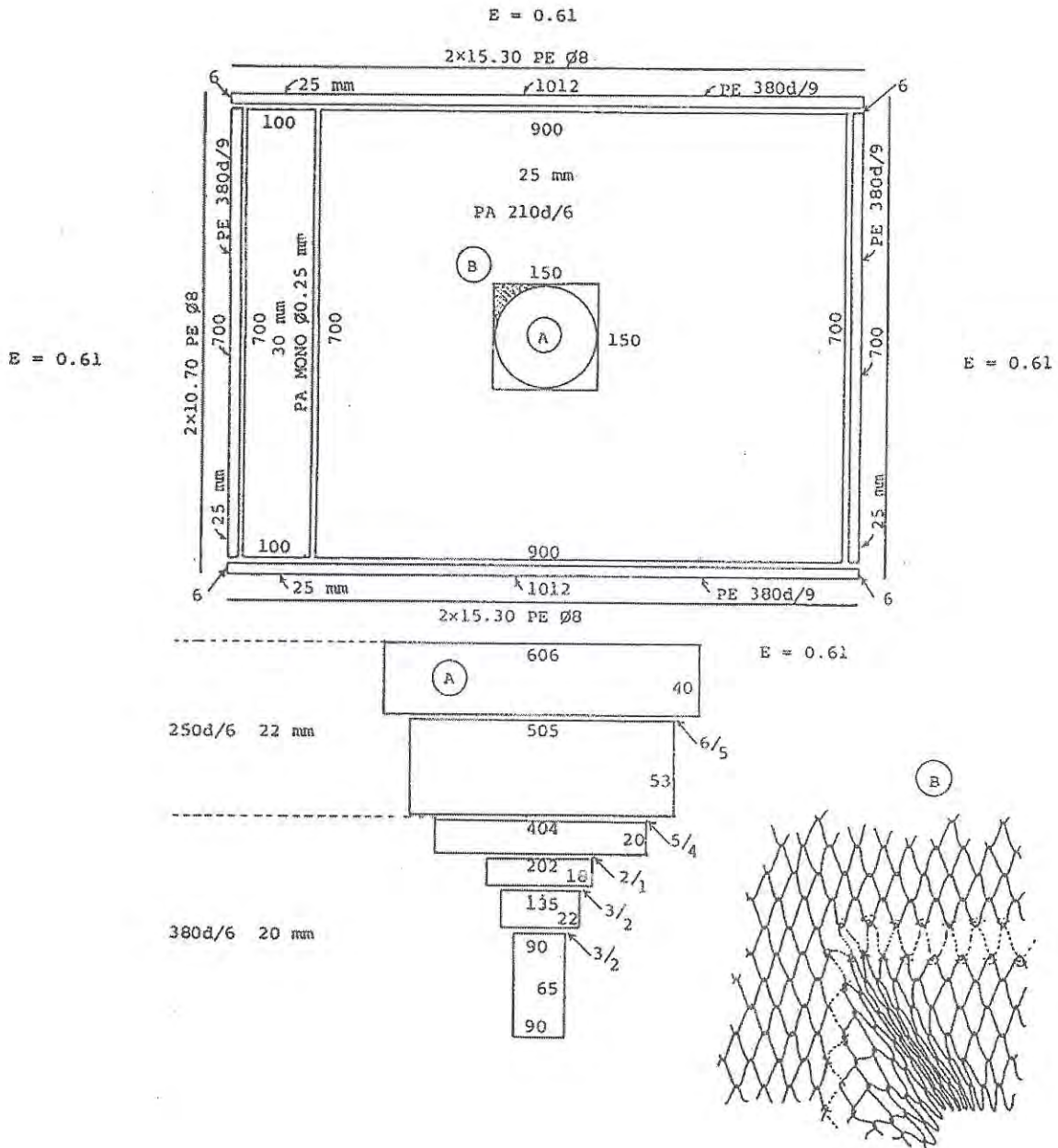
Mullet

VESSEL

Loa 6 m
 hp -

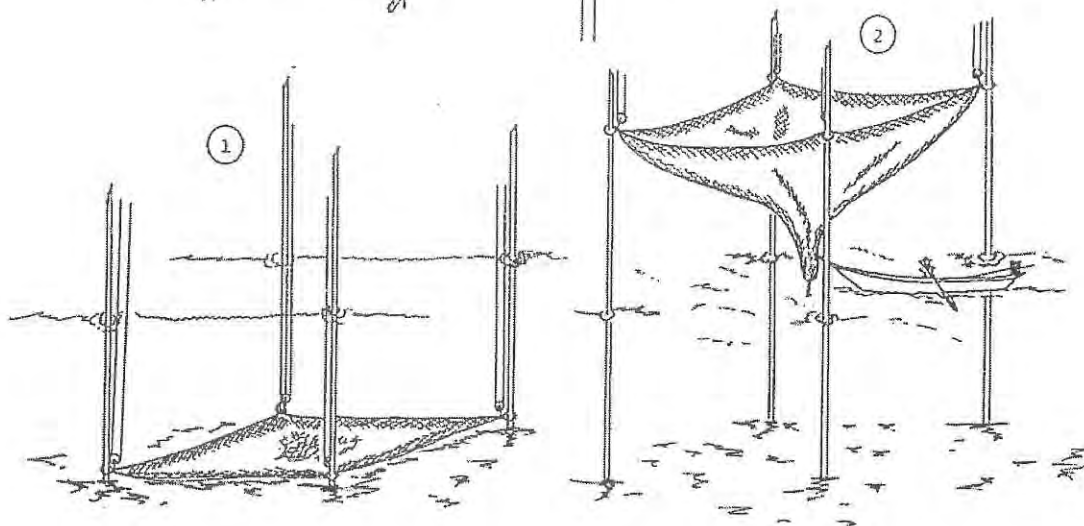
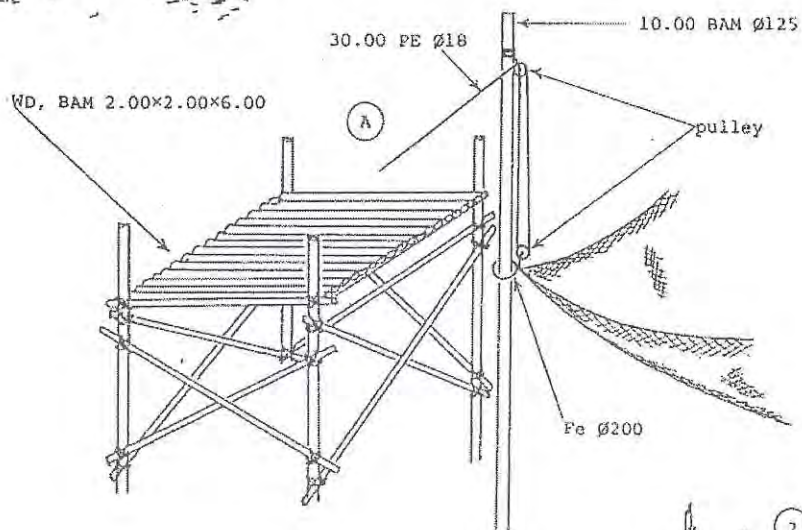
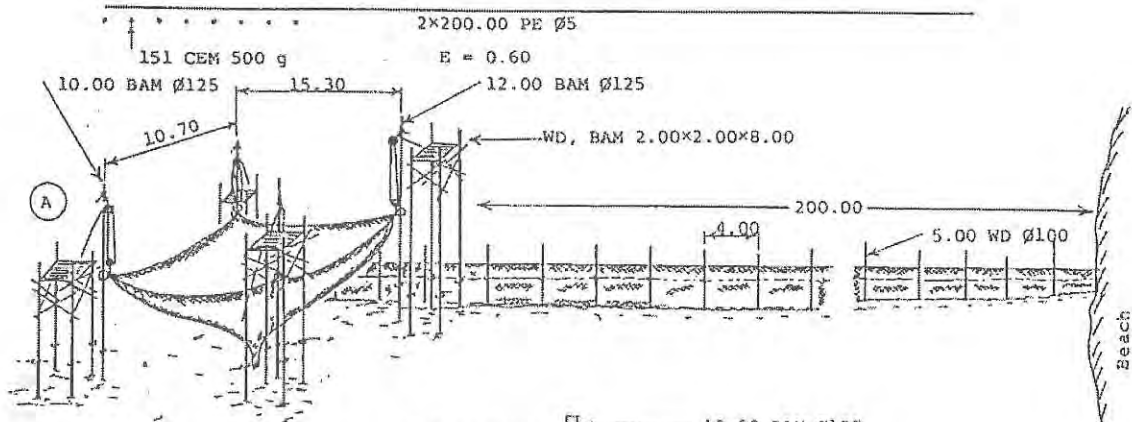
LOCATION

Laem Talumphuk
 Nakhon Si Thammarat



E = 0.60
 2x200.00 PE Ø5

80	50 mm	6667	PE 380d/15	80
----	-------	------	------------	----



LIFTNET

Stationary liftnet,
Barm Plakabong

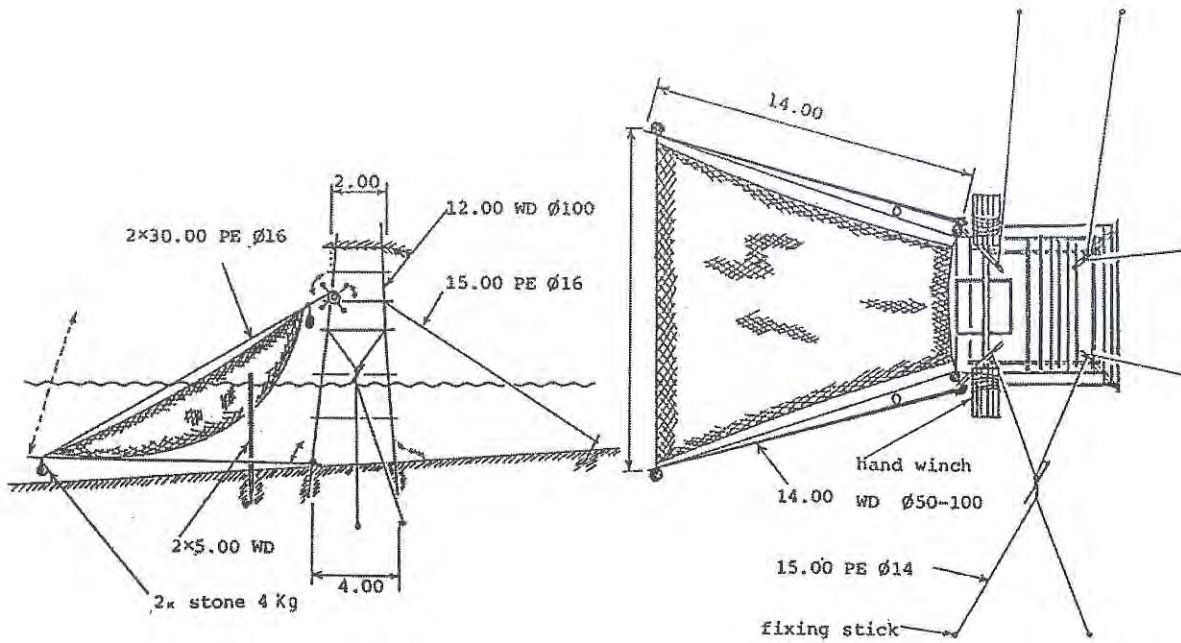
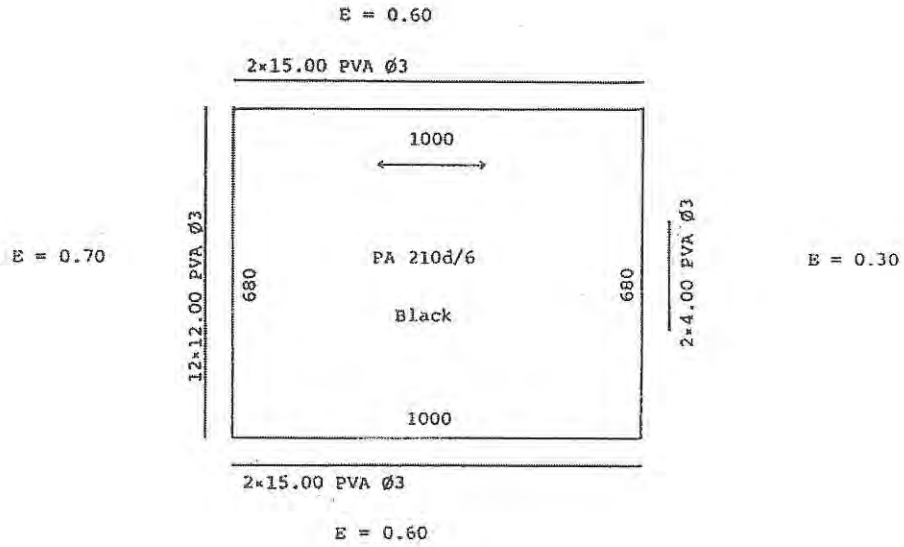
Mullet

VESSEL

Loa 3 - 5 m
hp 3-5 LT or None

LOCATION

Laem Samihla
Songkhla



LIFTNET

Stick held dip net
Uan Yok on Von
 I. Pulling type
 II. Pushing type
 Squid, cuttlefish

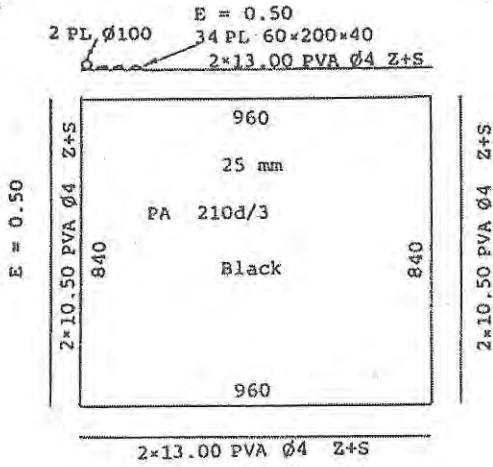
VESSEL

Loa 14 m
 hp 40
 EG 2.5 KVA dynamo
 LL 18*500 W

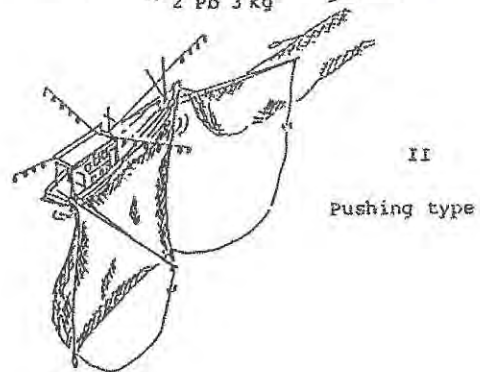
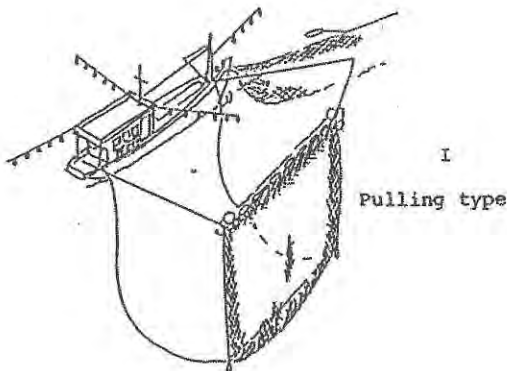
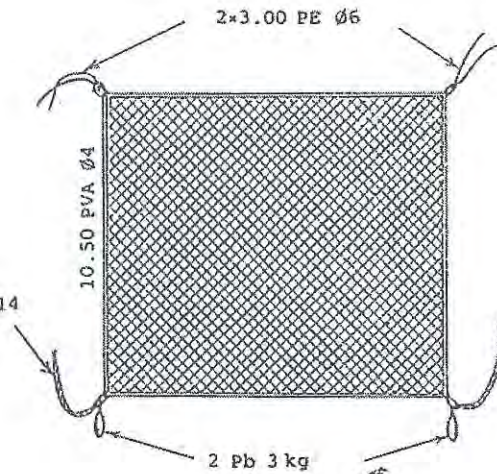
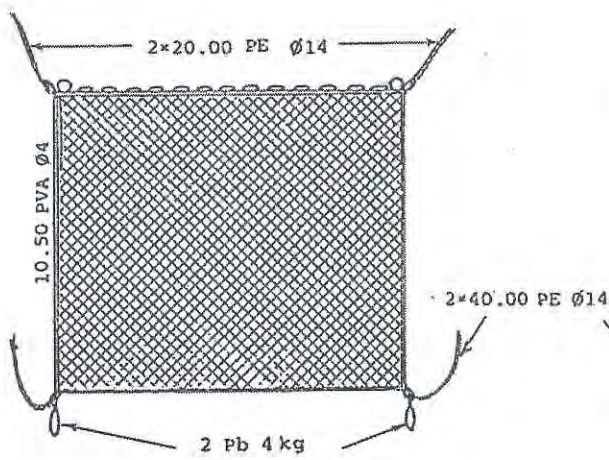
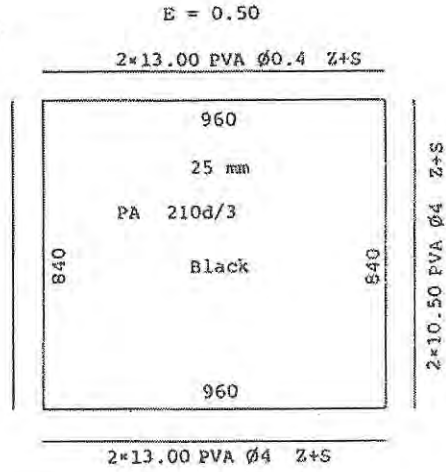
LOCATION

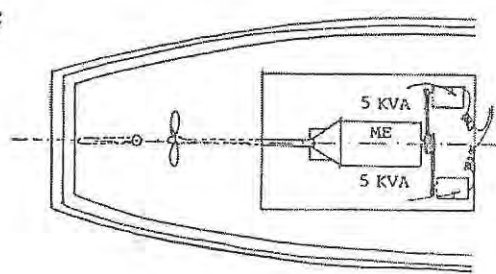
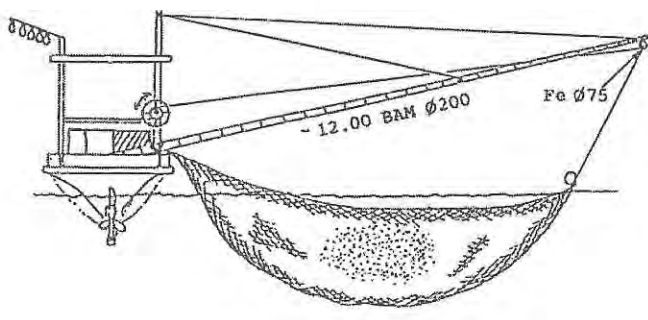
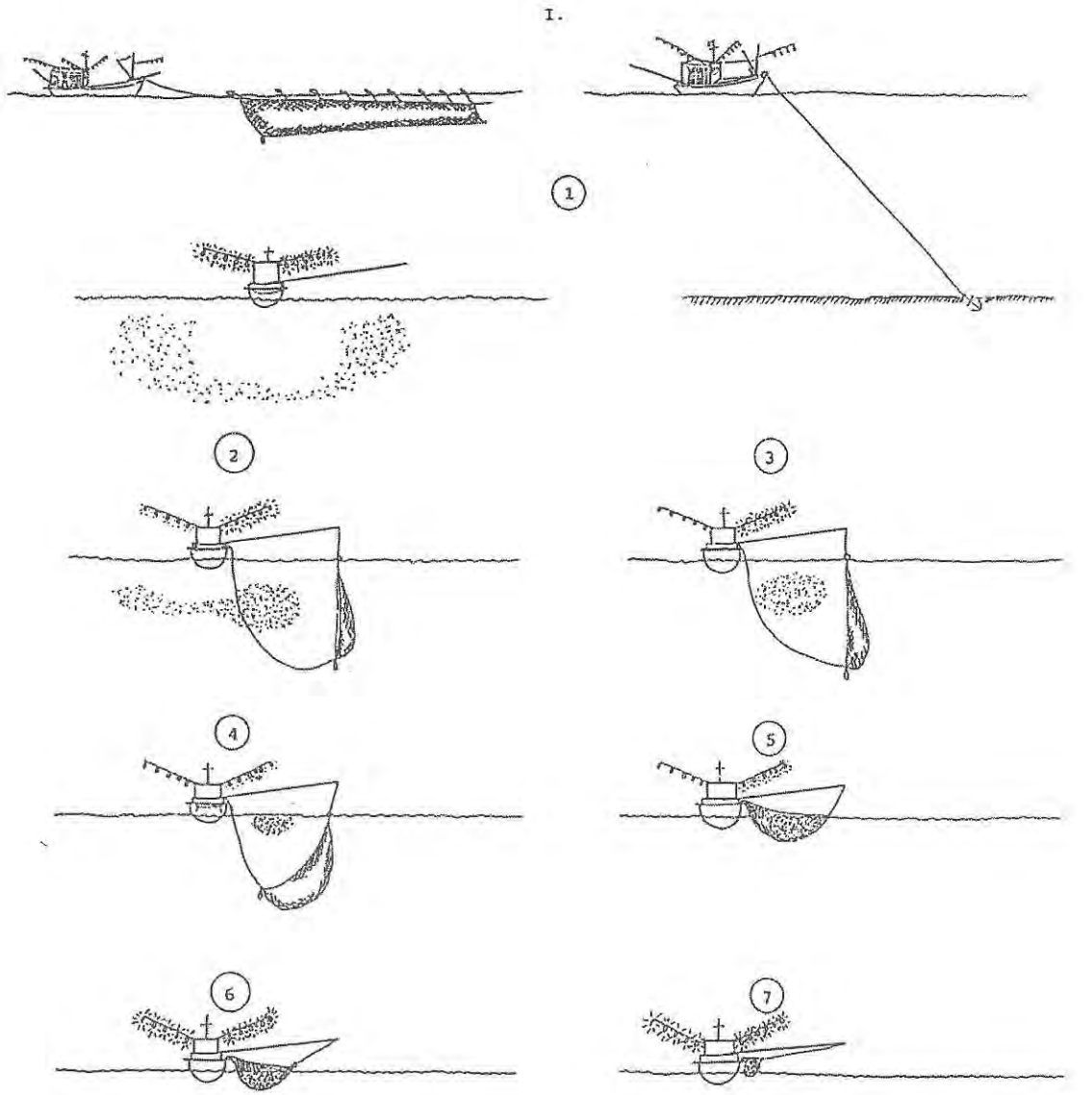
Banphe
Rayong

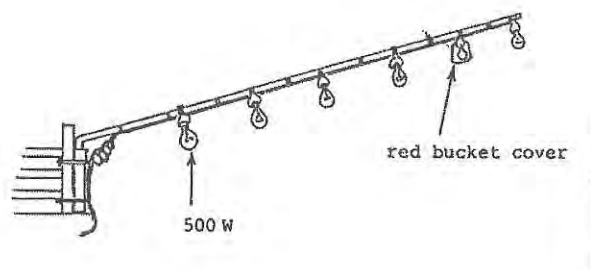
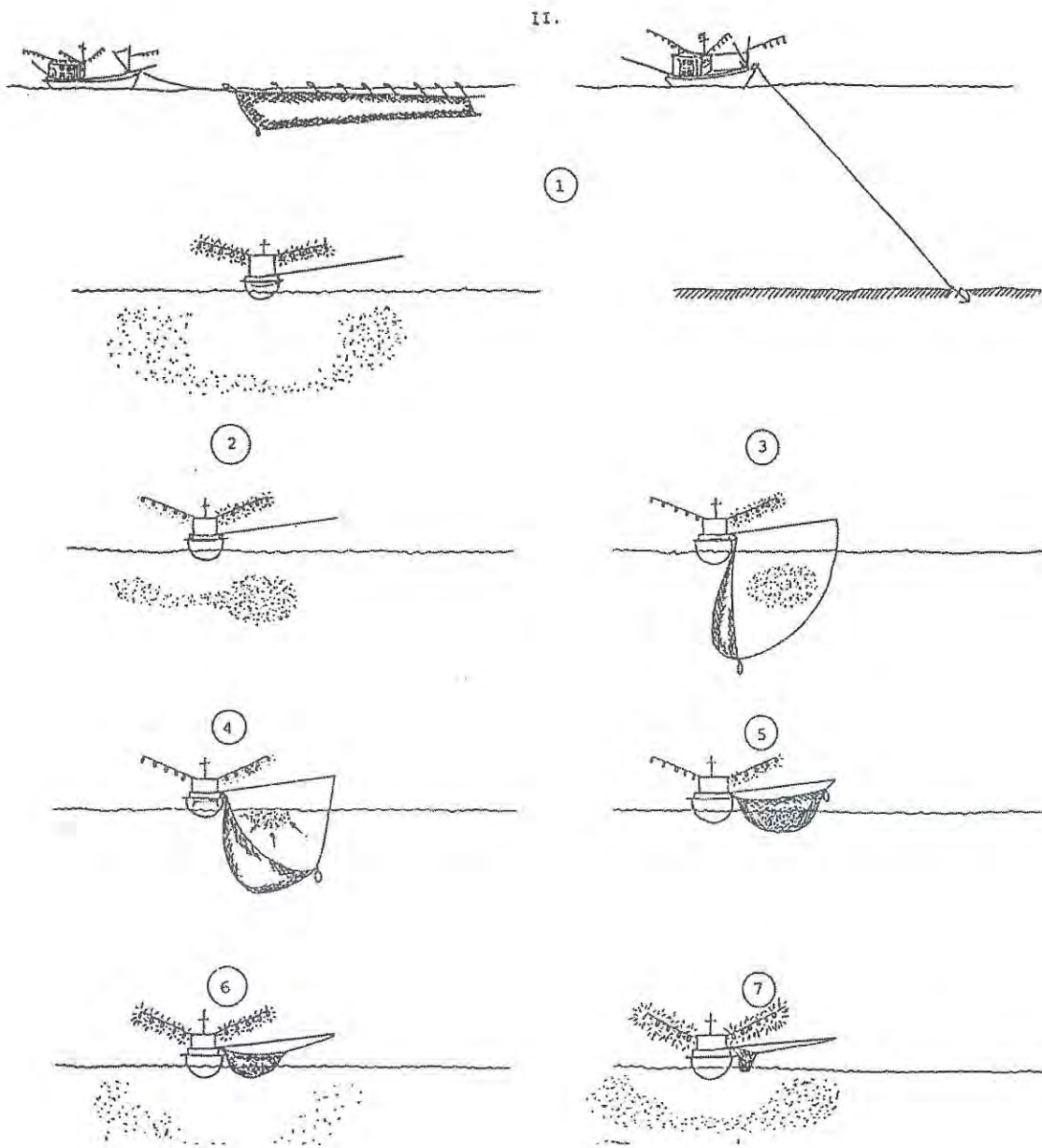
I

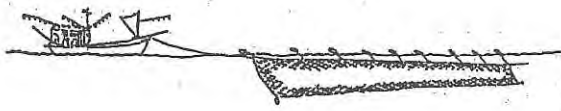


II

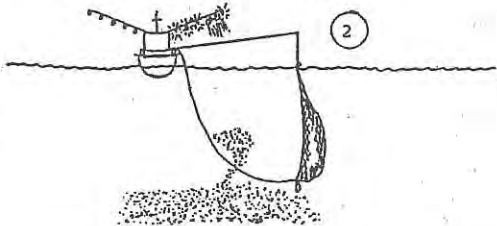
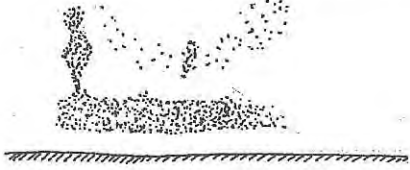




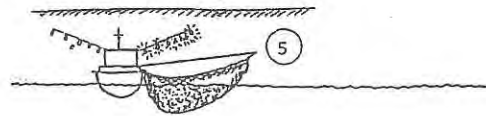
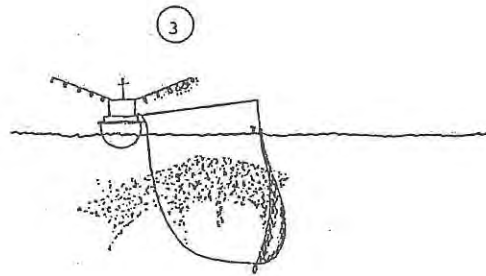




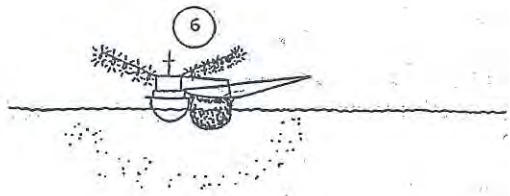
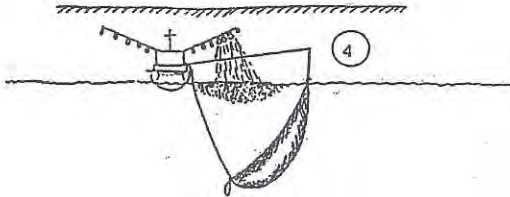
1



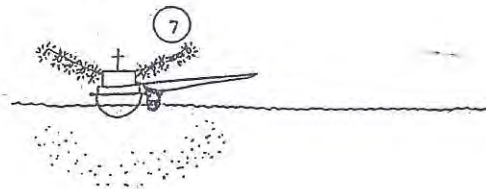
2



3



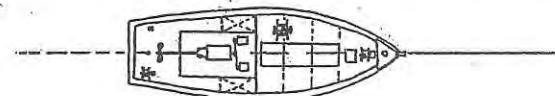
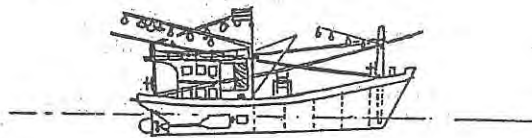
4



5

6

7



5. FALLING GEAR

**Prasert Masthawe
Aussanee Munprasit**

**Revised by
Nakaret Yasook**

CONTENTS

	Page
Castnet fishing	203
Fishing gear and methods	204
5.1 Small castnet	
5.2 Squid castnet	
5.3 Stick-held castnet	
5.4 Stick-held box net	
Designs and specifications	206
Small castnet	206
<input type="checkbox"/> Shrimp	
<input type="checkbox"/> Mullet	
Squid castnet	208
<input type="checkbox"/> Squid	
Stick-held castnet	211
<input type="checkbox"/> Squid	
Stick-held box net	215
<input type="checkbox"/> Squid	

CASTNET FISHING

Castnet (*Hae*) is a primitive fishing gear, and a very popular one among small-scale fisherman in Thailand. It is useful in inland waters and in shallow coastal waters, and can be operated by a single fisherman, with or without a boat. As they are a one-man gear, most such nets are small. A comparatively large castnet, which in the past had been used for Indo-Pacific mackerel, became popular in the 1970s for squid-fishing from a boat with luring lights. An improvement was made by adding a purse line to the bottom edge of the net. This type of castnet (stick-held castnet) is one of the most widely used gears in Thailand.

According to the fishery statistical records for 1990 to 1997, the annual catches by squid castnet (including stick-held castnet) have been increasing (Table 5.1). A particularly sharp rise was evident in 1993, which was attributed to improvements in gear, such as stick-held castnet.

Table 5.1 Annual catch by castnets, 1990-1997

Type of castnet \ year	1990	1991	1992	1993	1994	1995	1996	1997
Squid castnet	349	307	422	653	516	486	454	462
Others castnet	786	361	375	237	186	523	495	254

The number of registered boats for squid castnet and the main species caught by castnets in 1997, are shown below:

Table 5.2 Number of registered fishing boats for squid castnet.

Type of castnet \ year	1990	1991	1992	1993	1994	1995	1996	1997
Squid castnet	1,088	1,363	1,590	1,895	2,059	1,901	1,747	1,945

<u>Squid castnet</u>	<u>Catch-year (mt)</u>
Squid	444
Others	18
<hr/>	
Total	462

<u>Other castnet</u>	<u>Catch/year (mt)</u>
Mullet	135
Panaeid prawns	24
Non-penaeid prawns	42
Others	53
<hr/>	
Total	254

FISHING GEAR AND METHOD

5.1 Small castnet

This gear can be found in most fishing villages in Thailand and therefore there are many variations in the basic design. The size ranges from 2.5 to 5 meters in the depth and from 8 to 12 meters in the circumference of the net. The net is hand-made, of nylon 210 d/3-6, or attached to the bottom edge, to act as a sinker. Every 25-40 cm the chain is tied 10-15 meshes above the edge, so that small pockets are formed at the bottom of the net.

The size of twine depends on the target fish, as does the mesh-size. Castnets for shrimp generally have a smaller mesh-size (20-25 mm) than the fish castnets (over 25 mm).

5.2 Squid castnet

The largest of the traditional castnets were found suitable for squid-fishing. A modern squid castnet is 6-8 meters deep and 15-20 meters in circumference. It is hand-made, of nylon 210 d/4-6 netting, with 25-30 mm mesh size. A lead or iron chain is attached to the lowest meshes of the net. A heavy ring made of lead, 30-40 mm thick and 15-20 cm in diameter is used to block the escape of the catch.

The operation requires skill, but can be carried out by one man on a small boat, usually on a dark night, using a kerosene or electric luring light. Apart from squid, the catch consists of cuttlefish and some fishes. Many squid castnet fishing boats can be seen in Prachuap Khiri Khan and Chonburi province.

5.3 Stick-held castnet

This is an improved version of the squid castnet, with incorporated elements of a stick-held dip-net. The net is 10-20 meters deep, 20-50 meters in circumference. The main net material is nylon 210 d/4-6, 25-30 mm mesh-size, whereas cod-end and bottom selvedge are polyethylene 380 d/9-12, with the same mesh-size. There are two patterns of net construction: One way is to join 6-8 triangular pieces with the cutting pattern of 1N2B, and the other way is to join rectangular pieces with different lengths, so that the shortest one is at the top of the finished product and the longest one at the bottom. At the bottom of the net there is an iron chain sinker, and plastic, iron or stainless steel rings at 1-meter intervals. These rings are for the purse line, which is a 12-14 mm thick polyethylene or polypropylene, normal or cross-rope.

The fishing operation is carried out at night, from a boat equipped with electric luring lights. The net is set on a bamboo boom, as for the stick-held dip-net. The catch is mainly squid, but also cuttlefish, Indian mackerel and other fish. Fishing is done mostly in the Gulf of Thailand, all the year round, and is the most wide-spread form of squid-fishing in Thai waters.

5.1 Stick-held box net

Some fishermen believe that a stick-held castnet has two serious disadvantages: it has too large a resistance in the water when it is being set, and its upper part frightens the fish and squid away. The net has therefore been modified, so that it is in the shape of a cube or a box. The upper edge is a rope with the hanging ratio 0.7-0.6, the bottom edge is the same as before. The two outer vertical edges and sometimes all four edges, have rings and rope attached, so that the net can be lifted like a curtain during setting. The purpose of this is to minimize the surface, therefore the resistance, of the net in water. In all other respect this gear is similar to an ordinary stick-held castnet.

CASTNET

Small casnet
Hae Kung

VESSEL

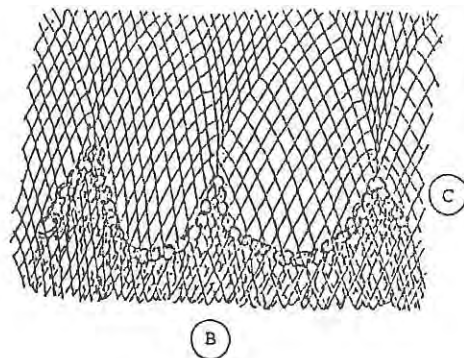
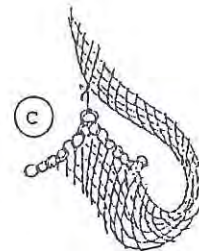
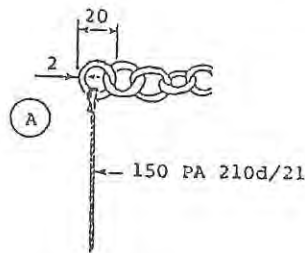
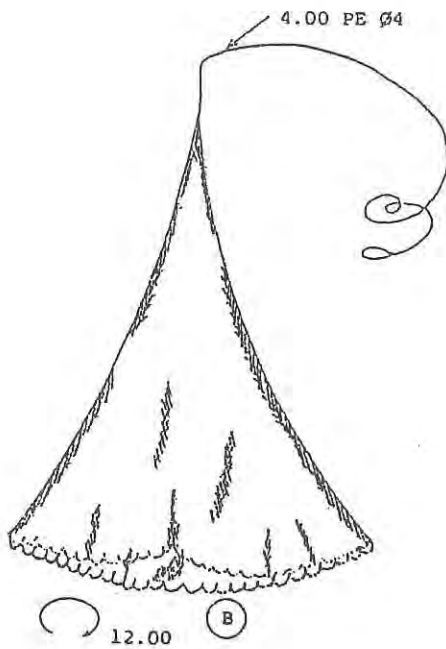
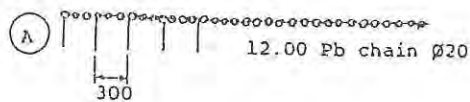
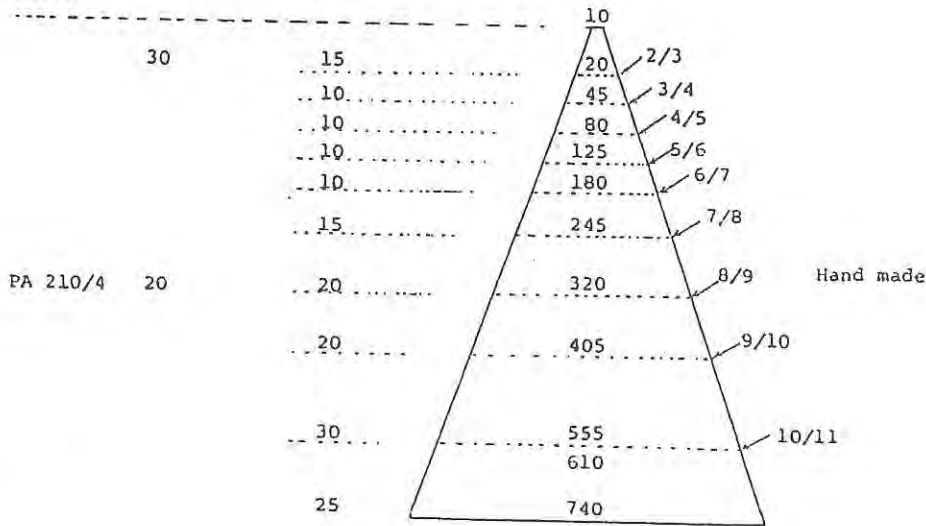
Loa -
hp -

LOCATION

Paknum Prasae
Rayong

Shrimp

MAT num meshes
Denier



CASTNET

Small castnet
Hae Pla Krabog

VESSEL

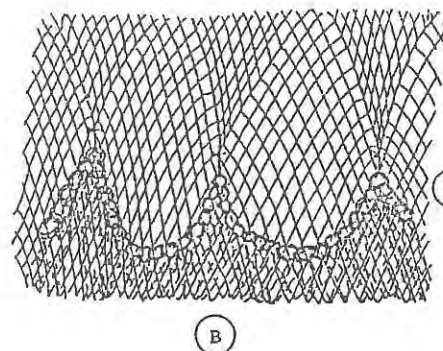
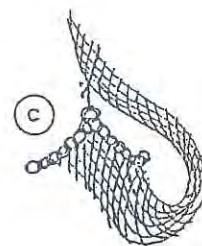
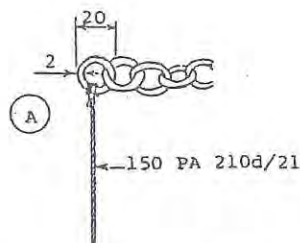
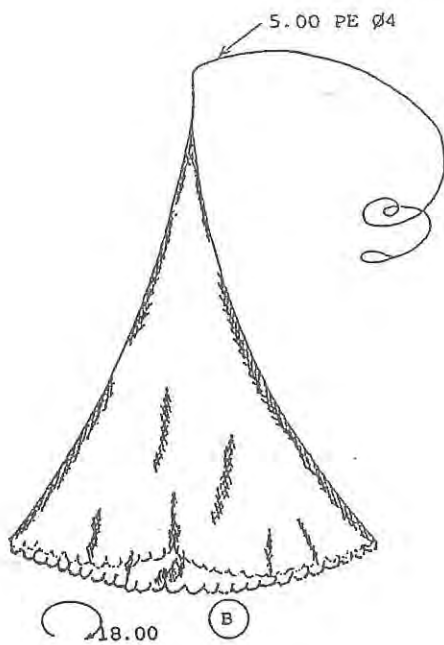
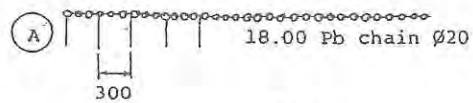
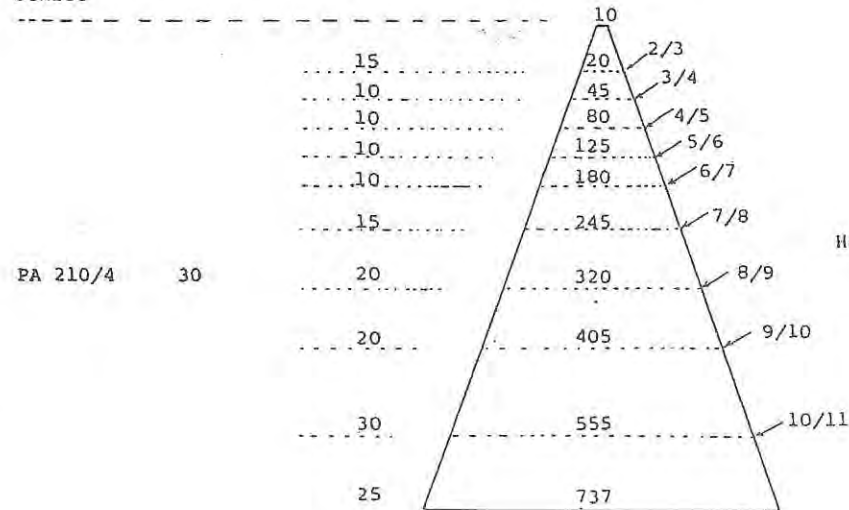
Loa -
hp -

LOCATION

Songkhla
Songkhla

Mullet

MAT Denier mm meshes



CASTNET

Squid castnet
Hae Hmouk

Squid

VESSEL

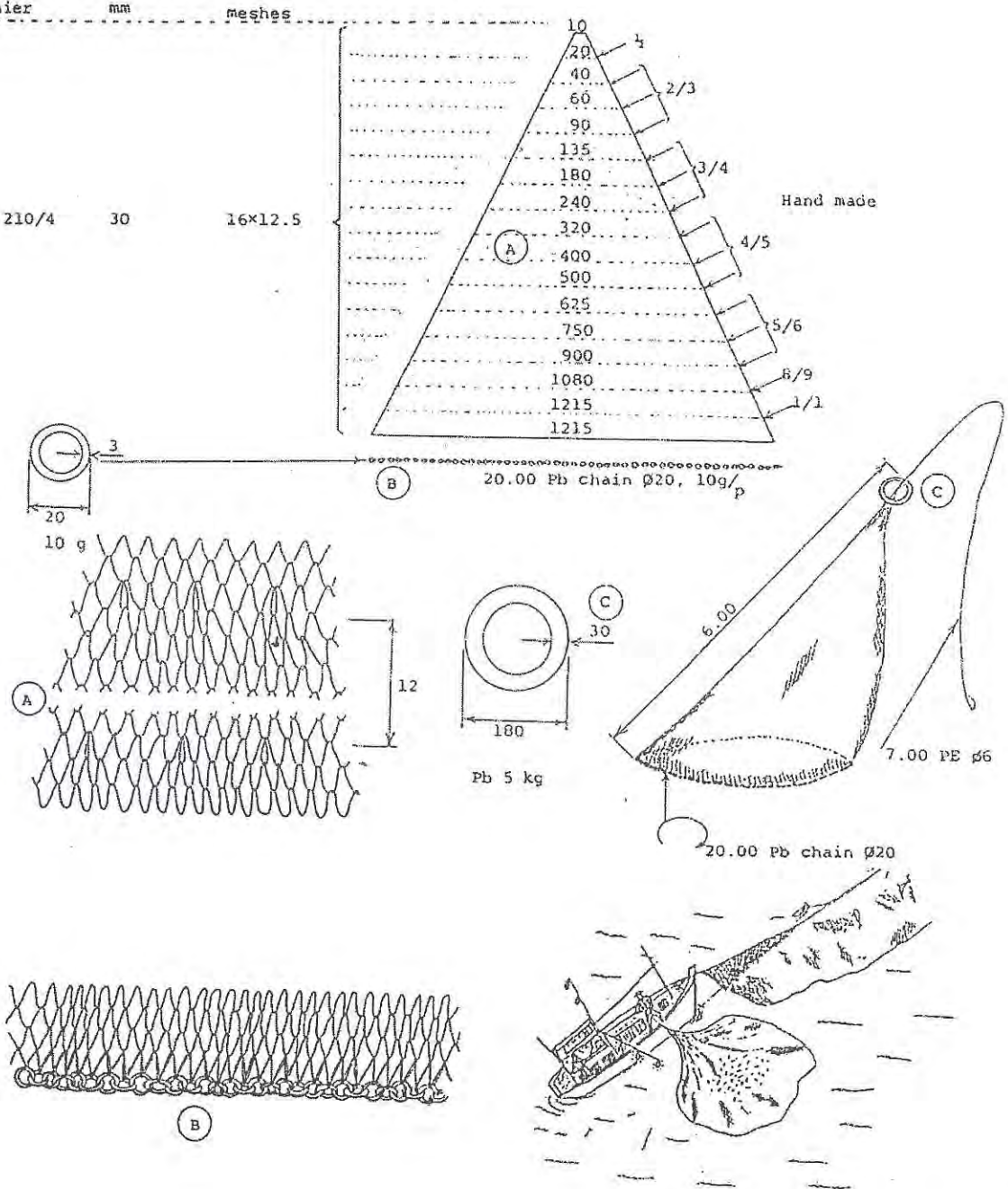
Loa 6 m
hp 8
EG 3 KVA dynamo
LL 5×500 watt

LOCATION

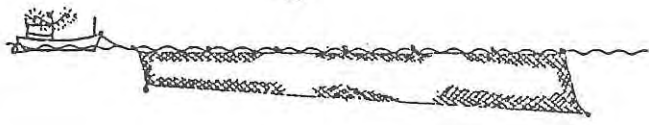
Pranburi
Prachuap Khiri Khan

MAT

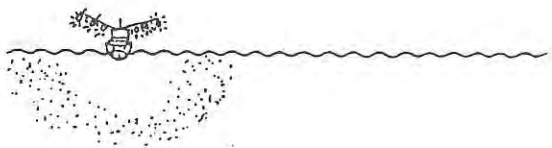
Denier	mm	meshes
PA 210/4	30	16×12.5



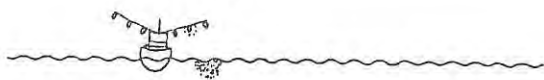
1



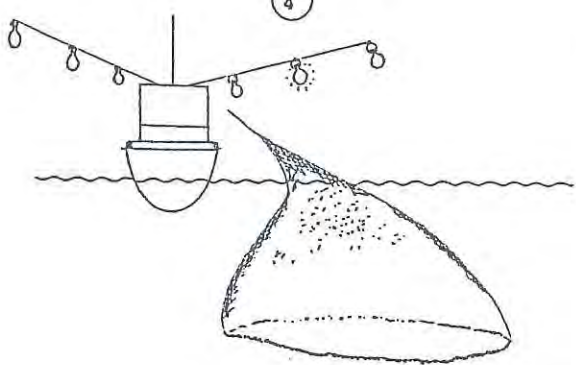
2



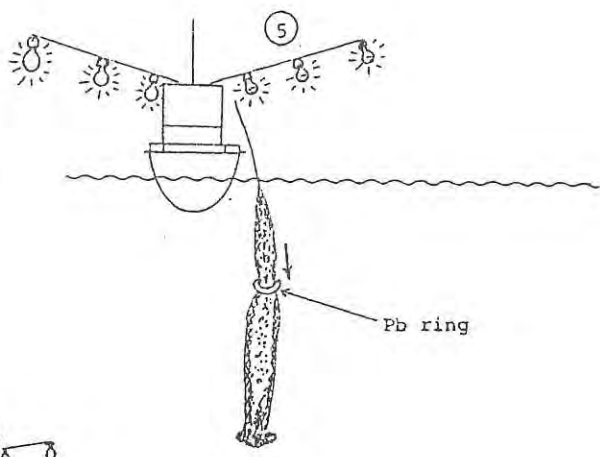
3



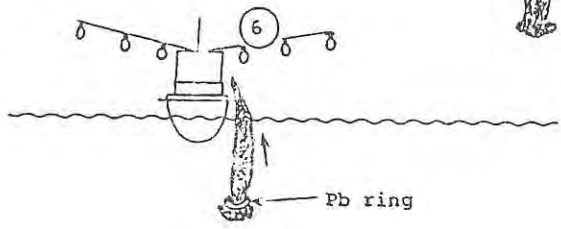
4



5



6



CAST NET

VESSEL

LOCATION

Squid cast net

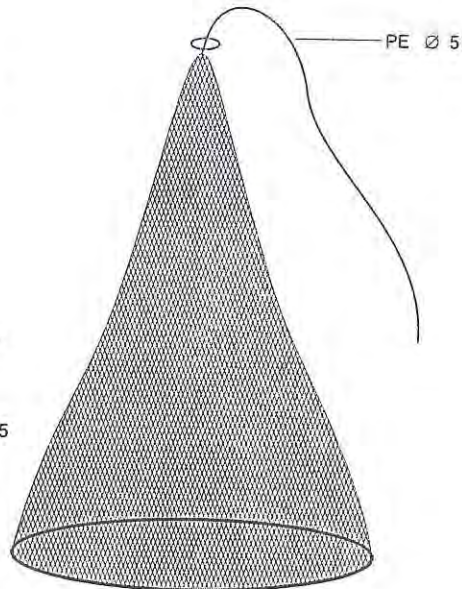
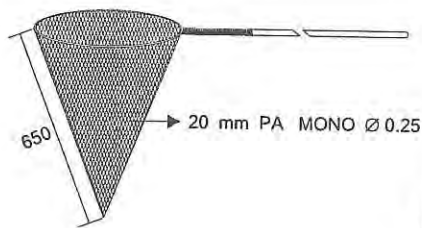
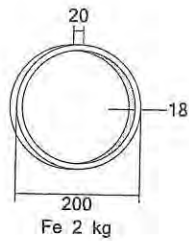
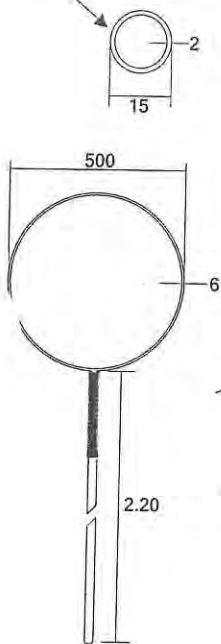
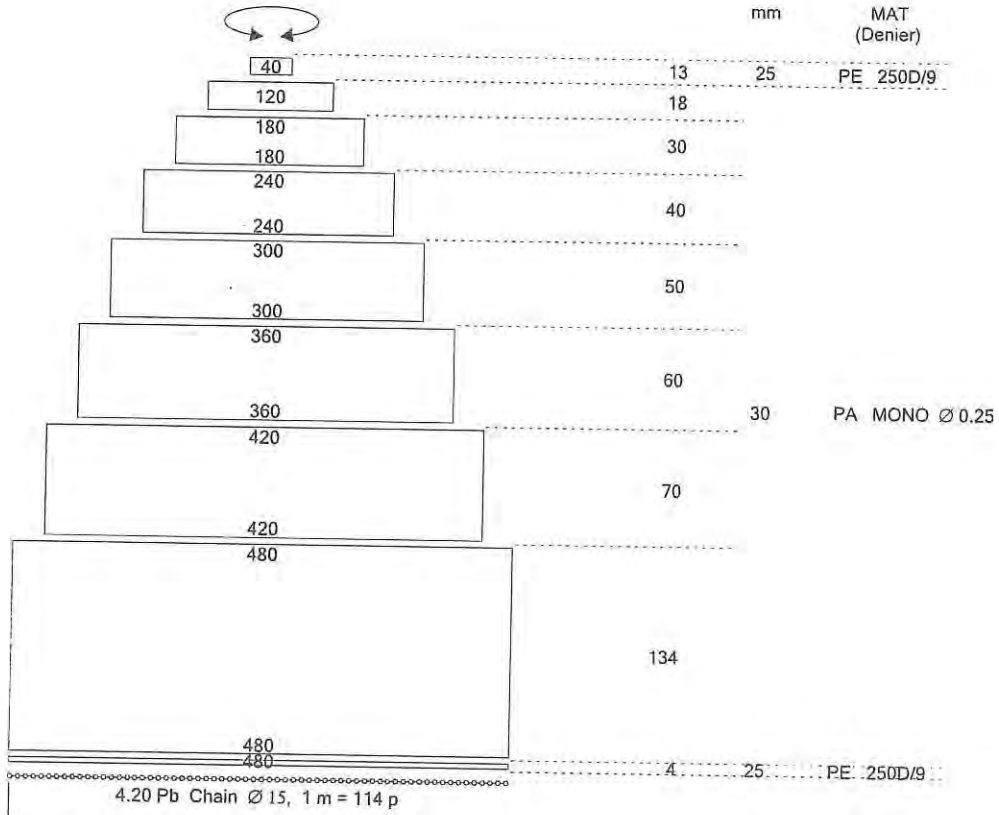
Loa 7 m

Hua Hin

Squid

hp 80 - 90 LT

Prachuap Khiri Khen

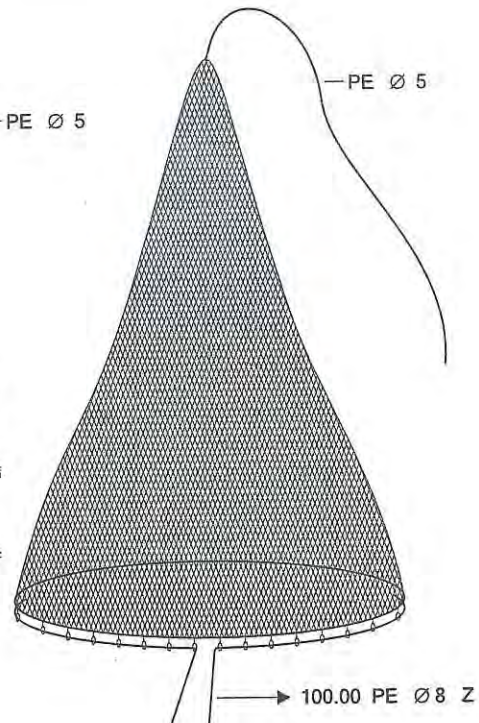
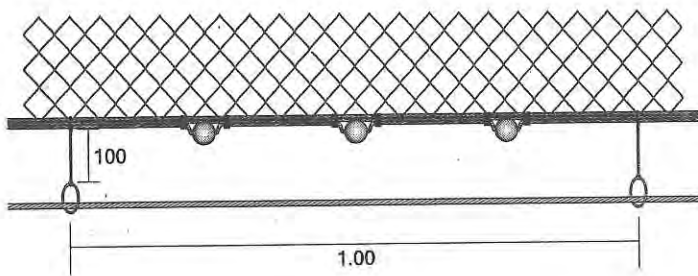
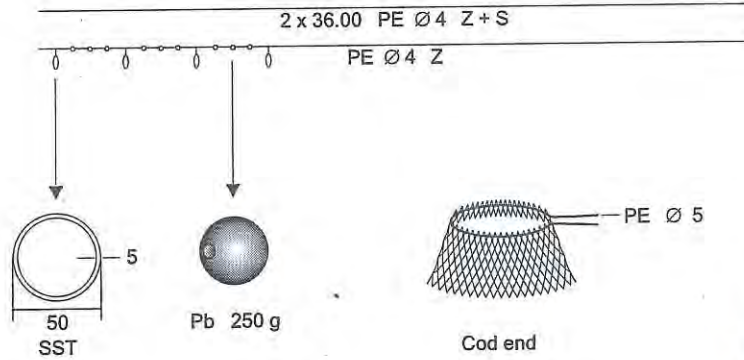
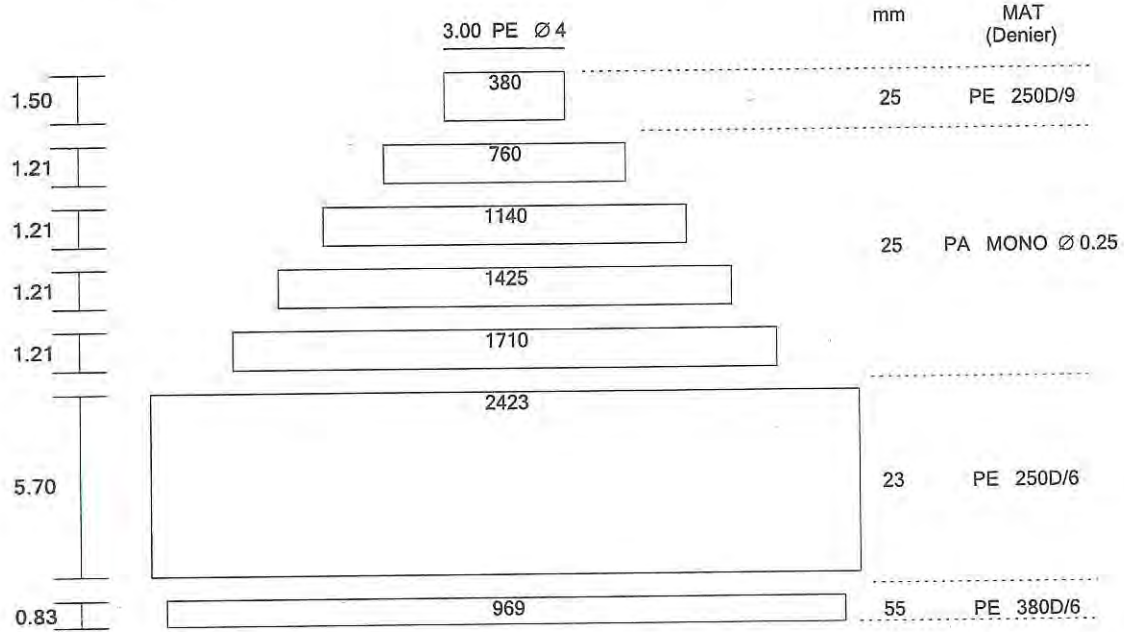


Rv. 2002

CAST NET
Squid cast net
Squid

VESSEL
Loa 7 m
hp 7.5

LOCATION
Patew
Chumphon



Rv. 2002

CASTNET

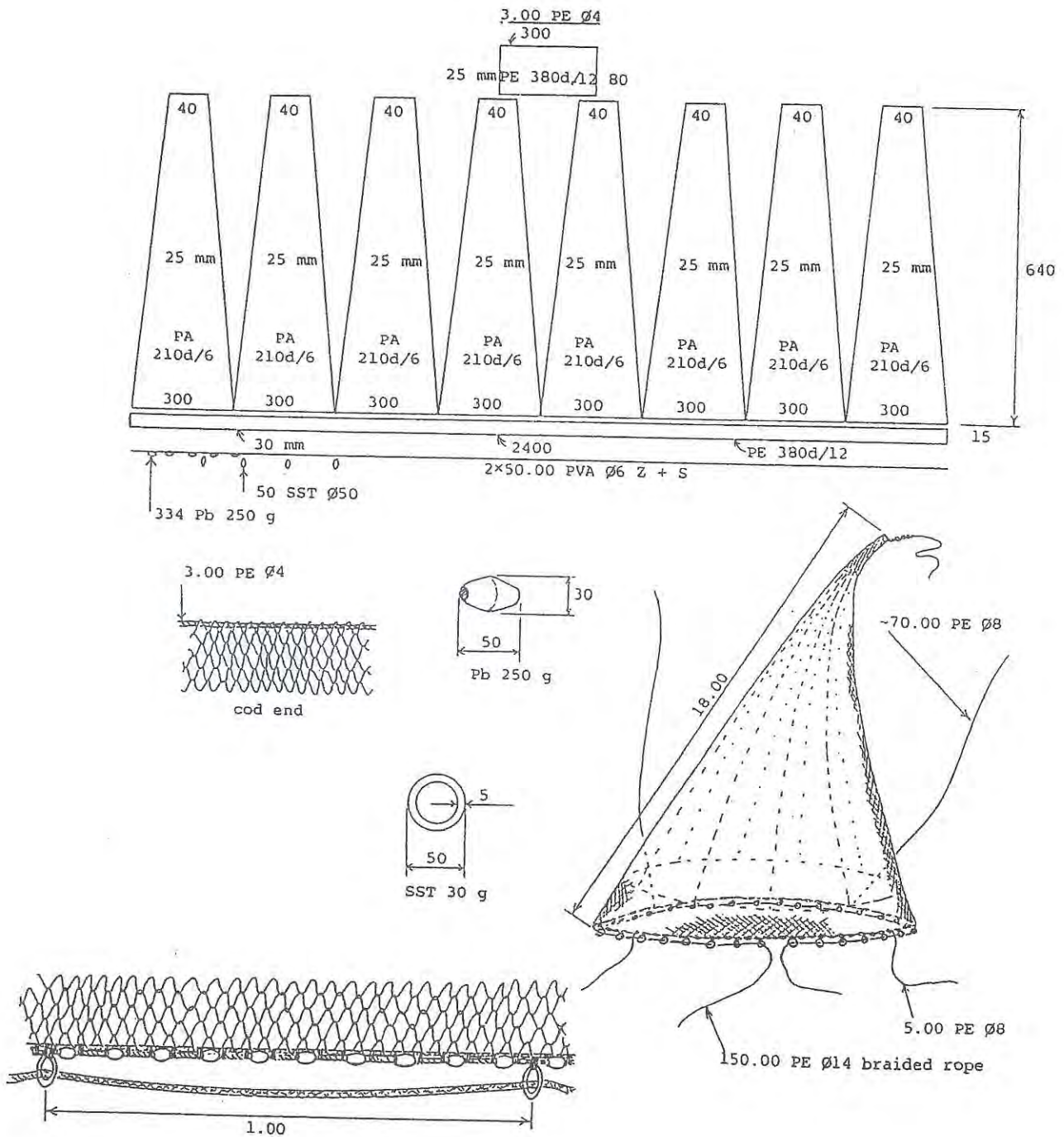
Stick held castnet
Hae Yak
Squid

VESSEL

Loa 17 m
hp 180
EG 2x10 KVA dynamo
LL 38x500 W

LOCATION

Thanun
Phangnga



CASTNET

Stick held castnet
Hae yak

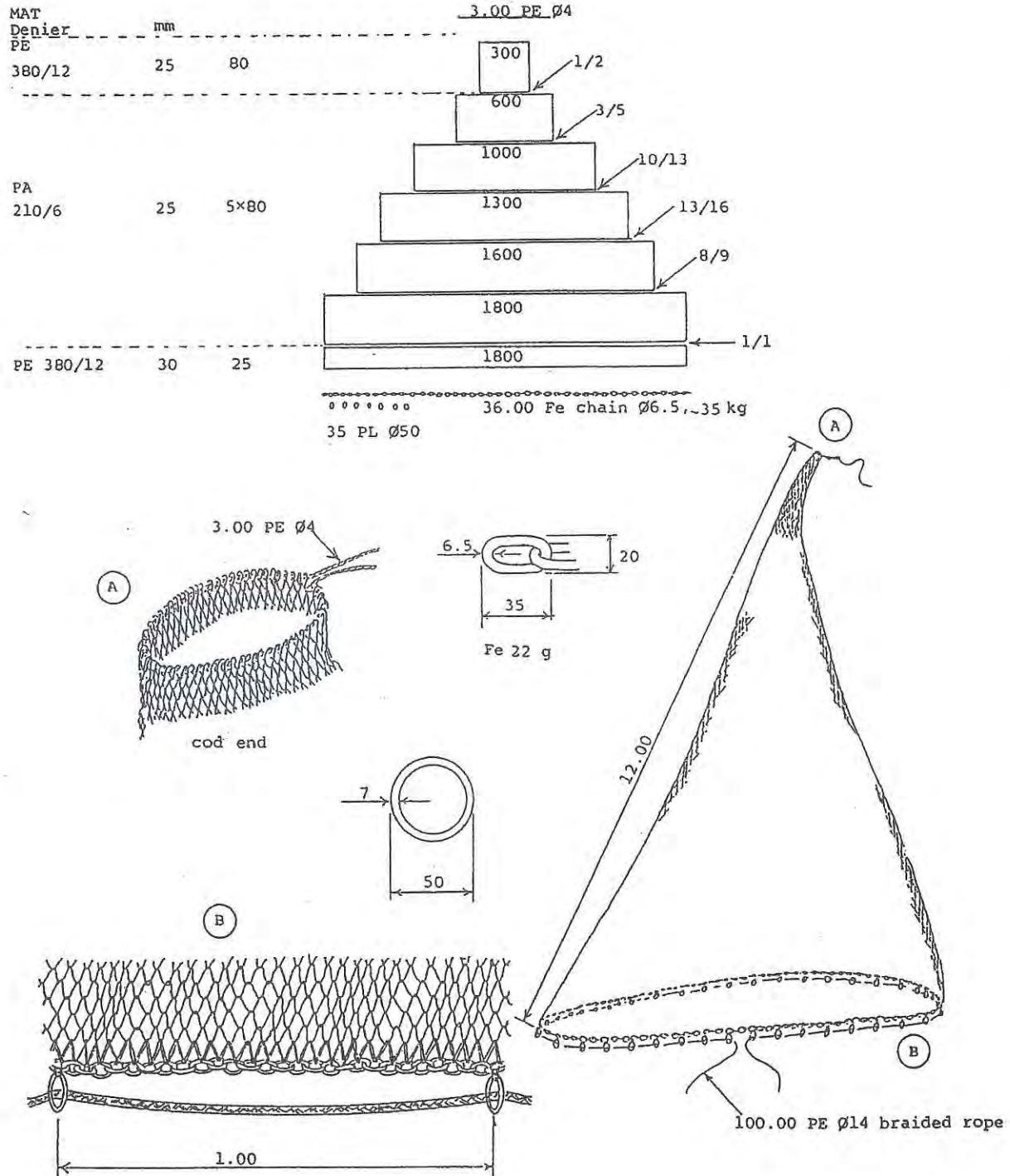
Squid

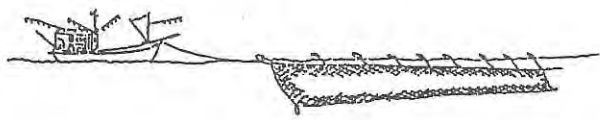
VESSEL

Loa 14 m
hp 60
EG 2x10 KVA dynamo
LL 18x500 watt

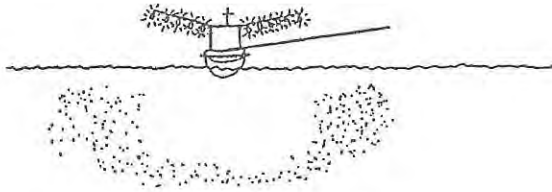
LOCATION

Prachuap
Prachuap Khiri Khan



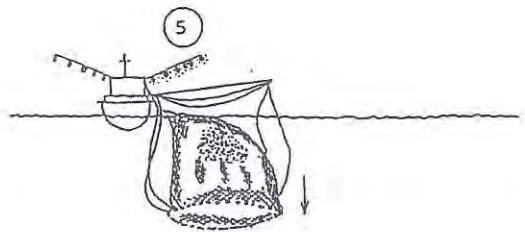
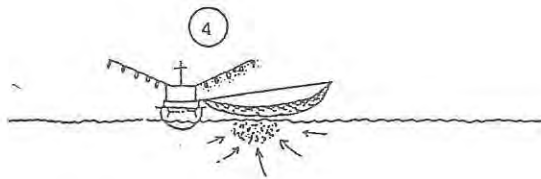
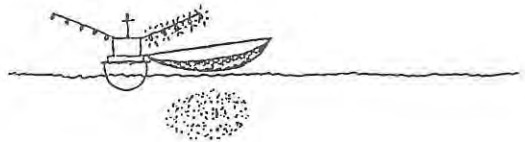
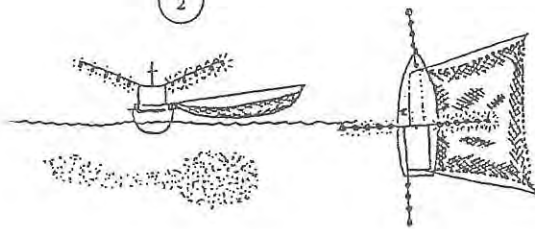


1



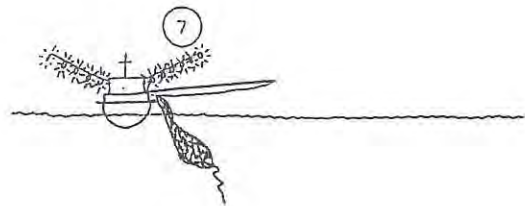
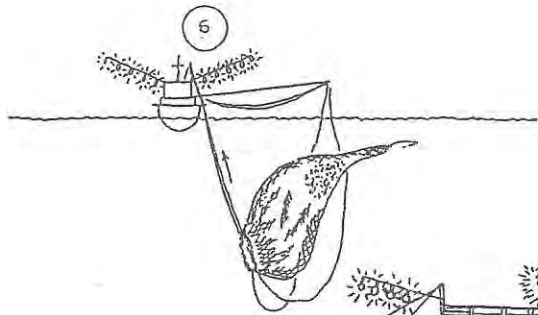
2

3



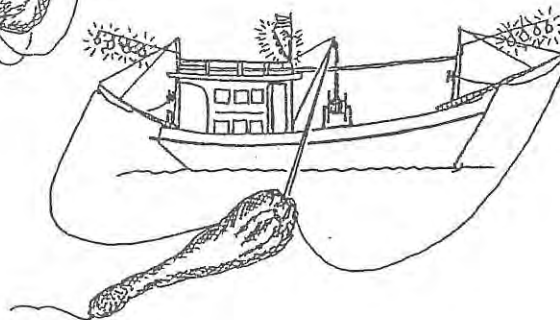
4

5



6

7



CASTNET

Stick held boxnet

Mung

Squid

VESSEL

Loa 16 m

hp 130

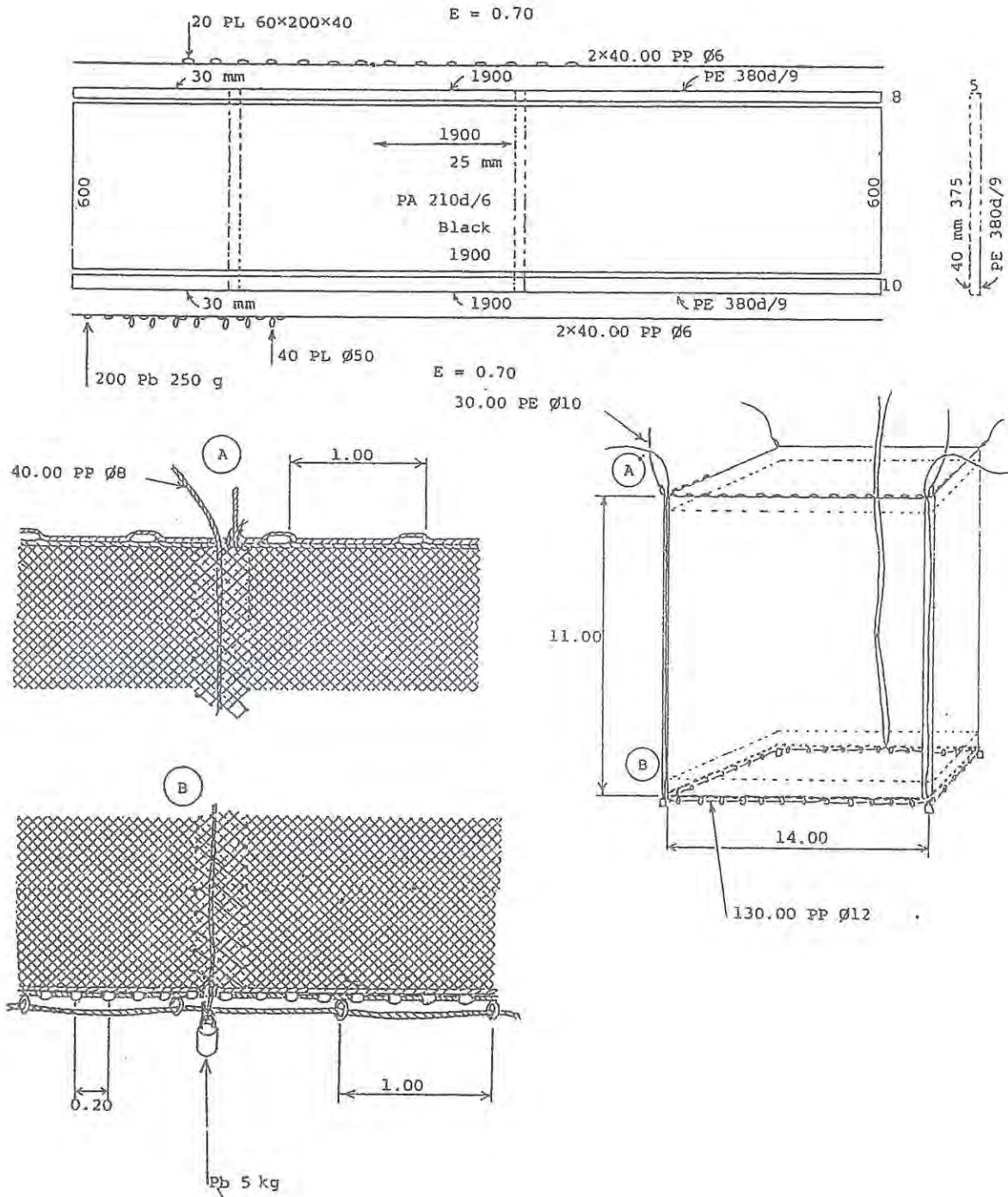
EG 2x5 KVA dynamo

LL 18x500 Watt, 500 red lamp

LOCATION

Ban Nang-Yon

Ranong



CASTNET

Stick held boxnet

Mung

Squid

VESSEL

Loa 14 m

hp 90

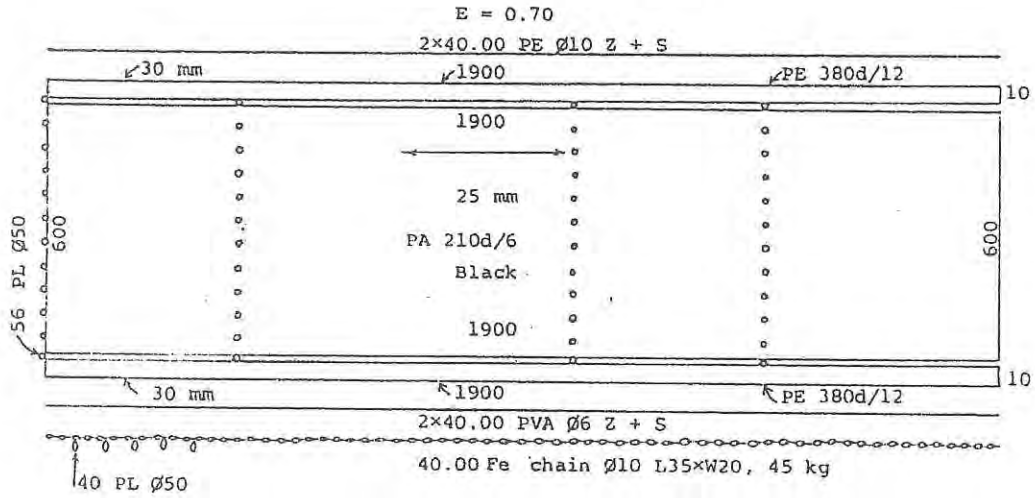
EG 2x6 KVA dynamo

LL 22x500 watt white
1x500 watt red

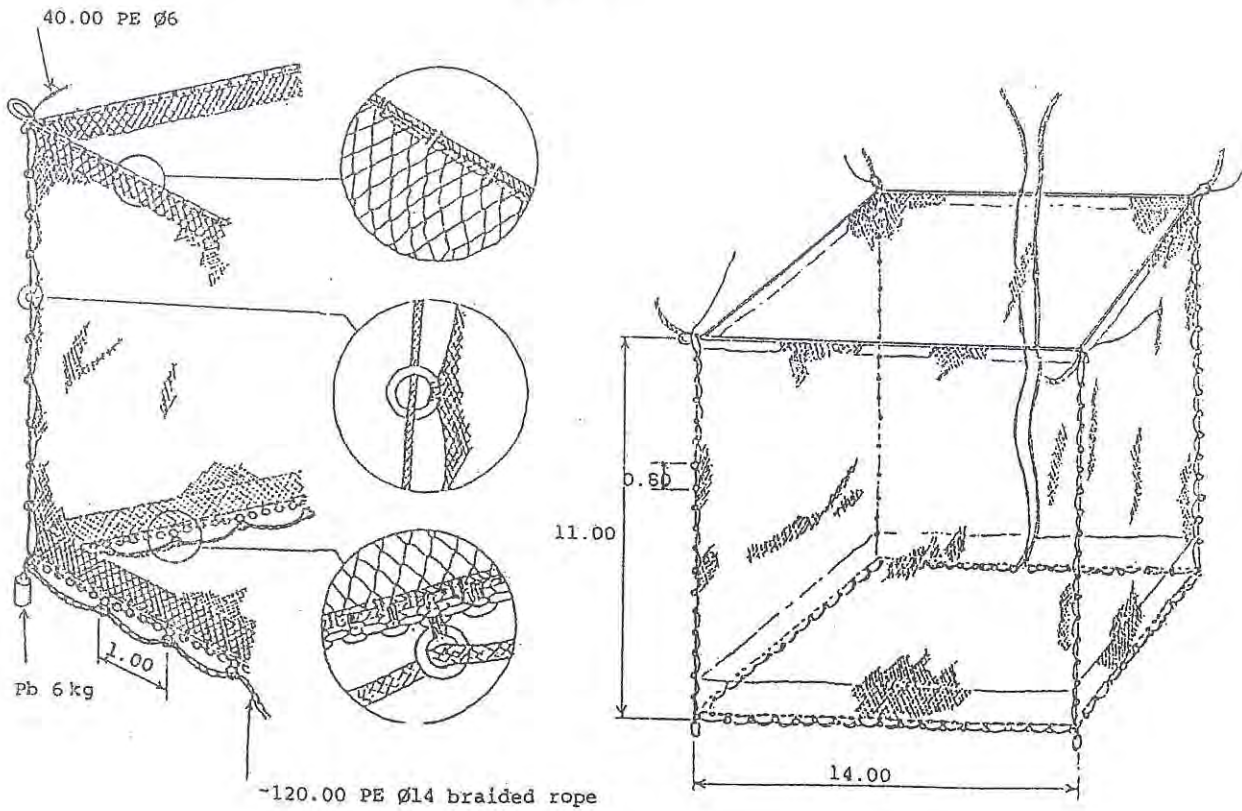
LOCATION

Banphe

Rayong

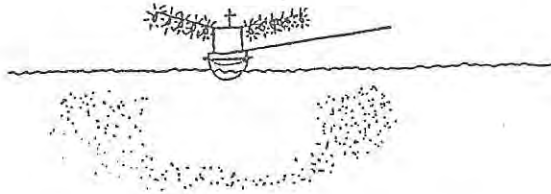


E = 0.70

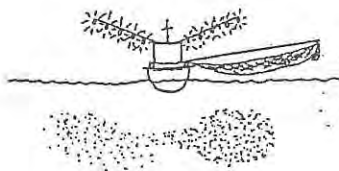




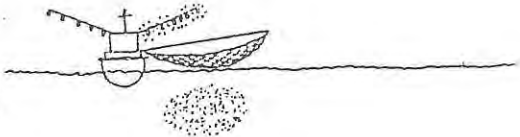
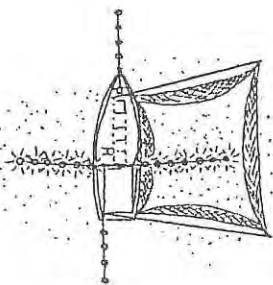
1



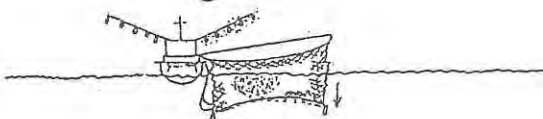
2



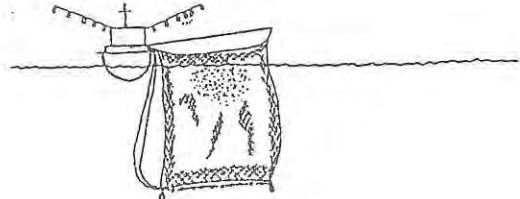
3



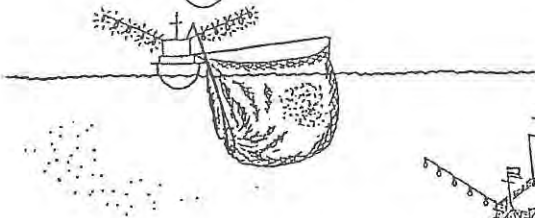
4



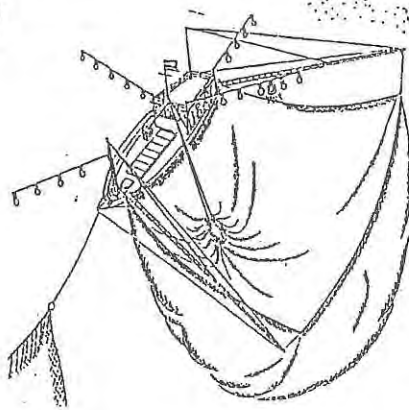
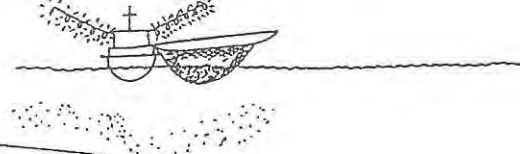
5



6



7



6. GILLNETS

Yuttana Theparoonrat

**Revised by
Pratakphol Prajakjit**

CONTENTS

	Page
Gill net fishing	223
Fishing gear and methods	224
6.1 Surface gill net	
6.2 Drift net	
6.3 Bottom gill net	
6.4 Trammel-net	
6.5 Encircling gill net	
Designs and specifications	226
Surface gill net	226
□ Mullet	
□ Fourfinger threadfin	
□ Sardine	
Drift net	231
□ Mullet	
□ Indo-Pacific mackerel	
□ Sardine	
□ False trevally	
□ Black pomfret	
□ Fourfinger threadfin, Spanish mackerel	
□ Spanish mackerel	
□ Pelagic fishes	
Bottom gill net	249
□ Mangrove crab	
□ Blue swimming crab	
□ Whiting	
□ Spiny lobster	
□ Red snapper	
□ Seabass	
□ Cavalla	
□ False trevally	
□ Fourfinger threadfin	
□ Giant queenfish, scad, trevally	
Trammel-net	278
□ Shrimp	
□ Cuttlefish	
Encircling gill net	287
□ Mullet	
□ Indo-Pacific mackerel	
□ Fourfinger threadfin	

GILL NET FISHING

Various types of gill nets, such as surface gill net, bottom gill net, drift gill net and encircling gill net, are operated both in Thai coastal waters and offshore. Some of them are operated on a large scale, for example spanish mackerel gill net and mackerel encircling gill net, whereas gill nets for pomfret, shrimps, swimming-crab, and mullet are small-scale fishing gears.

According to the fisher statistics from 1990 to 1997, the overall annual catches by gill nets decreased slightly after 1995.

Table 6.1 Annual catch by gill nets, 1990-1997

Type of gill net	1990	1991	1992	1993	1994	1995	1996	1997
Spanish mackerel	17,317	14,935	21,985	19,377	15,225	21,401	17,544	15,934
Mackerel encircling	17,207	14,413	12,828	10,663	18,323	18,554	16,912	18,828
Shrimp	11,460	12,762	12,610	13,859	16,207	15,585	12,769	12,900
Others	60,178	55,592	62,313	62,396	61,131	63,253	56,791	56,910
Total	106,162	97,702	109,736	106,295	110,886	118,793	104,016	104,572

The mackerel encircling gill net also sustained a relatively high annual production. The major species caught by this gear is Indo-Pacific mackerel, a very popular fish known as *pla-too* in Thailand. The catch of Indo-Pacific mackerel was particularly high in 1994, 1995 and 1997.

Pomfret is a very high value fish, but the annual catch by pomfret gill-net is comparatively low.

The annual production by shrimp gill nets increased from 1990 to 1994 then decreased slightly until 1997. Shrimp gill-net fishing has played an important role in spite of low production, because the captured shrimps have a high export value.

The proportion of catch by other gill nets is rather high. Among these gears the most noteworthy is swimming crab gill net, which is usually operated by small boats, but has a comparatively high production.

The main species caught by various gill nets in 1997 were as follows:

<u>Spanish mackerel gill net</u>	<u>Catch-year (mt)</u>
Longtail Tuna	5,737
Eastern little tuna	4,089
Narrow-barred king mackerel (Spanish mackerel)	4,578
Others	1,530
<hr/>	
Total	15,934

<u>Mackerel encircling gill net</u>	<u>Catch/year (mt)</u>
Indo-Pacific mackerel	12,537
Eastern little tuna	1,091
Others	5,200
<hr/>	
Total	18,828

<u>Shrimp gill net</u>	<u>Catch/year (mt)</u>
Tiger prawns	70
Other shrimps	10,283
Swimming-crab	412
Others	2,169
<hr/>	
Total	12,934

<u>Other gill nets</u>	<u>Catch/year (mt)</u>
Swimming-crab	23,558
Indo-Pacific mackerel	8,225
Mullet	4,613
Indian mackerel	1,818
Sardine	1,175
Others	17,521
<hr/>	
Total	56,910

FISHING GEAR AND METHODS

6.1 Surface gill net

This gill net is operated on a small scale, mostly in very shallow waters and inlets. The net is fixed with anchors or bamboo poles. The netting is made of either nylon monofilament or nylon multifilament. The mesh size ranges from 4.0 to 8.5 cm, and the height of net from 0.9 for mullet are spread suspended on the water surface and with bamboo stakes and have neither floats nor sinkers.

6.2 Drift gill net

There are various kinds of drift gill nets. Nylon multifilament is most often used as the netting material, but the yarn size varies from 210 d/4 to 210 d/18. Green colour nets are commonly used. Some drift gill nets, especially those for Spanish mackerel and pomfret, have a width of saran nylon netting attached along the bottom edge. This acts as a sinker because the specific gravity of saran nylon yarn is greater than that of nylon multifilament.

The drift gill net for Spanish mackerel is operated on a large scale. Netting yarns vary from 210 d/9 to 210 d/18, the size of mesh is around 6-10 cm, and the height of net ranges from 4.5 to 12 meters.

6.3 Bottom gill net

Nylon monofilament and nylon multifilament are the main materials for the netting of most bottom gill nets. The specifications such as the mesh-size, the length and height of net, and the hanging ratio, vary for different species of marine animals. In the case of bottom gill net for blue swimming crab which is most widely operated, the mesh-size is about 10-12 cm, height of net is about 120 cm and the hanging ratio is around 0.5. The bottom gill net for whiting is comparatively smaller than other bottom gill nets; its mesh-size is about 2.5-3.0 cm, height of net is 65-120 cm, and the hanging ratio ranges from 0.52 to 0.68. In contrast, the bottom gill net for giant queenfish, scad and trevally, has large dimensions; the mesh-size is 9.0-9.5 cm, and height is about 8 m, so that sometimes when it is operated in shallow waters it intercepts anything swimming between the bottom and the surface of the sea. Bottom gill nets are operated in shallow coastal waters where the depth ranges between 3 and 40 meters.

6.4 Trammel-net

Trammel-nets are commonly operated to catch shrimps. The netting for trammel-nets is in most cases made of nylon multifilament; the yarn size for the inner net is 210 d/2 whereas for the outer net it is 210 d/4. There are some local variations in the construction of gear; the size of mesh for the inner net is usually 4 cm, but for the outer net it ranges from 14 to 26 cm. The hanging ratio of inner net does not vary much; it is about 0.46-0.48 on the float lines, and 0.55-0.57 on the sinker line. There is, however, a considerable difference in hanging ratios of the outer net: we came across nets with a high hanging ration such as 0.79, and others with a low hanging ratio of only 0.37

Fishing operation is carried out in either day or night-time, the net is shot across the tide, and allowed to drift by the tide for one hour before hauling. The water depth of fishing grounds is between 5 and 20 meters. (Trammel-net for cuttlefish is set along the coast for 12 hour in the day-time).

6.5 Encircling gill net

The encircling gill-net for Indo-Pacific mackerel is a widely operated gear. The netting for this gear is mostly nylon multifilament, made of yarns between 210 d/9 and 210 d/12. The size of mesh is about 4-4.5 cm, height of net ranges from 7 to 19 m. When encircling gill net is used for mullet, it is smaller than the gear used for Indo-Pacific mackerel, material is nylon monofilament.

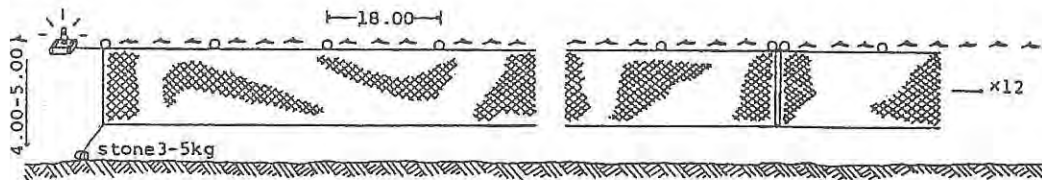
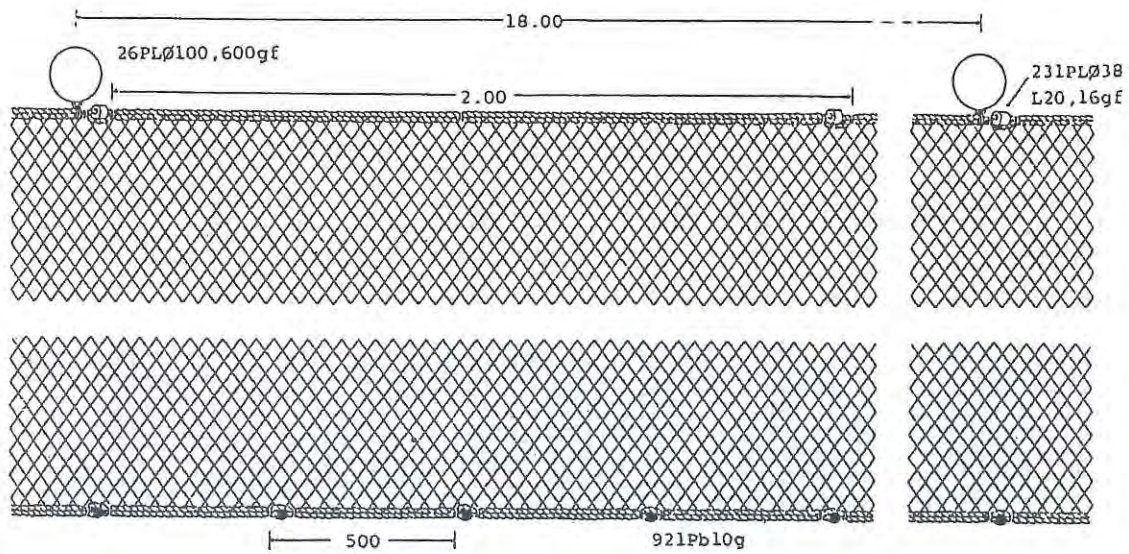
The encircling gill-net for Indo-Pacific mackerel can be operated in the day-time and at night. In day-time operation the fish school is first encircled by the net, after which the fishermen create commotion and noise by beating the water surface with some implement so as to frighten the fish into the meshes of the net. In night-time operation an electric lamp is used for the same purpose.

GILL NET
Surface set
Mullet

VESSEL
Loa 10 m
hp 6

LOCATION
Khuraburi
Phangnga

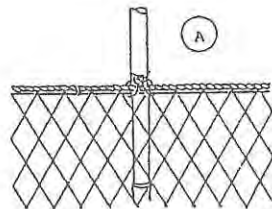
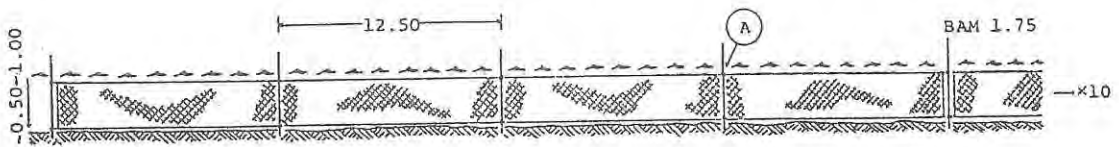
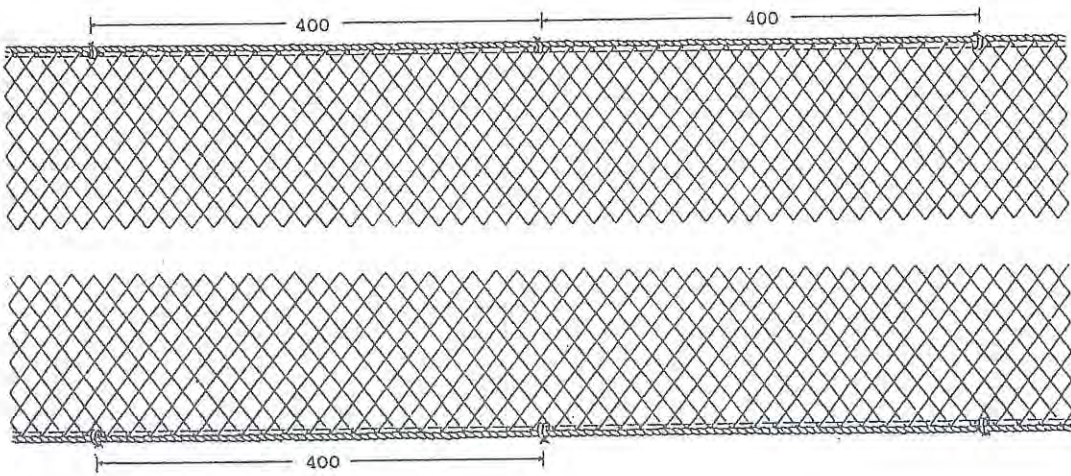
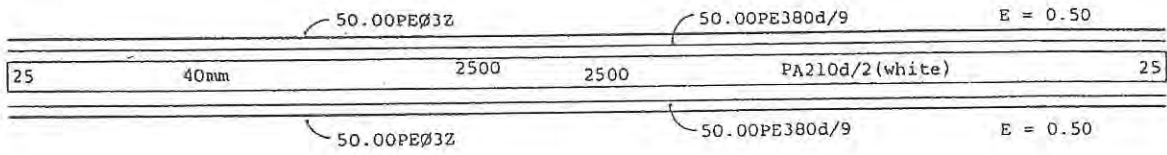
2x460.00PEØ3Z+Z				E = 0.53
50	85mm	10210	PA210d/3 (white)	50
2x460.00PEØ3Z+Z				E = 0.53



GILL NET
Surface
Mullet

VESSEL
Loa 7 m
hp 3 LT

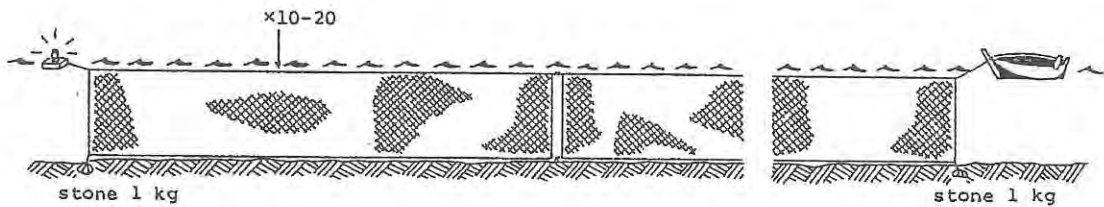
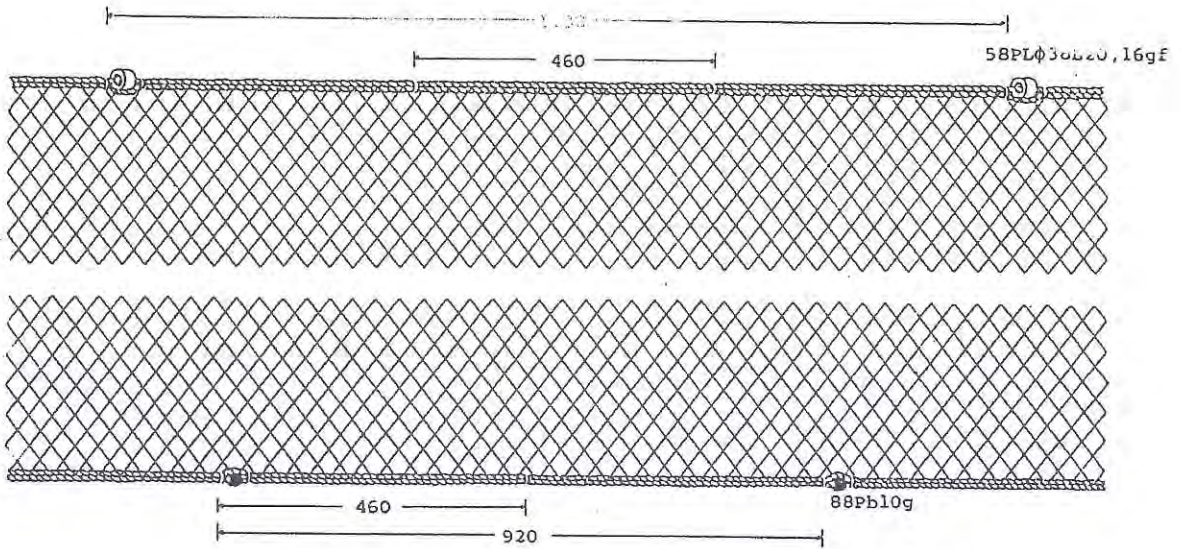
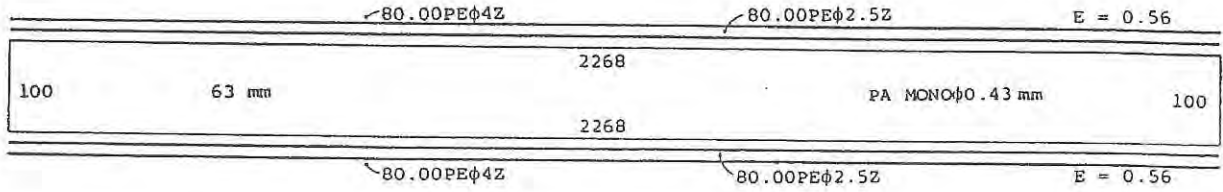
LOCATION
Thachang
Surat Thani



GILL NET
 Surface set
 Fourfinger threadfin

VESSEL
 Loa 5 m
 hp 4 LT

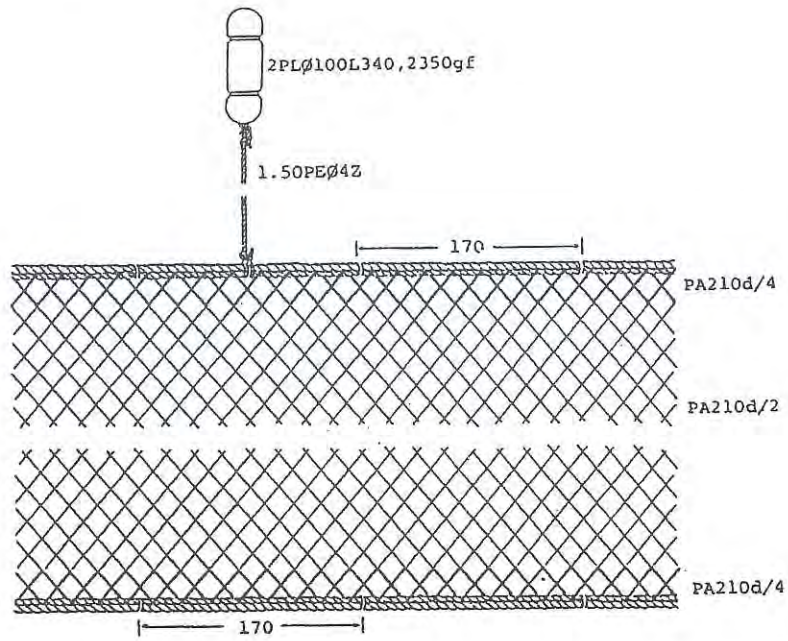
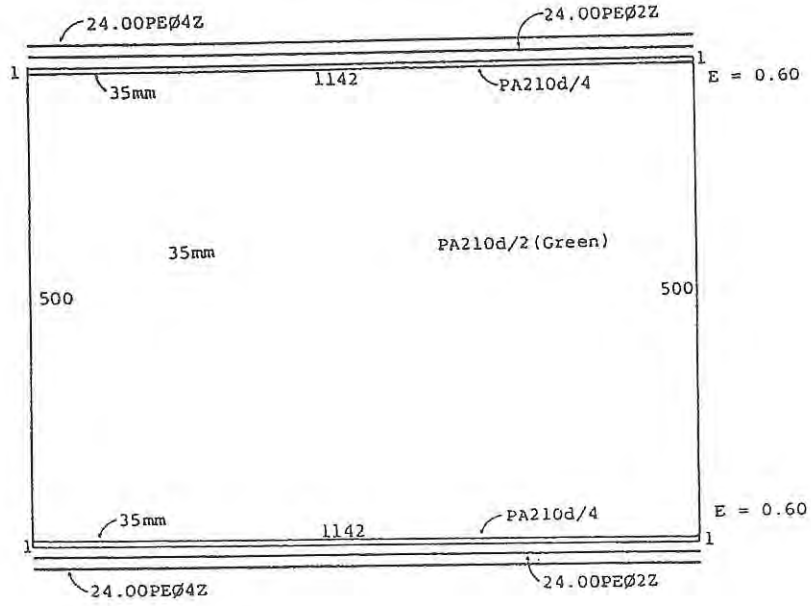
LOCATION
 Bangsaphanyai
 Prachuap Khiri Khan

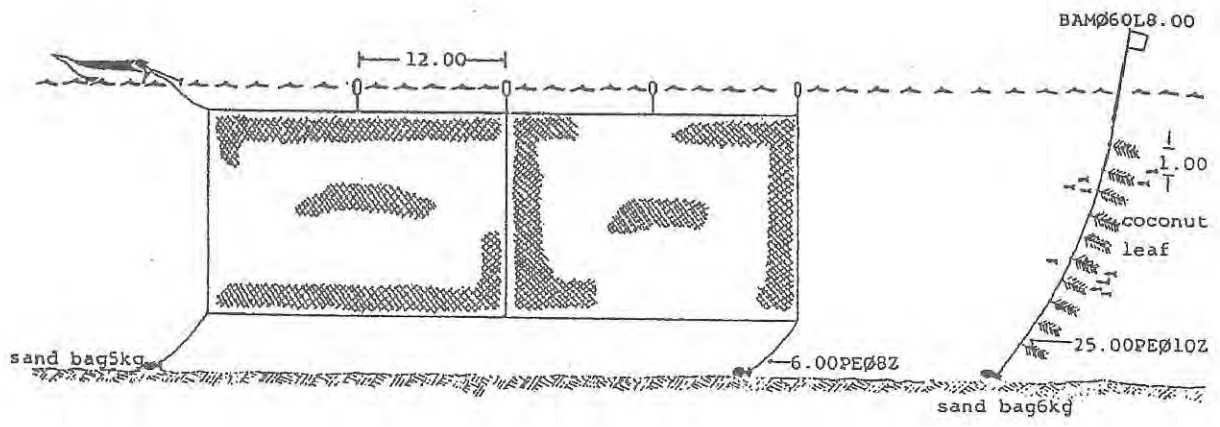


GILL NET
Surface set
Sardine

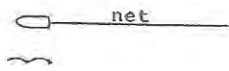
VESSEL
Loa 10 m
hp 4 LT

LOCATION
Takbai
Narathiwat





1



2



3



4



5



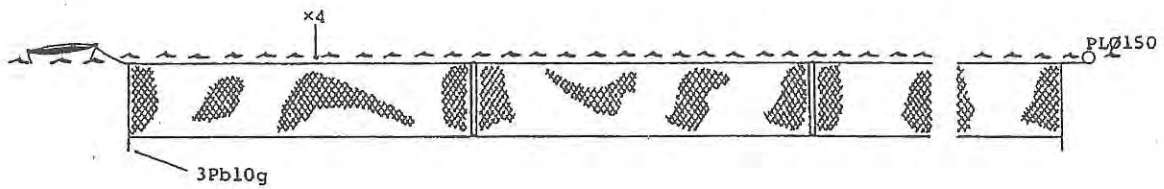
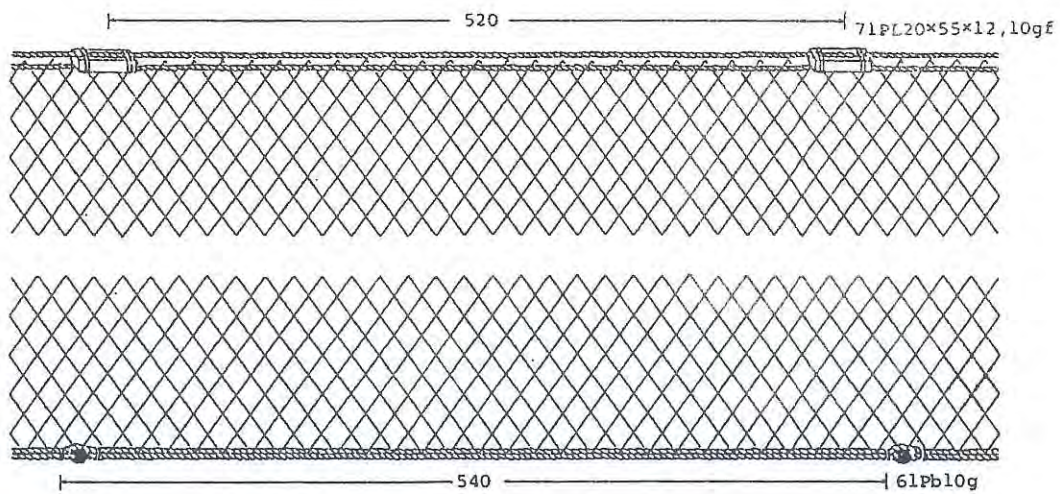
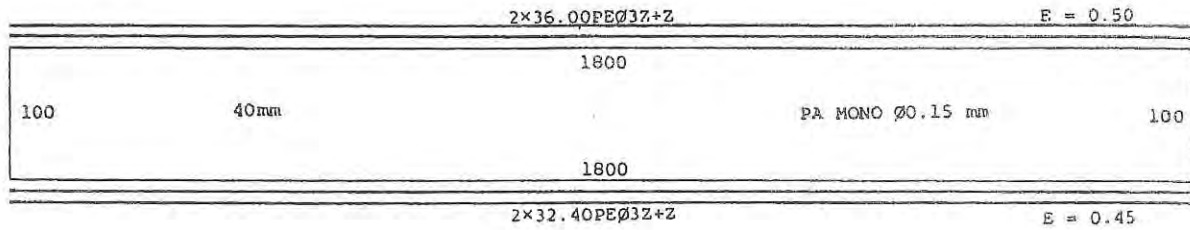
6



GILL NET
 Driftnet
 Mullet

VESSEL
 Loa 4 m
 hp -

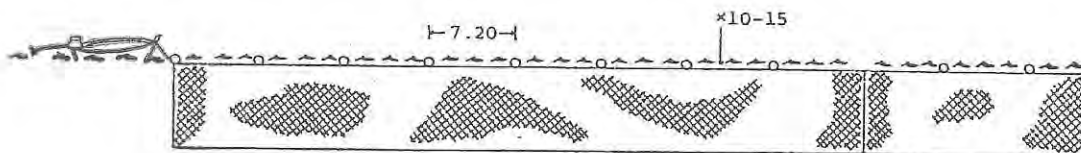
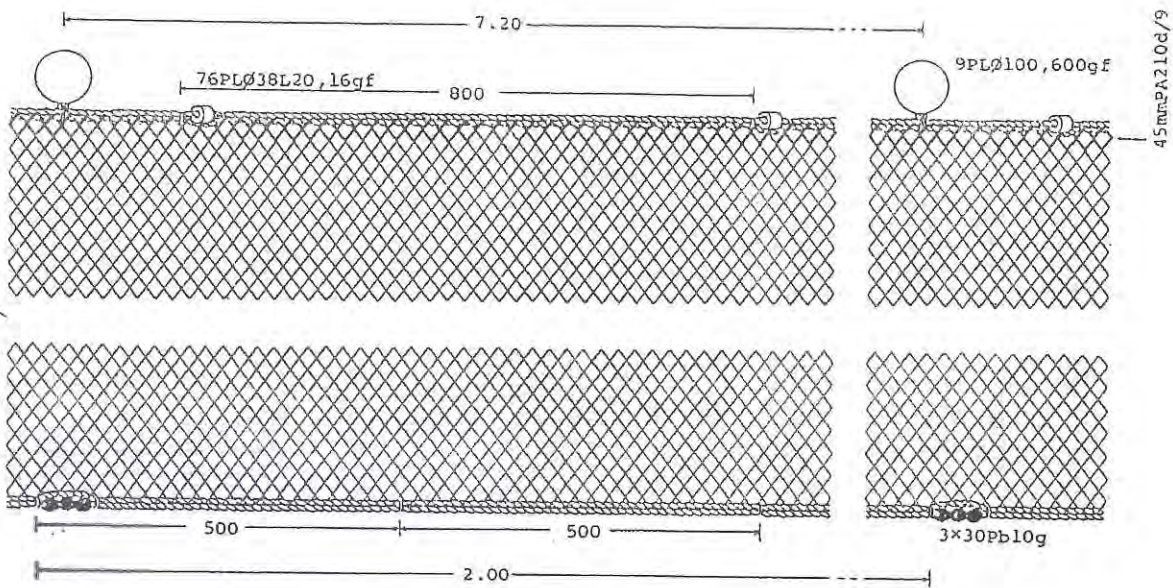
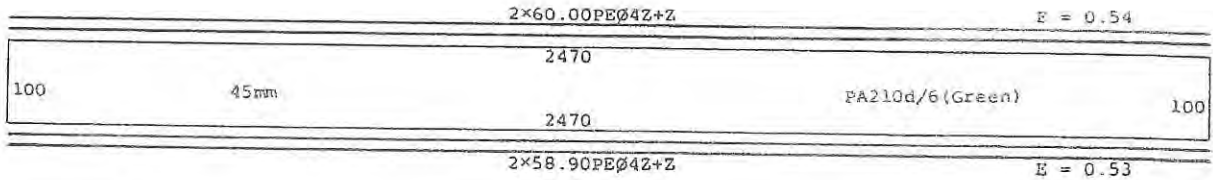
LOCATION
 Haukhaodang
 Songkhla



GILL NET
 Driftnet
 Indo-Pacific mackerel

VESSEL
 Loa 10 m
 hp 5 LT

LOCATION
 Laem Sak
 Krabi



GILL NET

VESSEL

LOCATION

Drift gill net

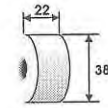
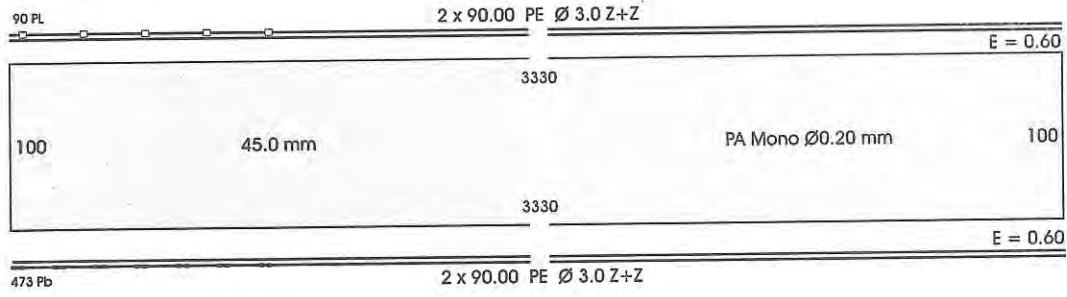
Loa 8 m

Sawee

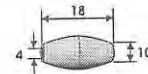
Indian mackerel,
Short-bodied mackerel

hp 13

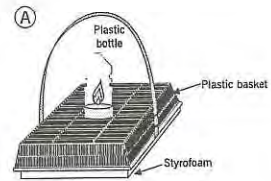
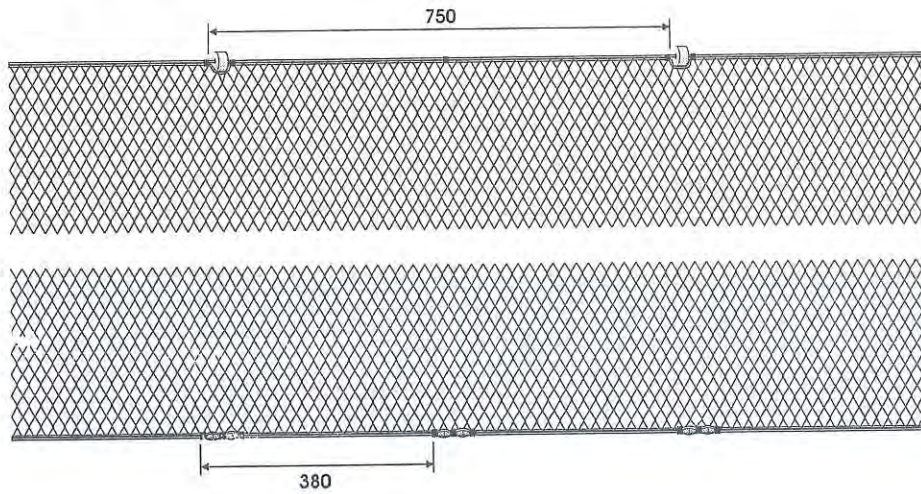
Chumporn



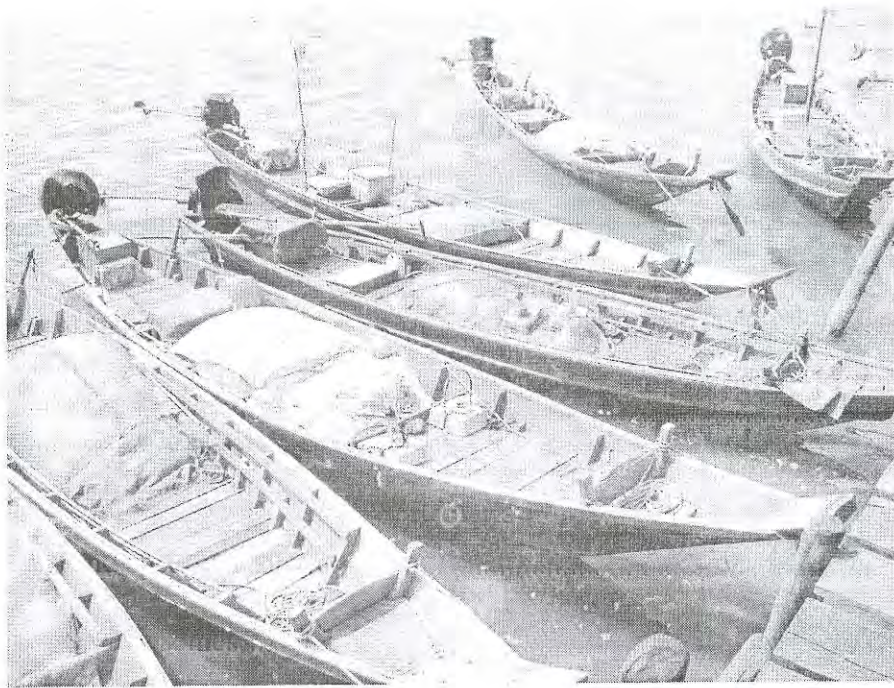
Plastic float



Pb



Rv. 2002



GILL NET

Driftnet

Sardine

VESSEL

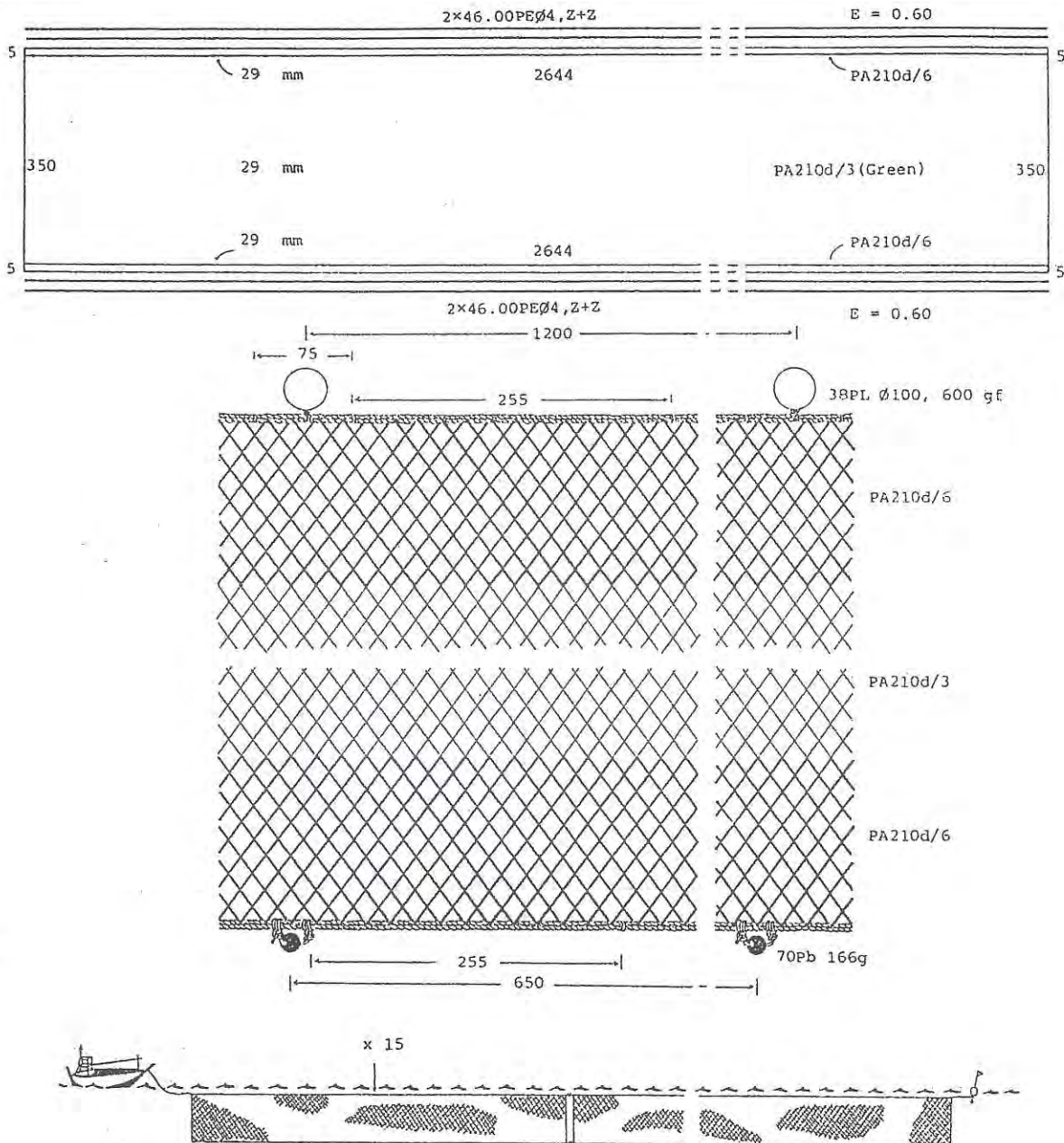
Loa 8 m

hp 4

LOCATION

Cha-am

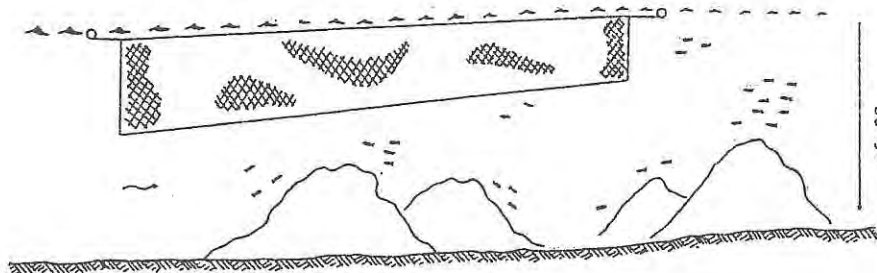
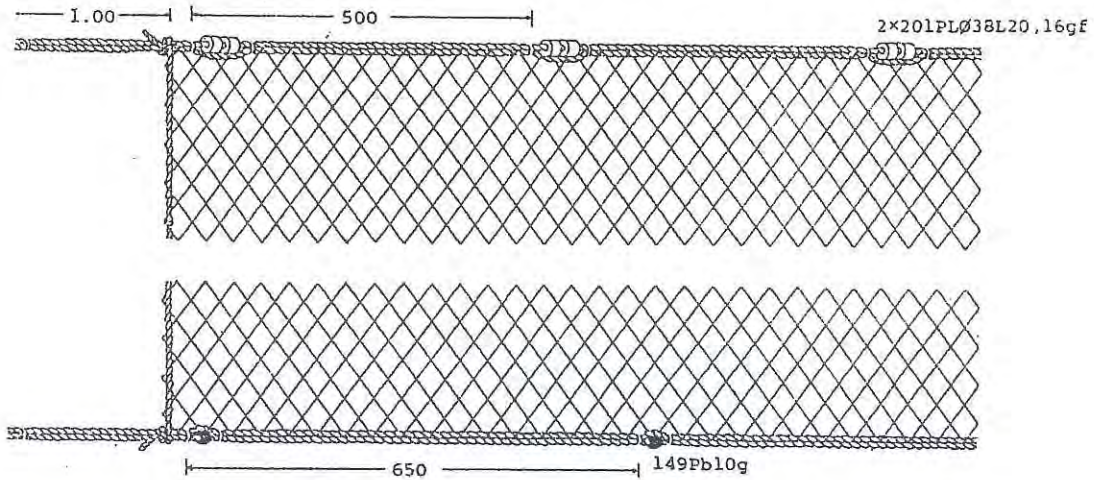
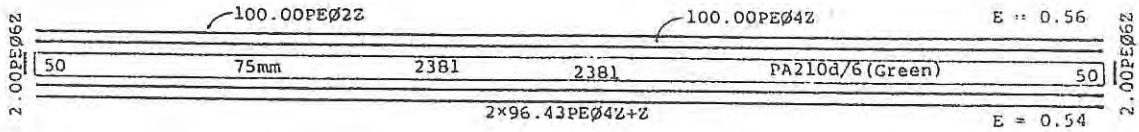
Prachuap Khiri Khan



GILL NET
 Driftnet
 Trevally, Scad, Giant queenfish,
 Mullet

VESSEL
 Loa 6 m
 hp 8

LOCATION
 Banphe
 Rayong

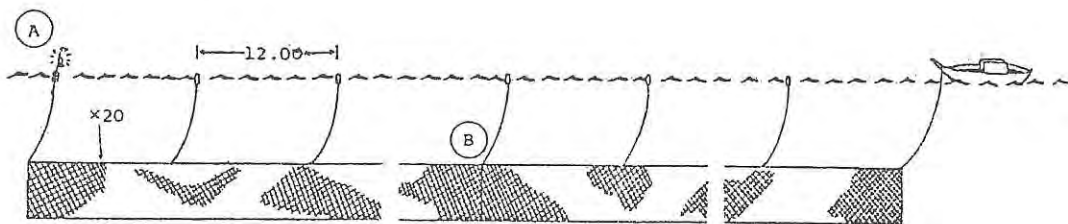
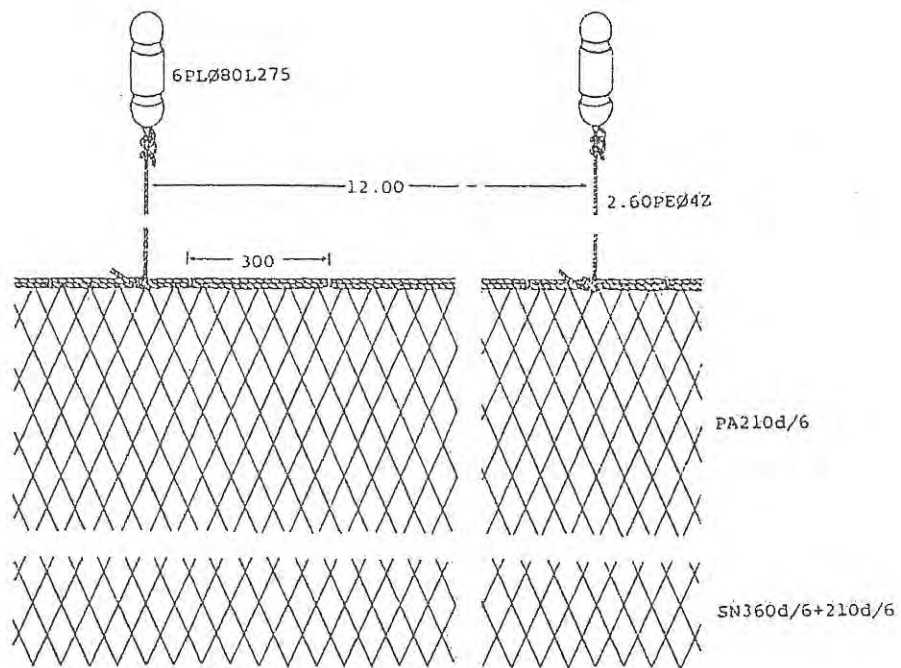


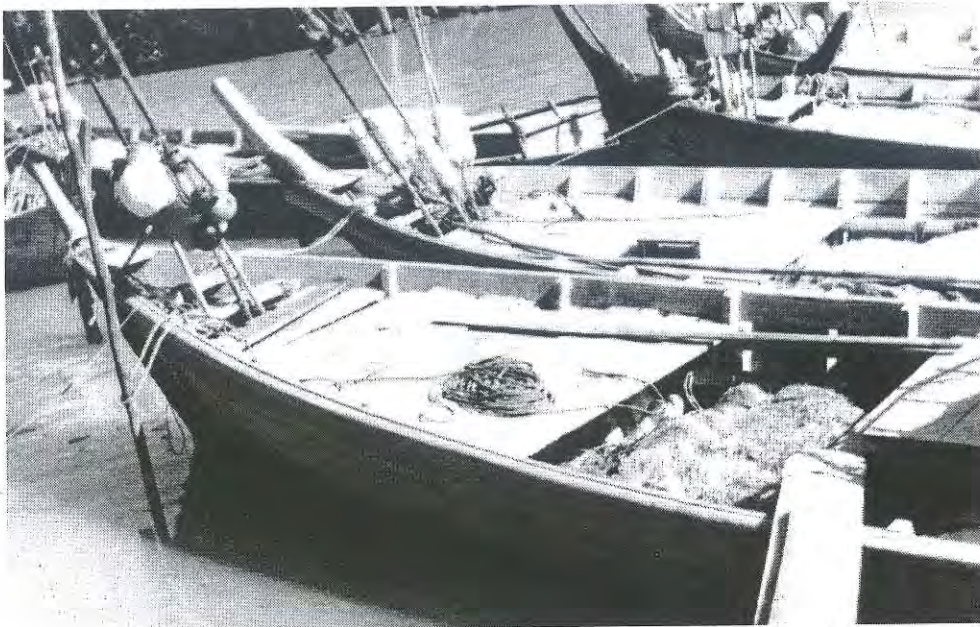
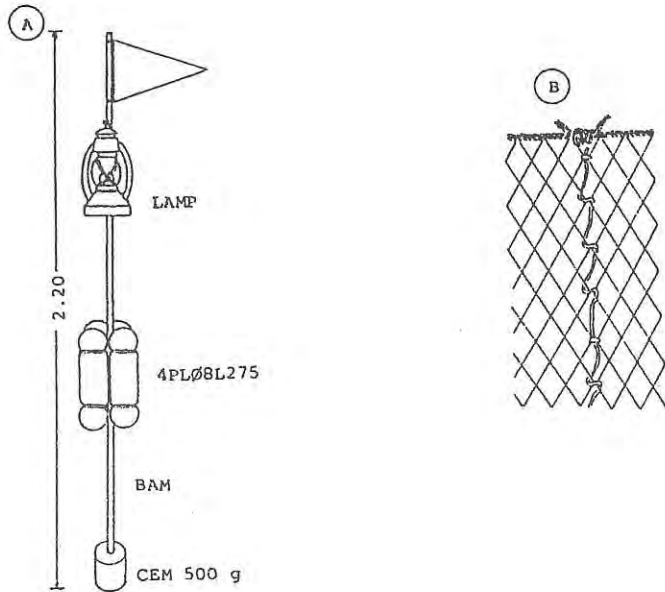
GILL NET
 Driftnet
 Black pomfret

VESSEL
 Loa 8 m
 hp 4

LOCATION
 Sapun
 Phuket

		2x86.00PEØ4Z+Z	E = 0.44	
1433				
90	135mm		PA210d/6 (Green)	90
1433				
10	135mm	1433	SN360d/6+210d/6	10

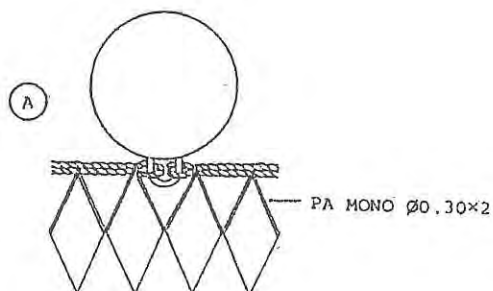
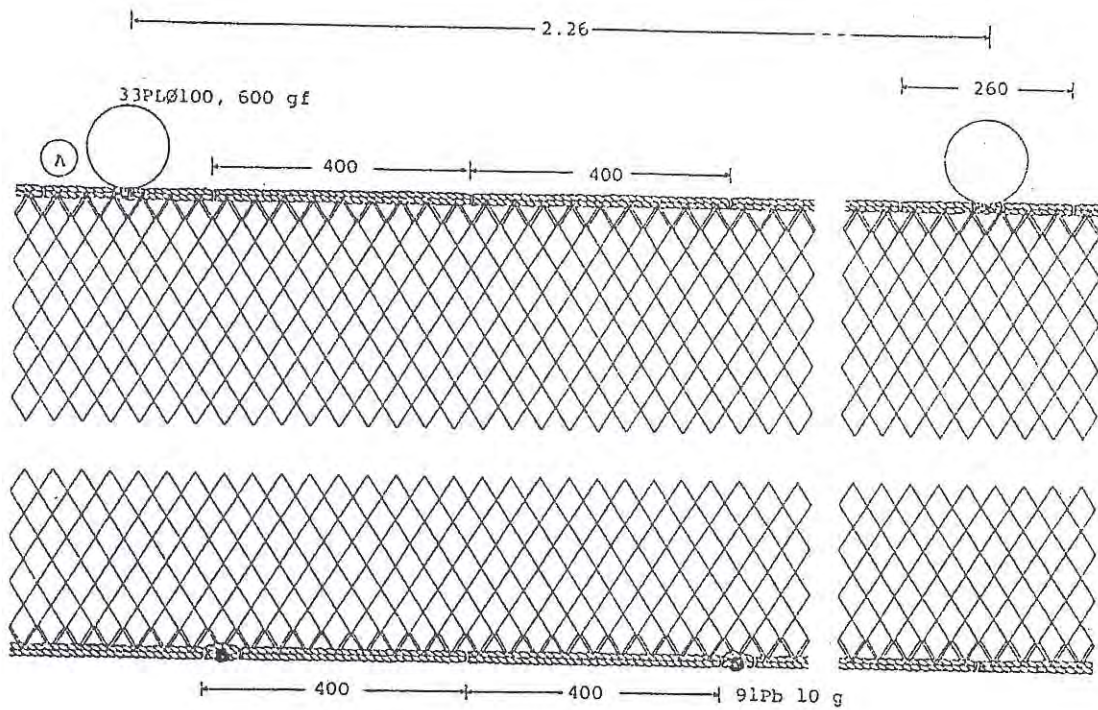
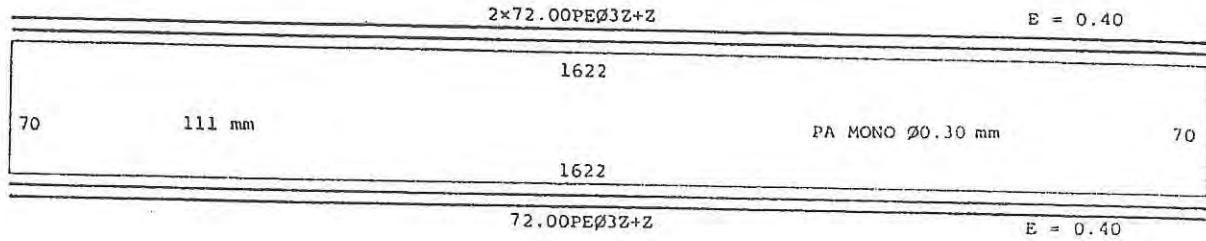


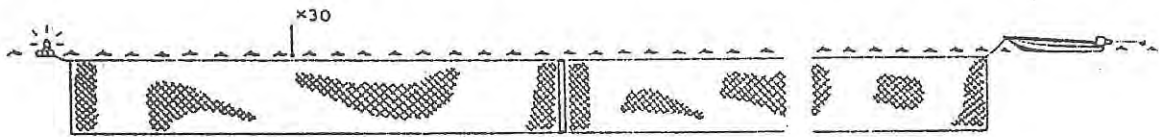


GILL NET
 Driftnet
 Pomfret

VESSEL
 Loa 6 m
 hp 50 LT

LOCATION
 Donsak
 Surat Thani

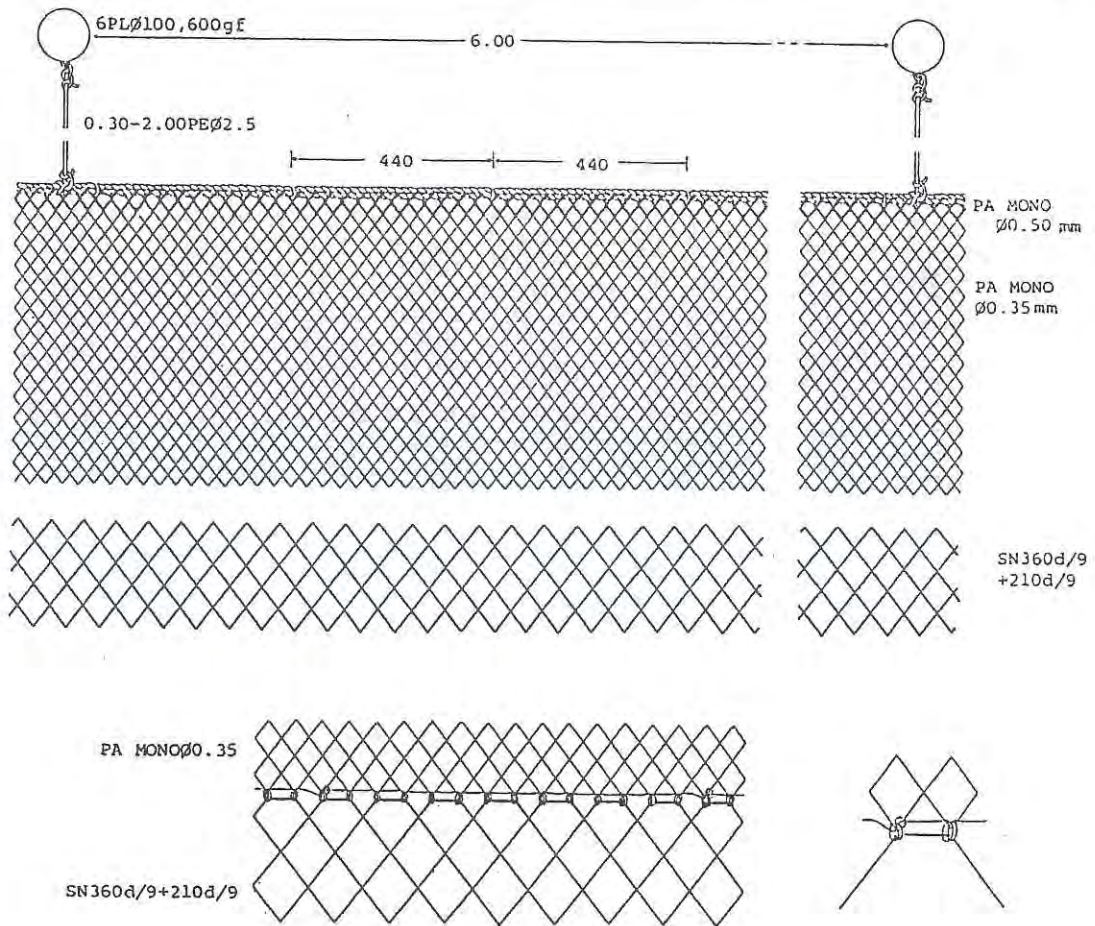
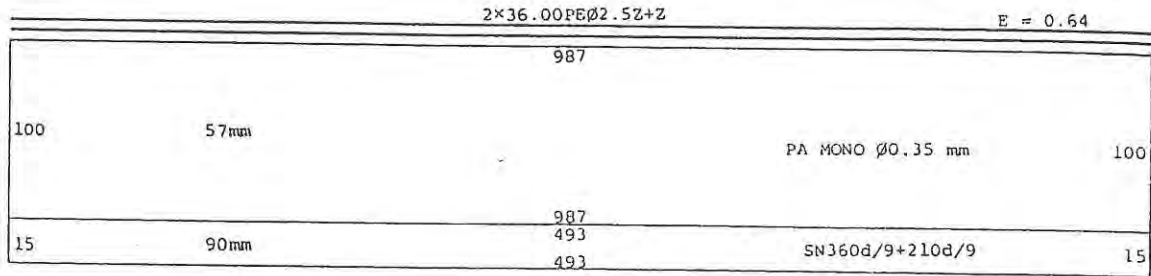


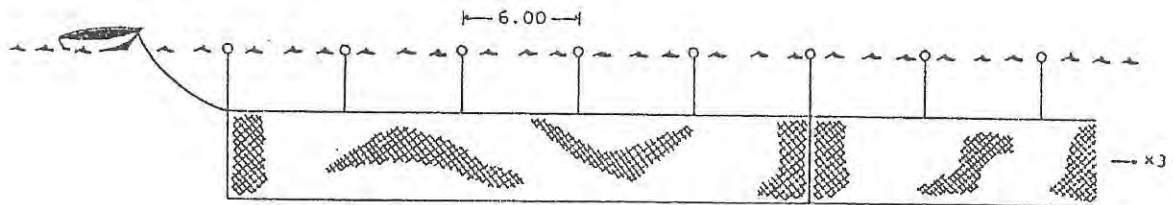


GILL NET
 Driftnet
 Fourfinger threadfin,
 Spanish mackerel

VESSEL
 Loa 5 m
 hp 5 LT

LOCATION
 Laem Sing
 Chanthaburi



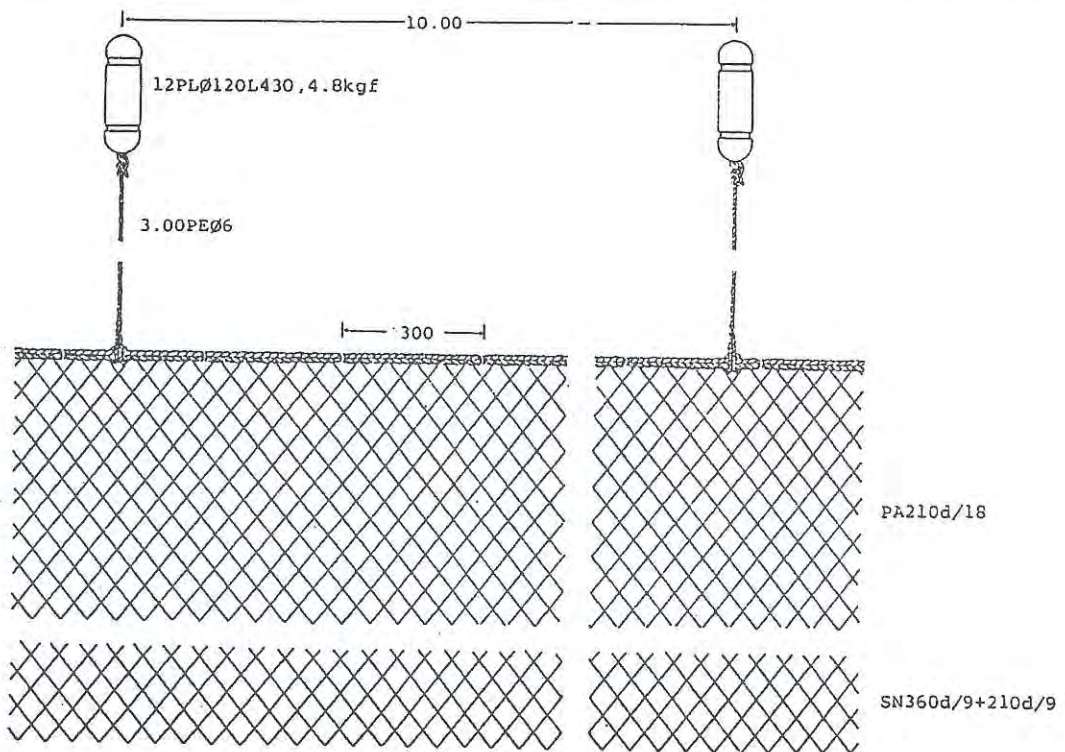


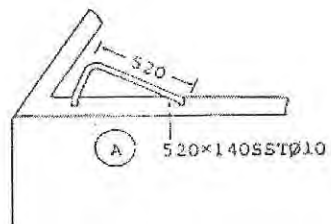
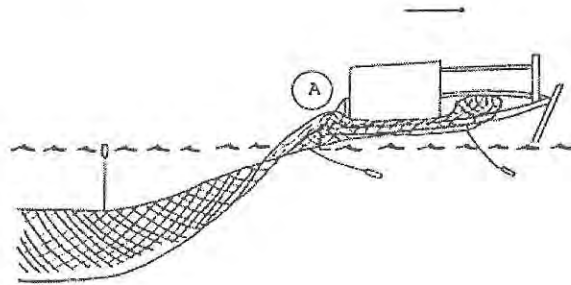
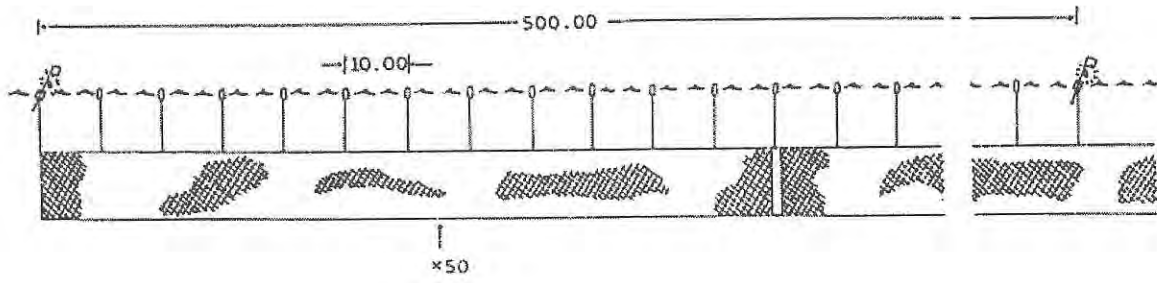
GILL NET
 Driftnet
 Spanish mackerel

VESSEL
 Loa 17 m
 hp 120

LOCATION
 Pattani
 Pattani

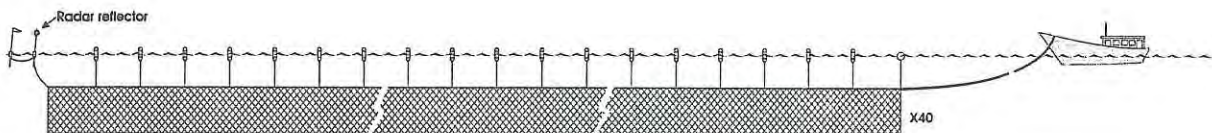
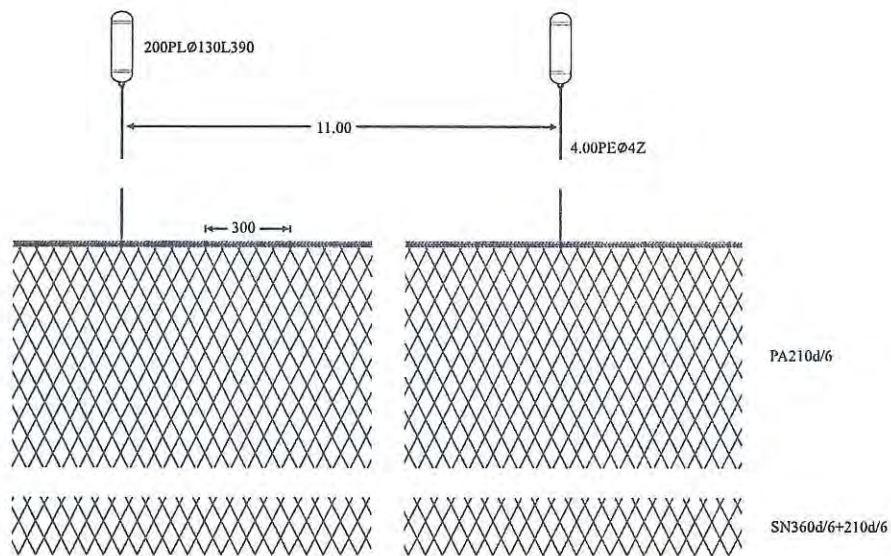
		2x120.00PVAØ10S+Z		E = 0.60	
2000					
150	100mm			PA210d/18 (Green)	150
2000					
25	100mm	2000	SN360d/9+210d/9		25



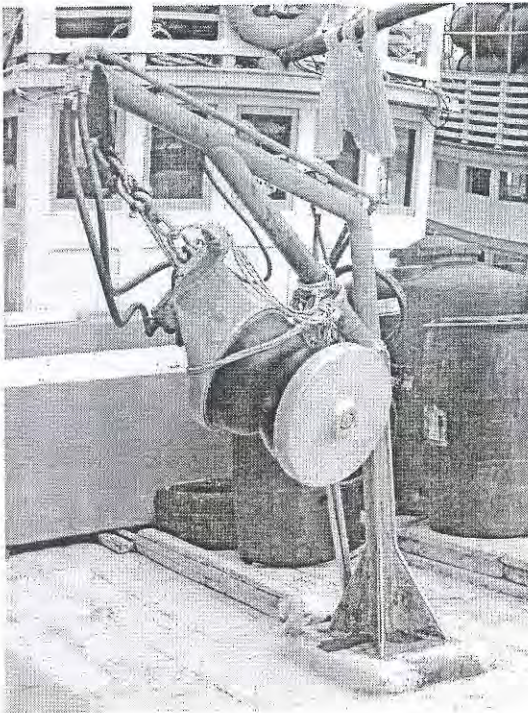
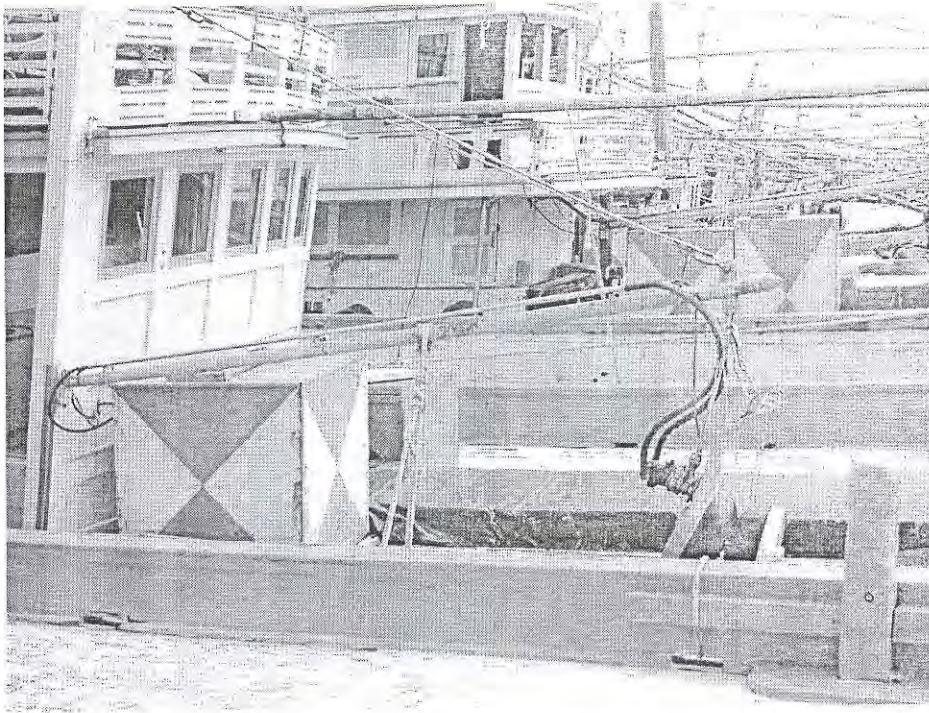


GILL NET	VESSEL		LOCATION
Drift gill net	Loa	24 m	Moung
Spanish mackeral	hp	350	Songkla

2x2200.00PESØ8S+Z				E=0.40
36667				
175	100mm	PA210d/6 (Green)	175	
36667				
25	100mm	SN360D/6+210d/6	25	



Rv. 2002



Spanish mackerel line hauler installed on fishing boat

GILL NET

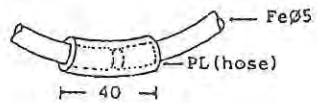
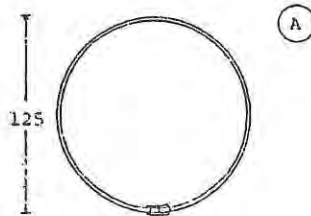
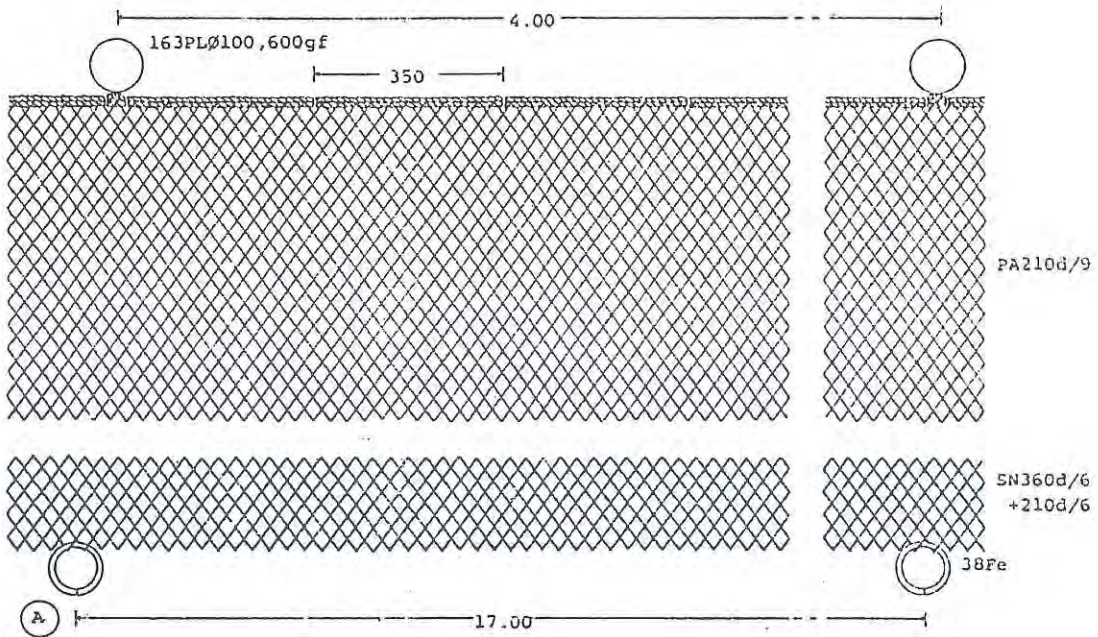
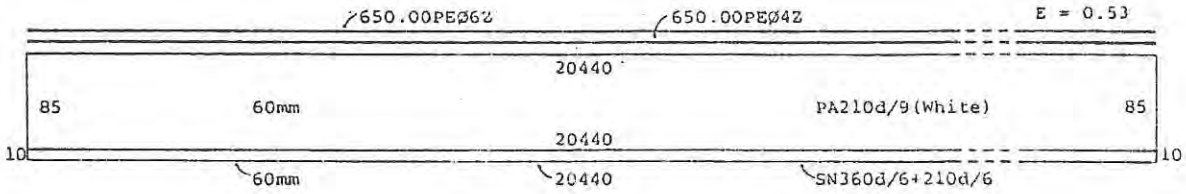
Driftnet
 Spanish mackerel, Pomfret, Scad,
 Dorab wolf-herring, Croaker

VESSEL

Loa 6 m
 hp 7

LOCATION

Kapoe
 Ranong

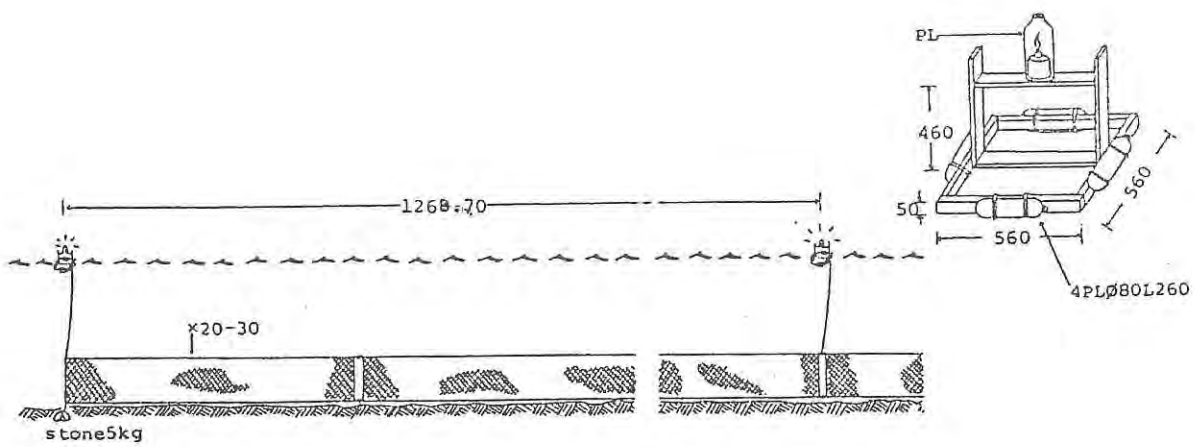
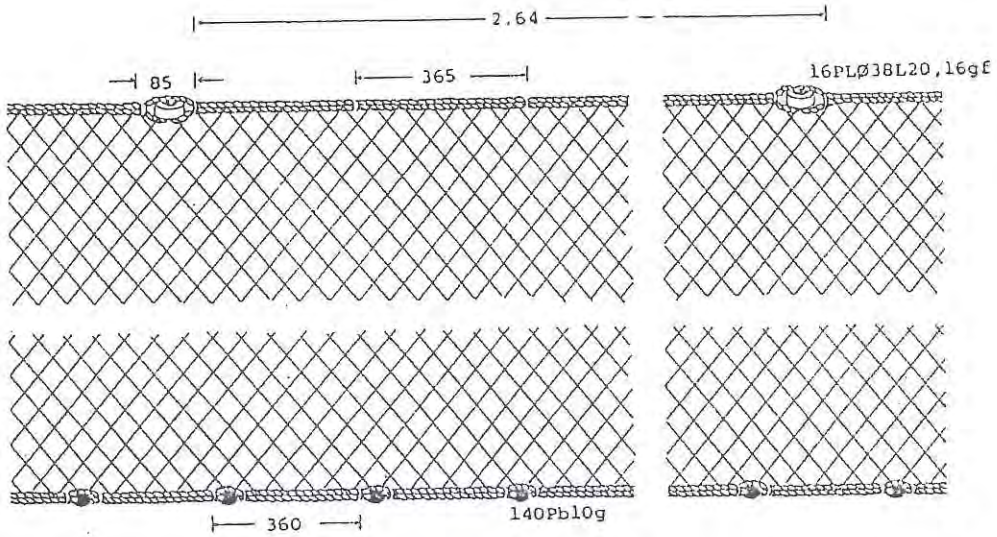


GILL NET
 Bottom set
 Blue swimming crab

VESSEL
 Loa 10 m
 hp 6

LOCATION
 Thasala
 Nakhon Si Thammarat

		2x42.29PEØ3.5Z+Z	E = 0.53
19	114mm	700	PA210d/4 (Green)
		700	19
		2x50.27PEØ3Z+Z	E = 0.63

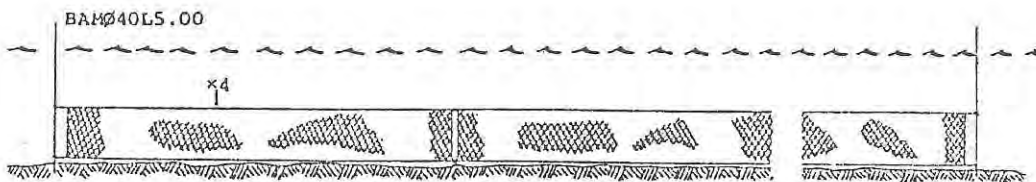
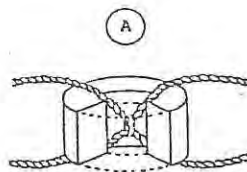
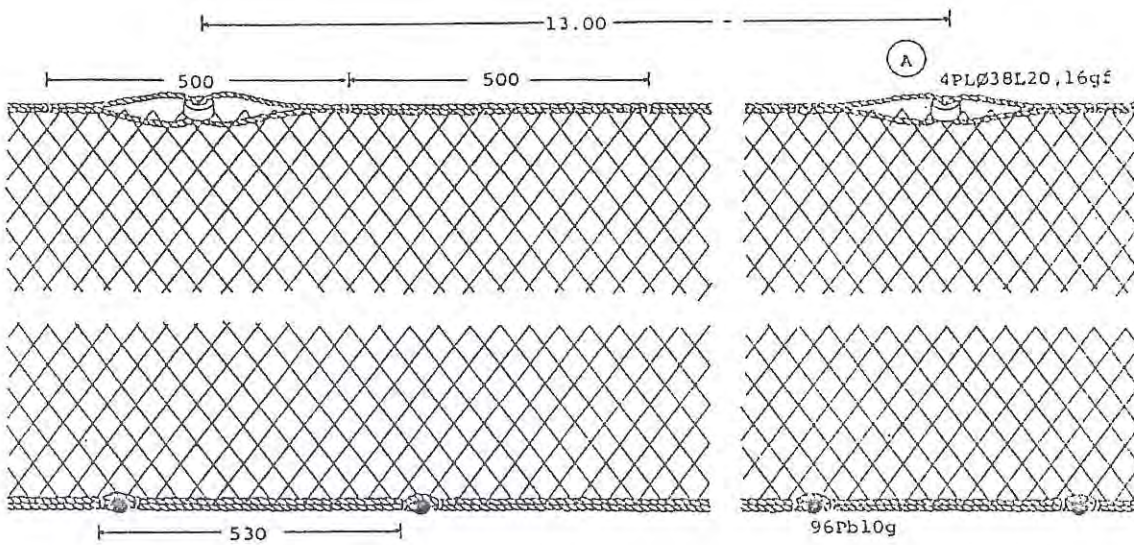


LL NET
 ttom set
 ue swimming crab

VESSEL
 Loa 8 m
 hp 7 LT

LOCATION
 Thachang
 Surat Thani

2x48.00PEØ2.5Z+Z		E = 0.50
100mm	960	PA210d/4 (White) 16
2x50.88PEØ2.5Z+Z		E = 0.53

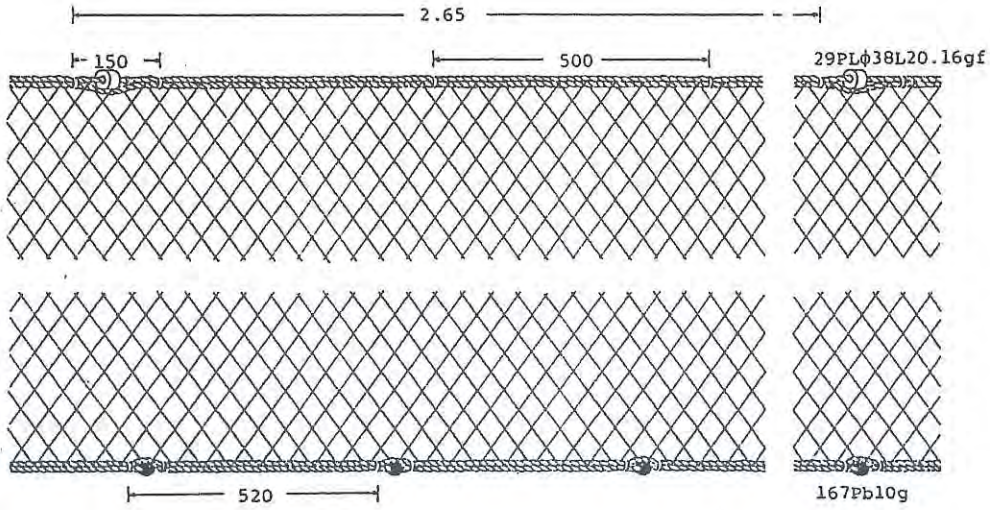


GILL NET
 Bottom set
 Blue swimming crab

VESSEL
 Loa 7 m
 hp 6

LOCATION
 Bangsaen
 Chon Buri

2×75.60PEφ2.5Z+Z				E = 0.42
12	120mm	1500	1500	PA MONOφ0.35 mm
2×86.40PEφ2.5Z+Z				E = 0.48

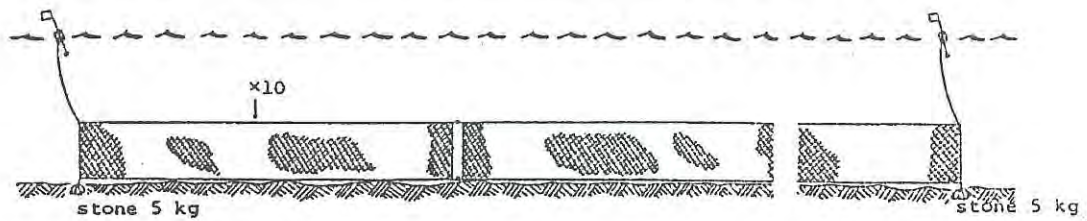
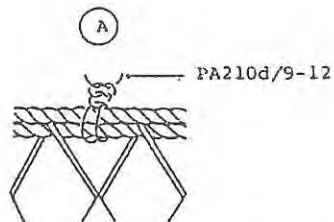
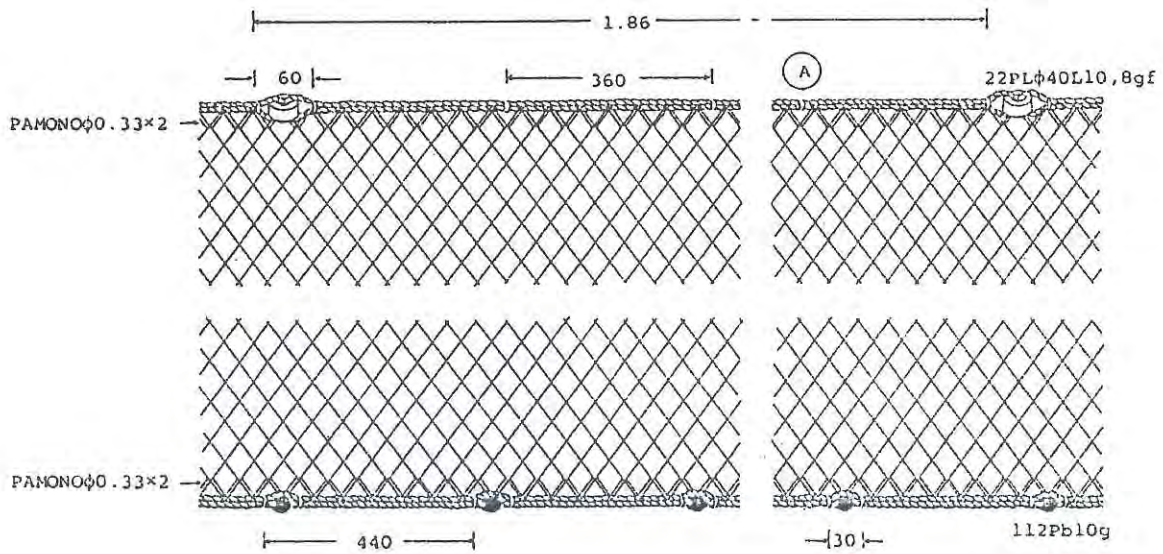


GILL NET
 Bottom set
 Blue swimming crab

VESSEL
 Loa 4 m
 hp 2 LT

LOCATION
 Cha-am
 Prachuap Khiri Khan

2x40.00PEφ2.5Z+Z				E = 0.42
9	122 mm	780	780	PA MONO φ0.33 mm
2x49.48PEφ2.5Z+Z				E = 0.52

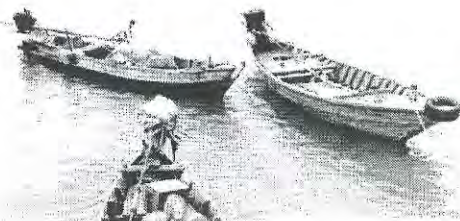
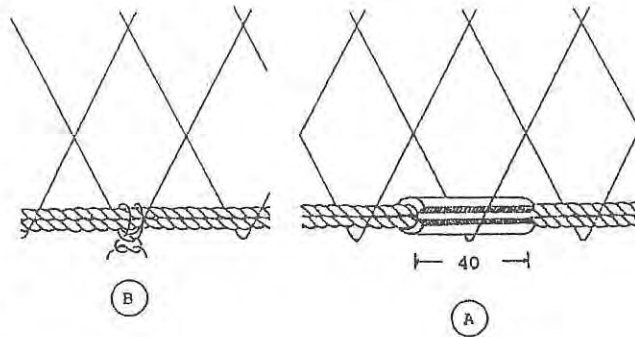
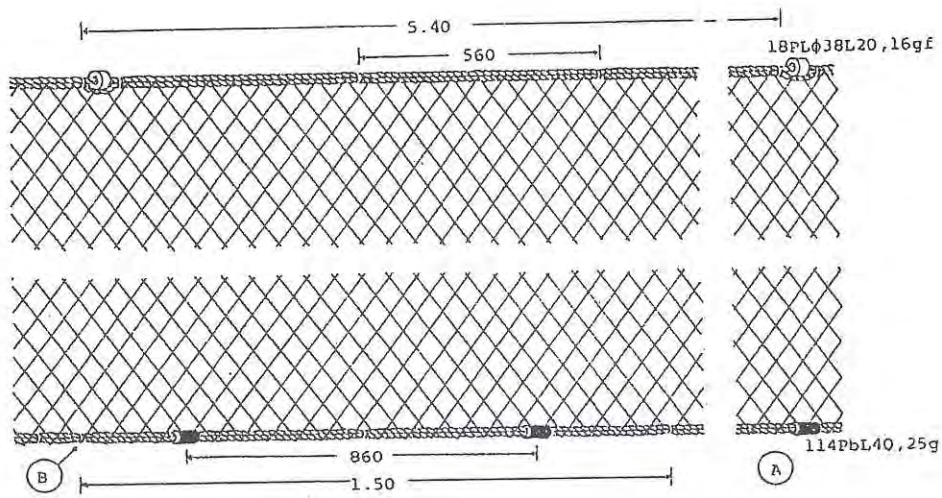


GILL NET
 Bottom set
 Blue swimming crab

VESSEL
 Loa 4 m
 hp 2 LT

LOCATION
 Ban-Phala
 Rayong

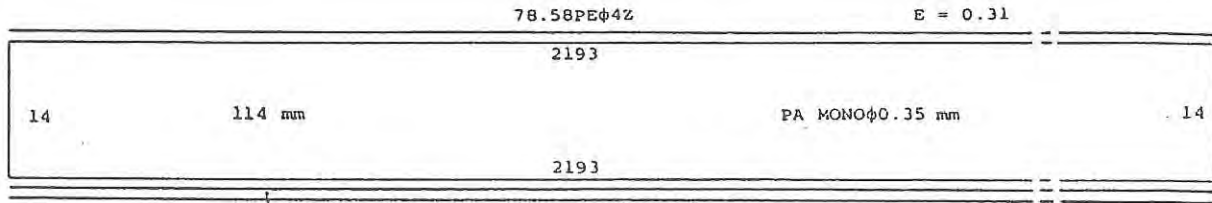
2×93.60PEφ2.5Z+Z				E = 0.52
12	120mm	1500	1500	PA MONOφ0.30 mm
2×97.20PEφ2.5Z+Z				E = 0.54



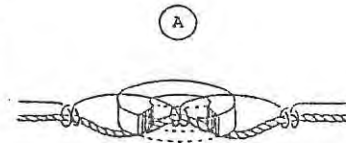
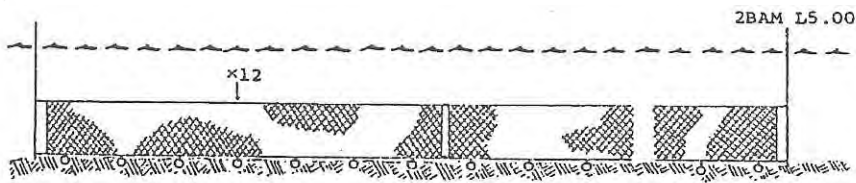
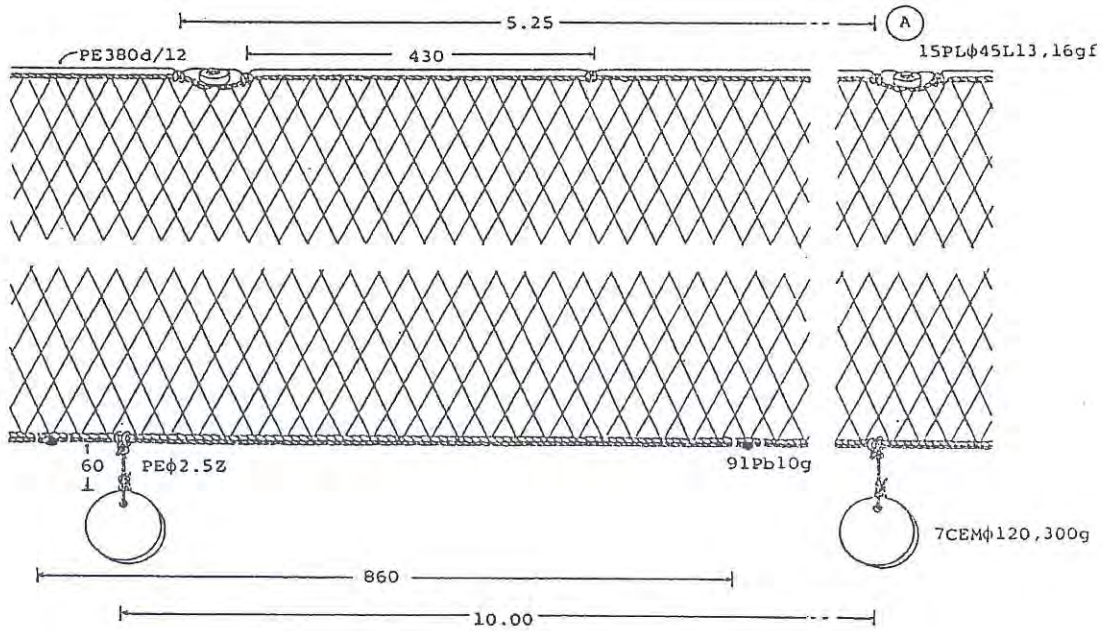
GILL NET
 Bottom set
 Mangrove crab

VESSEL
 Loa 8 m
 hp 4 LT

LOCATION
 Klong-sansuk,
 Samut Prakarn



78.58PEφ4Z 78.58PEφ1.5Z E = 0.31



GILL NET

Gill net

Red frog crab

VESSEL

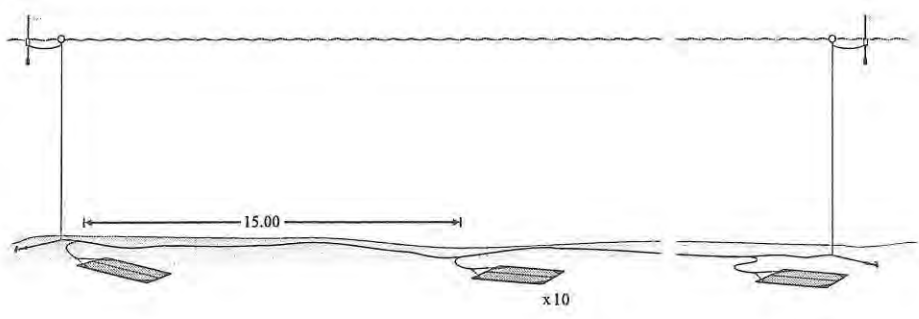
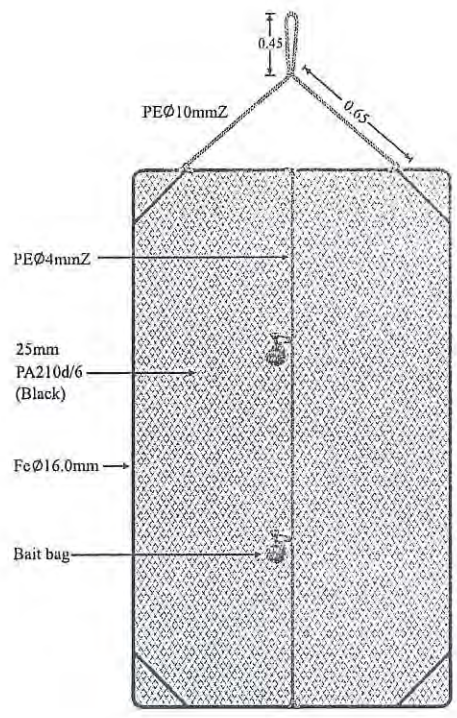
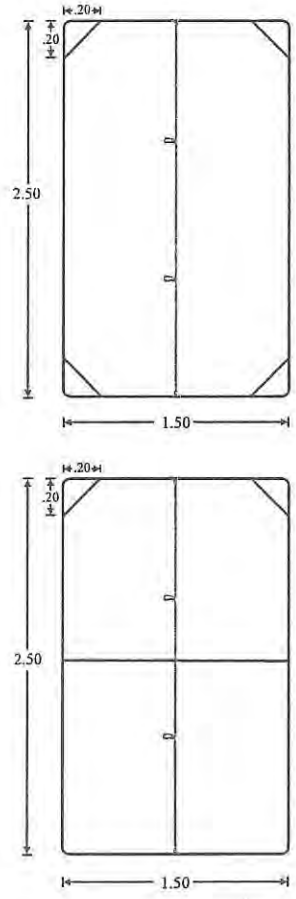
Loa 18 m

hp 275

LOCATION

Talang

Phuket

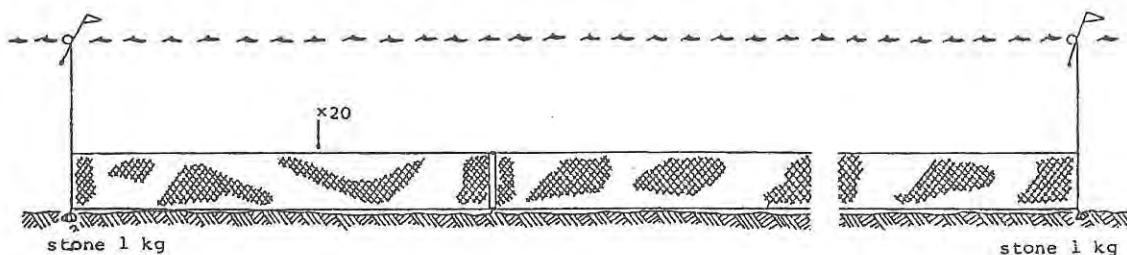
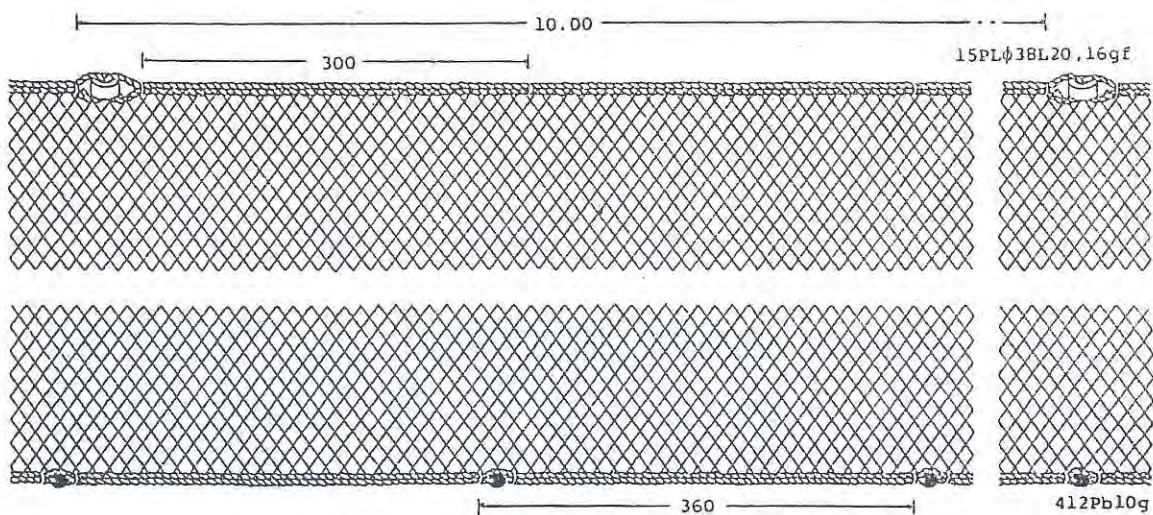
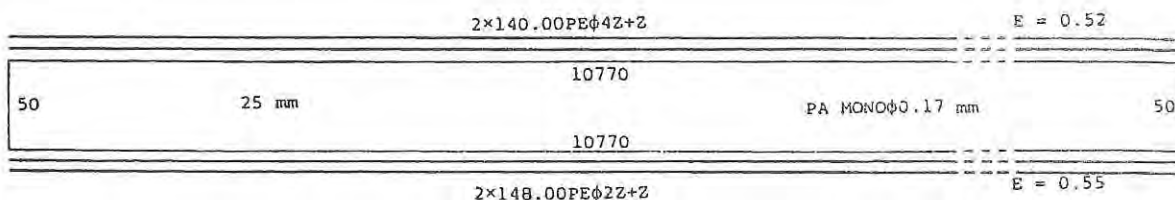


Rv. 2002

GILL NET
Bottom set
Whiting

VESSEL
Loa 10 m
hp 5 LT

LOCATION
Kawsang
Songkhla

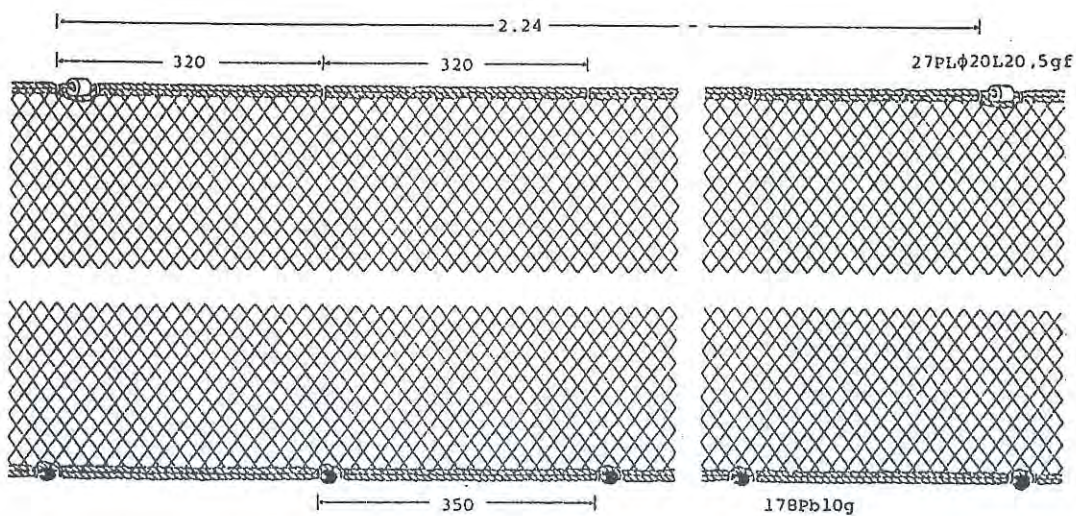


GILL NET
Bottom set
Whiting

VESSEL
Loa 6 m
hp 4 LT

LOCATION
Hua-hin
Prachuap Khiri Khan

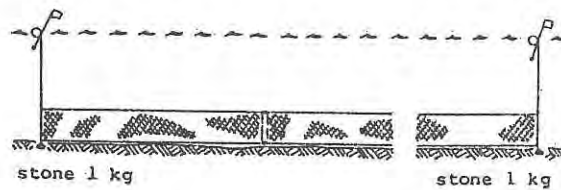
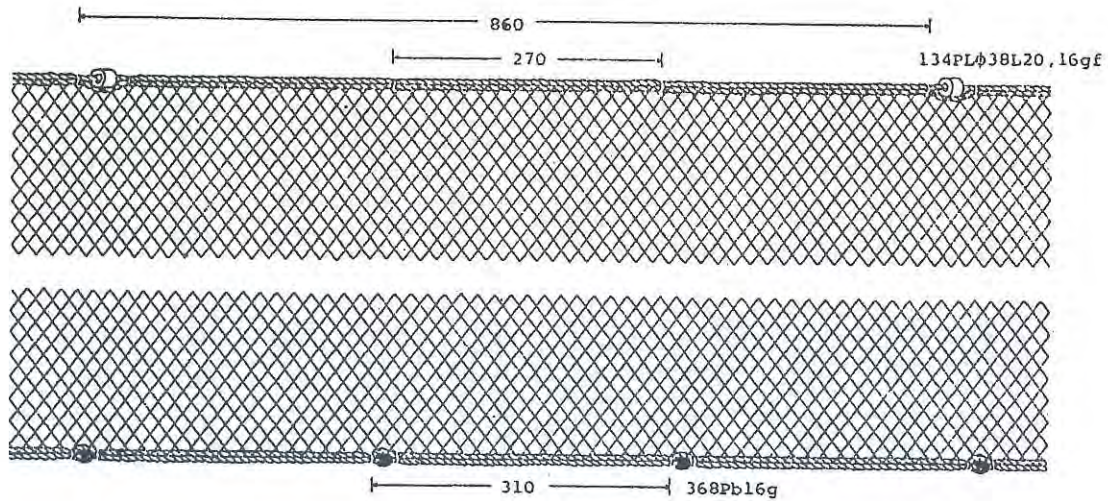
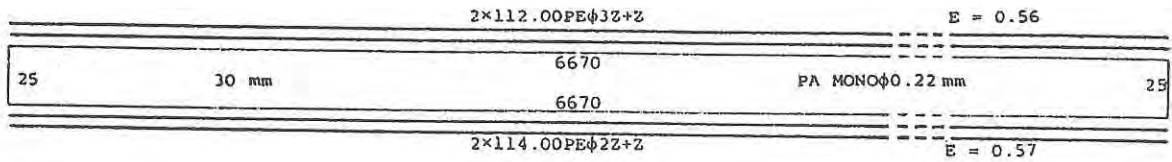
2x60.00PEφ2.5Z+Z					E = 0.66
50	30 mm	3030	3030	PA MONOφ0.25 mm	50
2x62.00PEφ2.5Z+Z					E = 0.68



GILL NET
Bottom set
Whiting

VESSEL
Loa 7 m
hp 6

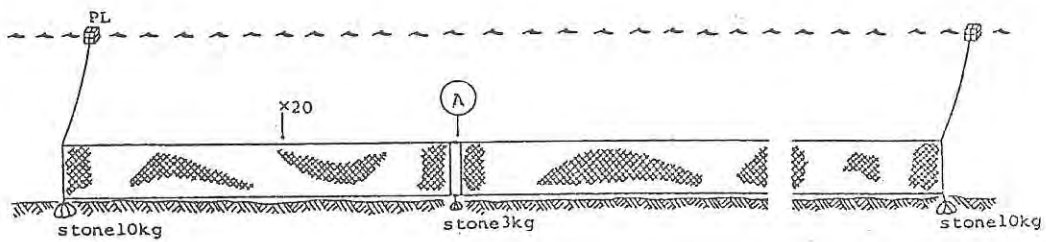
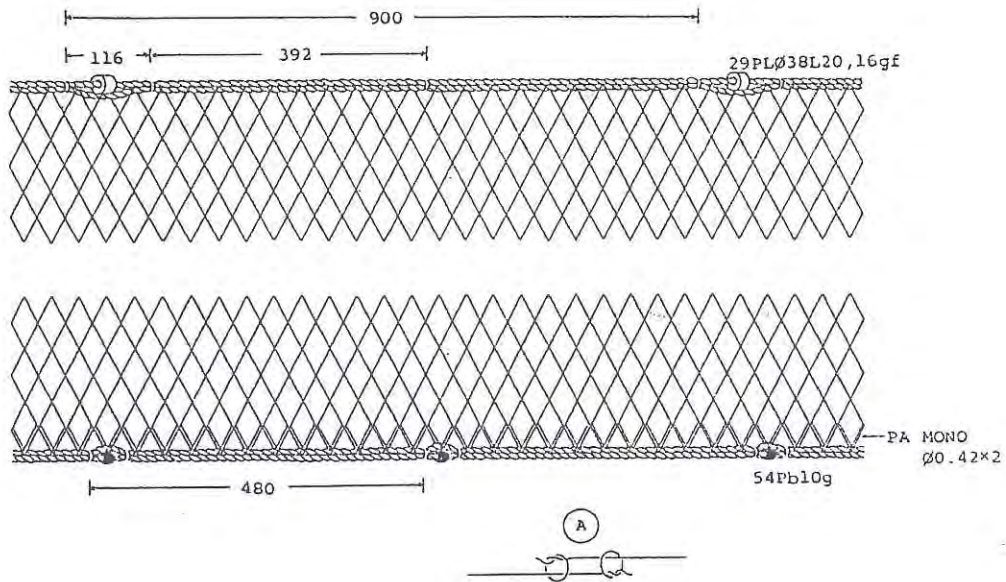
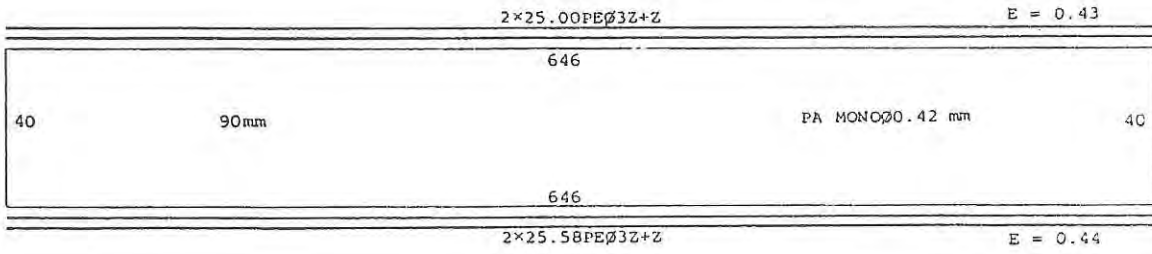
LOCATION
Ban Pakbara
Satun



GILL NET
Bottom set
Spiny lobster

VESSEL
Loa 6 m
hp 6 LT

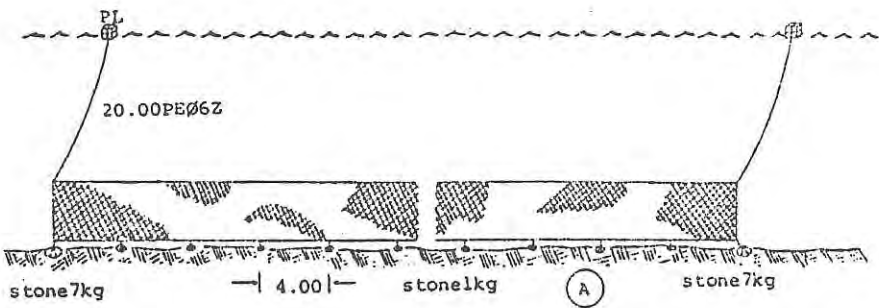
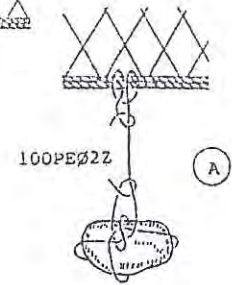
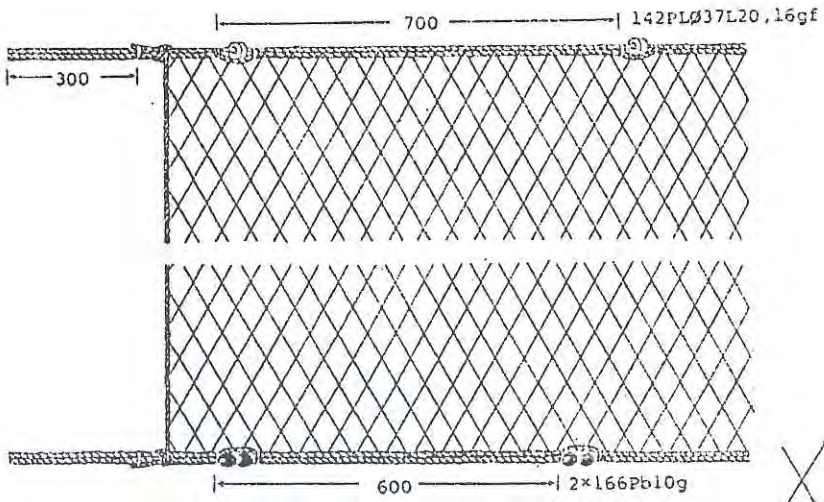
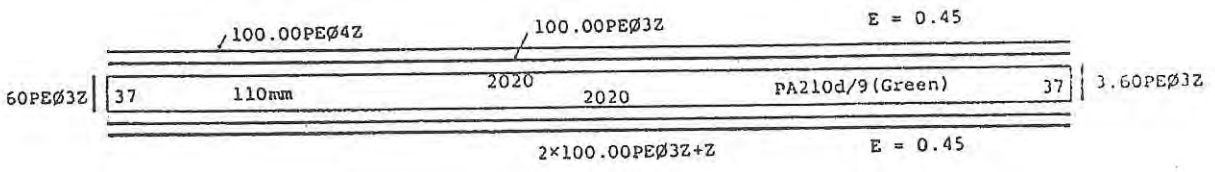
LOCATION
Thapput
Phangnga



GILL NET
Bottom set
Red snapper

VESSEL
Loa 6 m
hp 7 LT

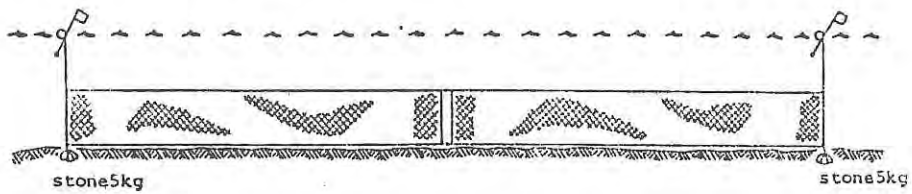
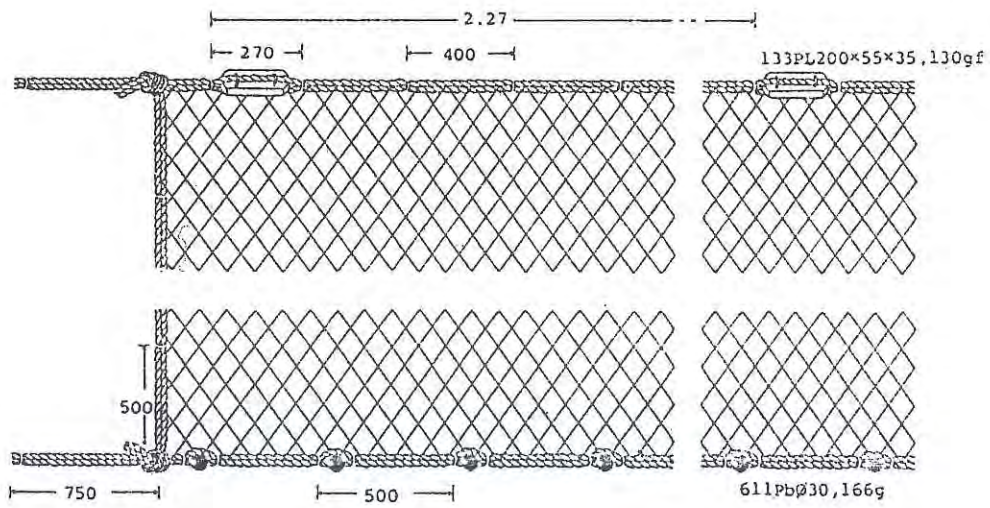
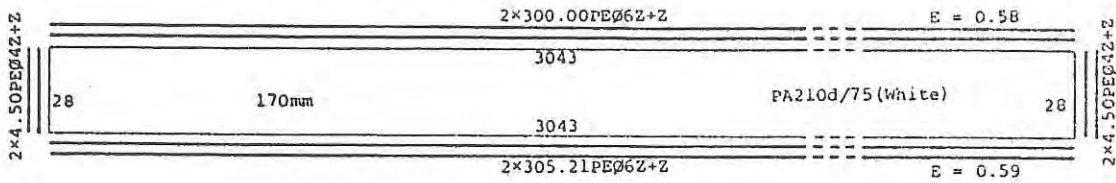
LOCATION
Kapoe
Ranong



GILL NET
Bottom set
Seabass

VESSEL
Loa 9 m
hp 8 LT

LOCATION
Ban Silong
Chachoengsao



GILL NET
Bottom set
Seabass

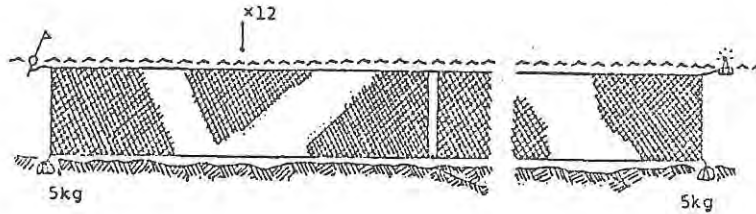
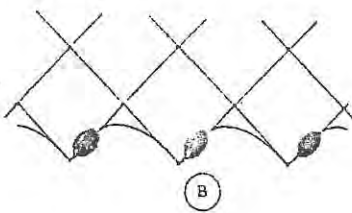
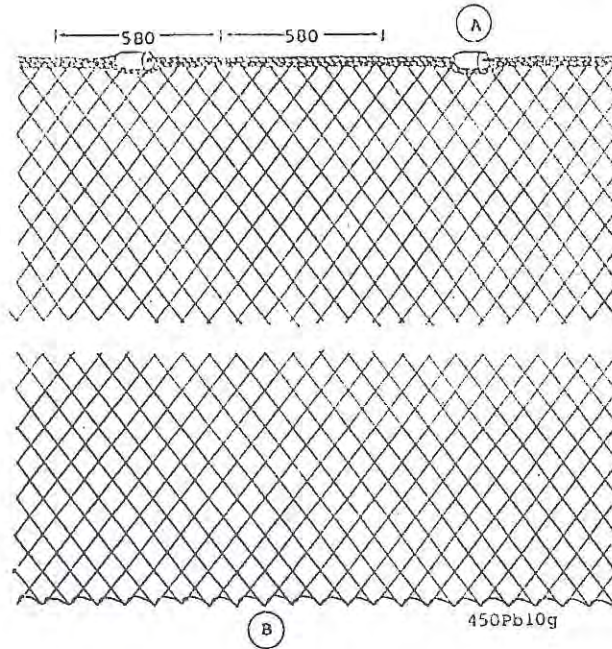
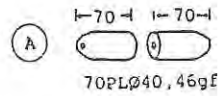
VESSEL
Loa 6 m
hp 5 LT

LOCATION
Ban-Rusanilae
Pattani

2x43.29PEφ7Z+Z

E = 0.52

20	185mm	450	PA MONO φ1.45 mm	20
		450		

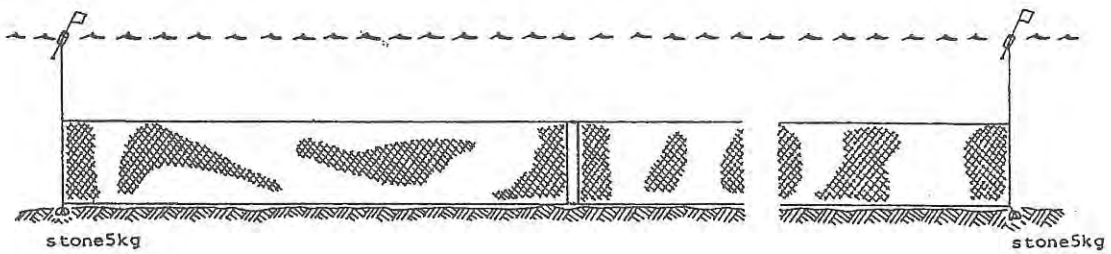
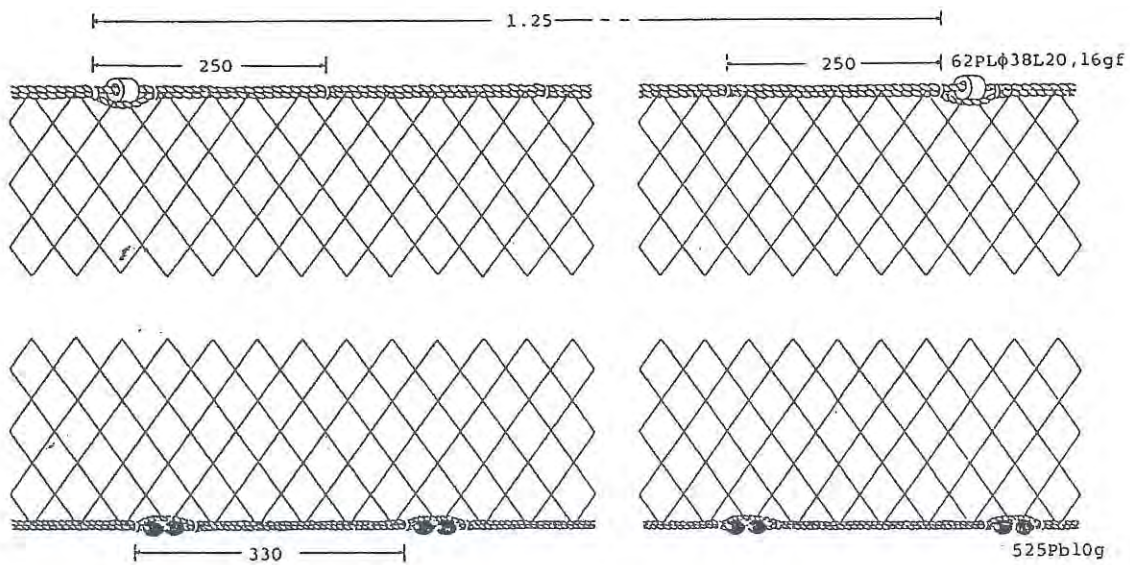


GILL NET
Bottom set
Cavalla

VESSEL
Loa 7 m
hp 6

LOCATION
Ban Pakbara
Satun

2×77.40PEφ42+Z					E = 0.43
20	115 mm	1565	1565	PA. MONOφ0.42mm	20
2×86.40PEφ27+Z					E = 0.48

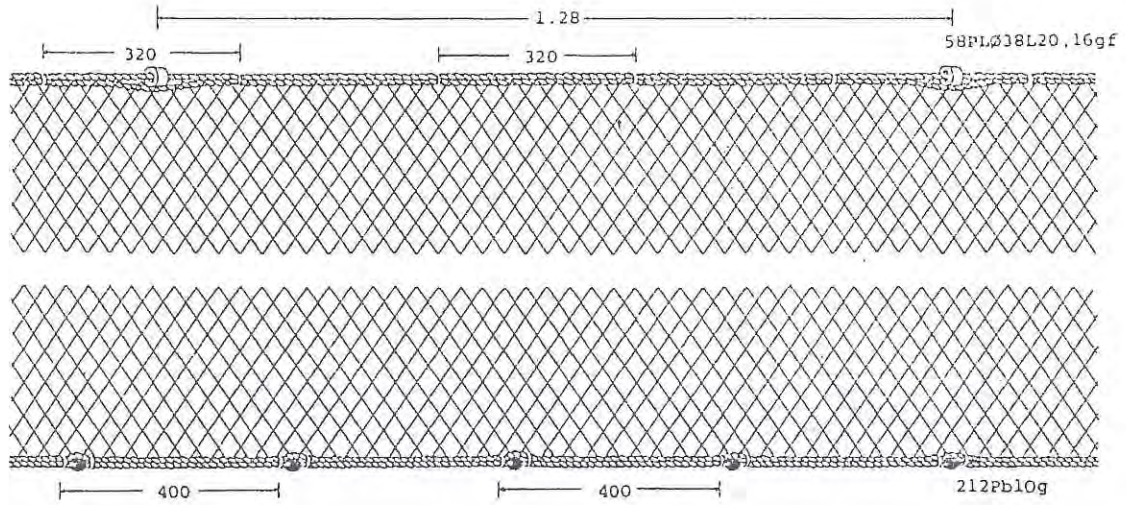


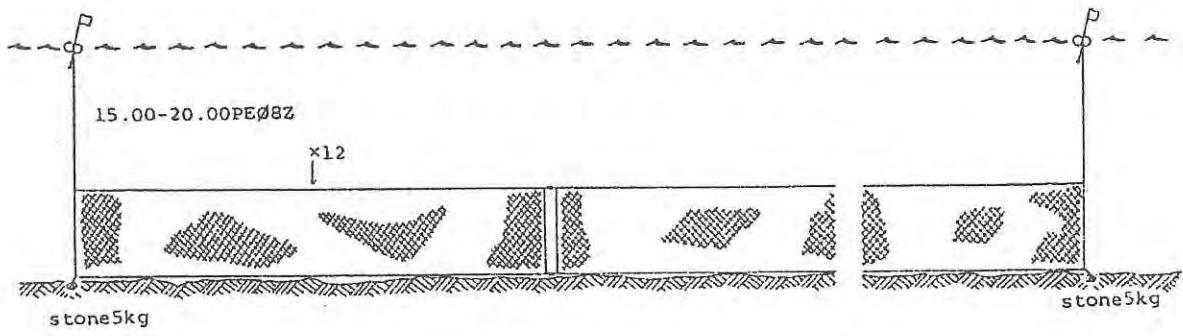
GILL NET
Bottom set
False trevally

VESSEL
Loa 8 m
hp 5 LT

LOCATION
Thanun
Phangnga

		2x73.80PEØ32+Z	E = 0.42
50	85mm	2117	PA MONOØ30.45 mm
		2117	50
		2x84.60PEØ32+Z	E = 0.47

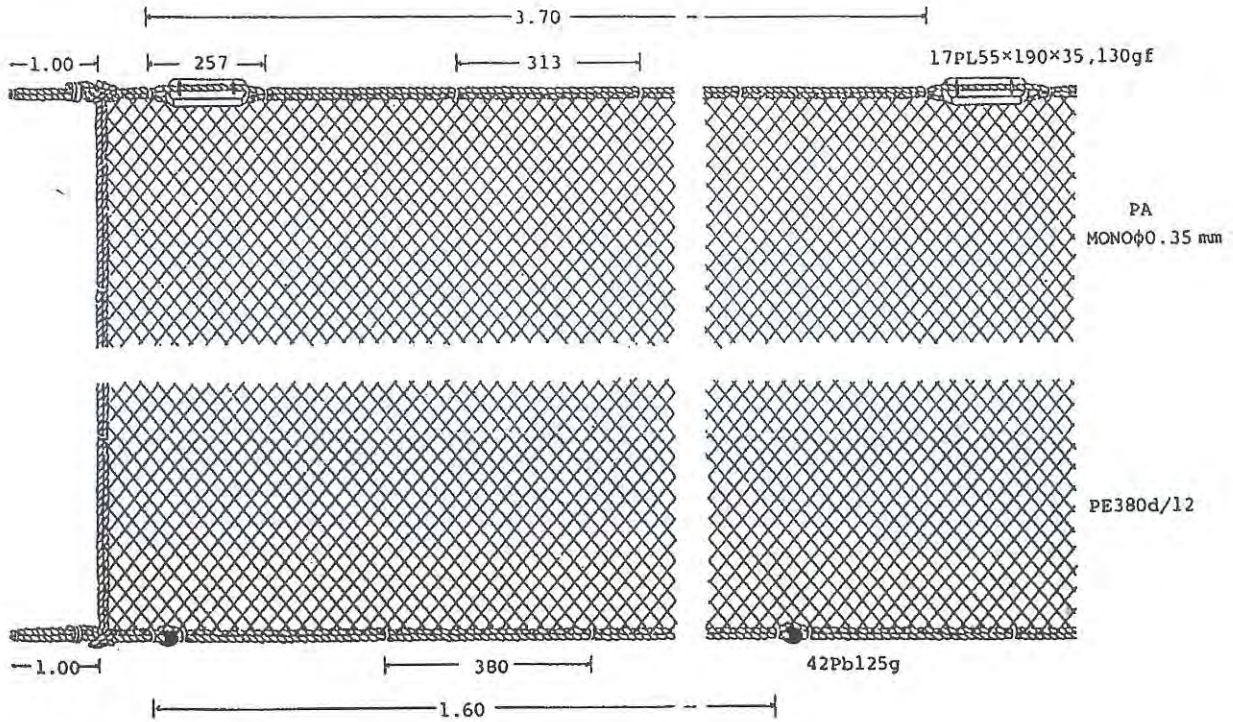
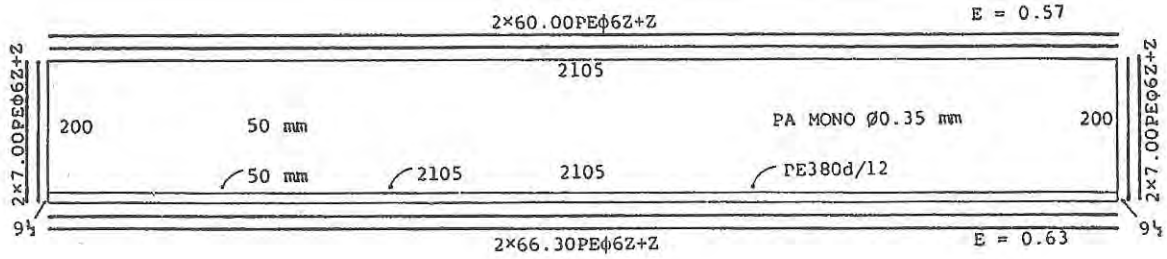


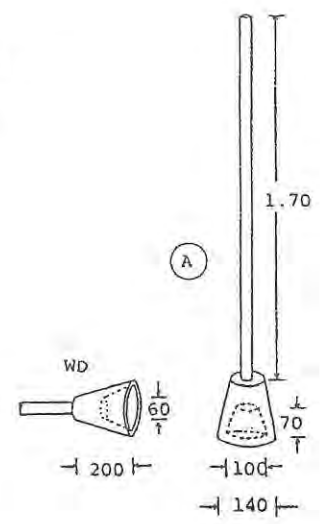
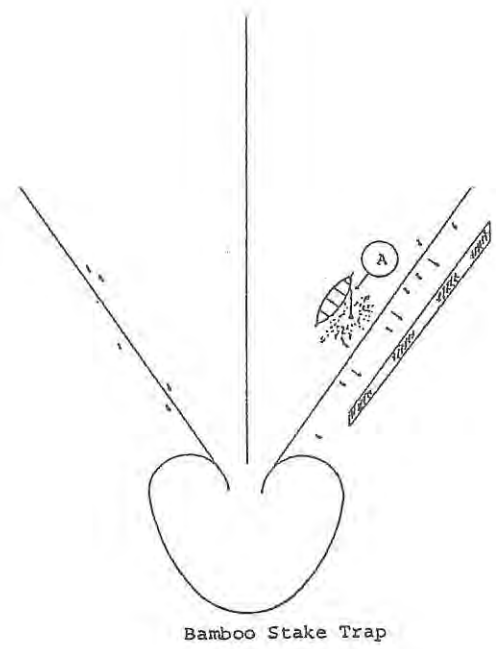
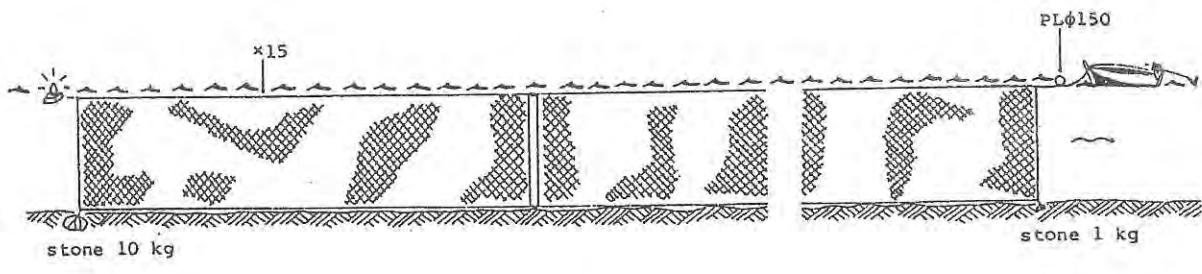


GILL NET
 Bottom set
 Fourfinger threadfin

VESSEL
 Loa 9 m
 hp 10 LT

LOCATION
 Ban Silong
 Chachoengsao

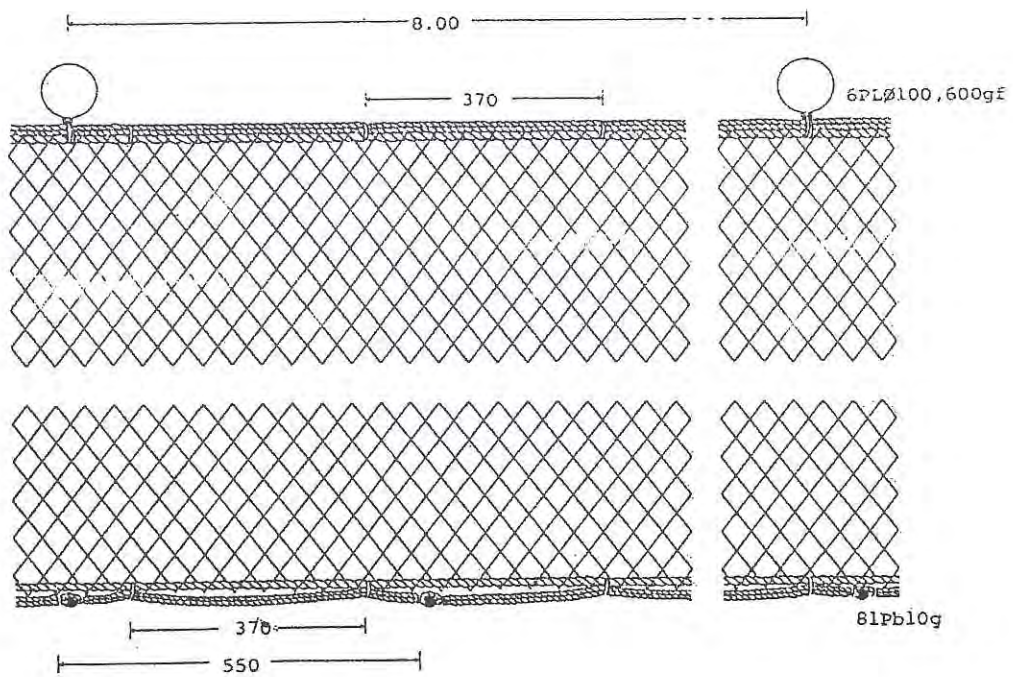
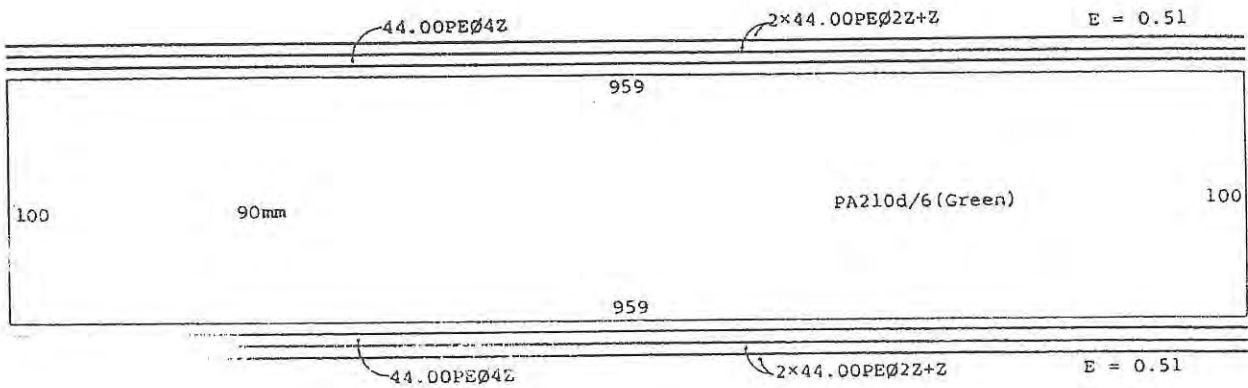


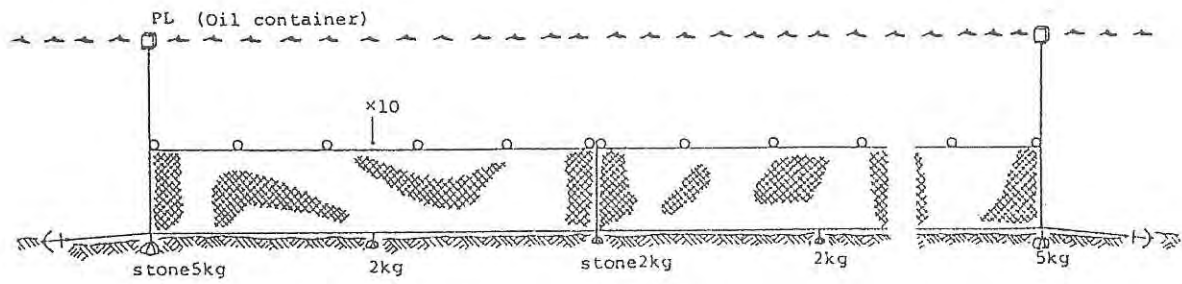


GILL NET
 Bottom set
 Giant queenfish, Scad, Trevally

VESSEL
 Loa 7 m
 hp 7

LOCATION
 Ao-Makhampon
 Rayong

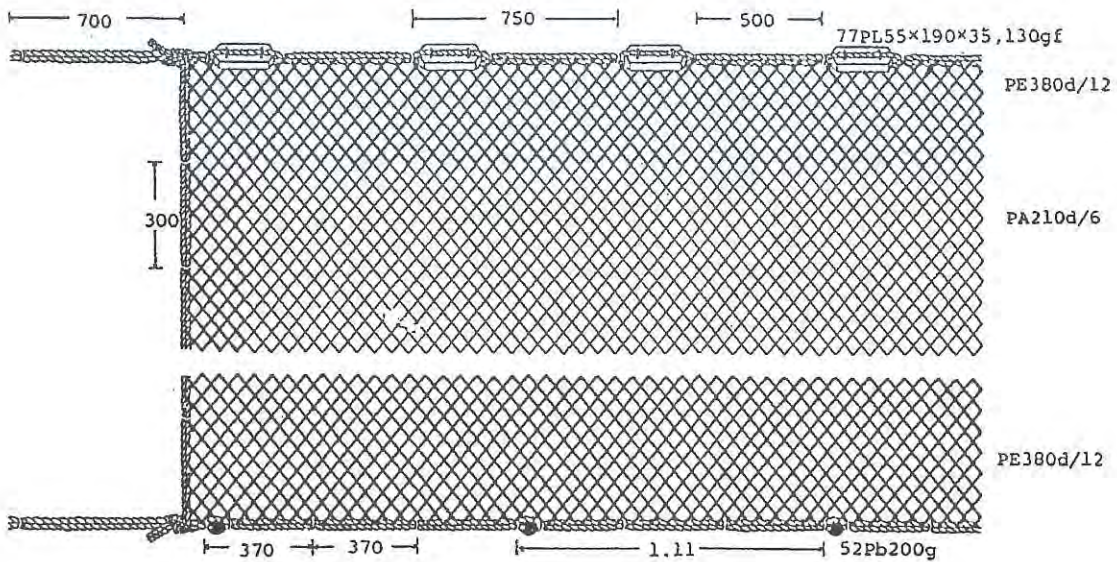
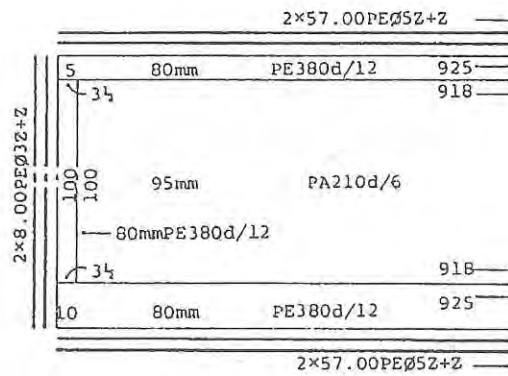
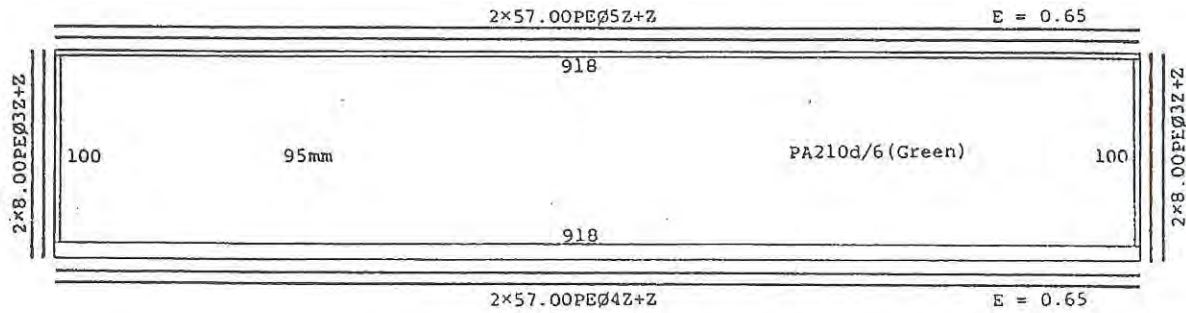


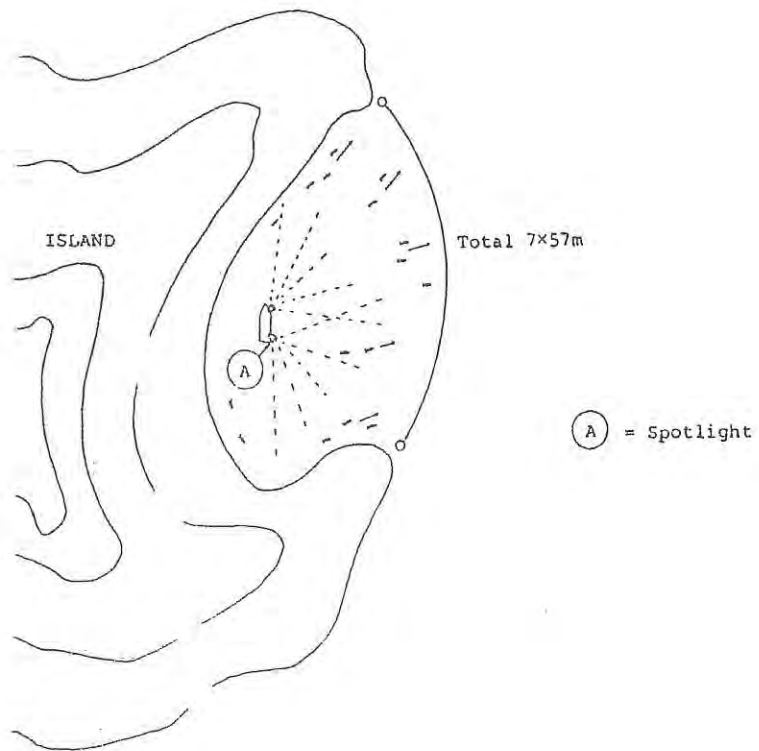


GILL NET
 Bottom set
 Giant queenfish, Scad, Trevally

VESSEL
 Loa 8 m
 hp 7

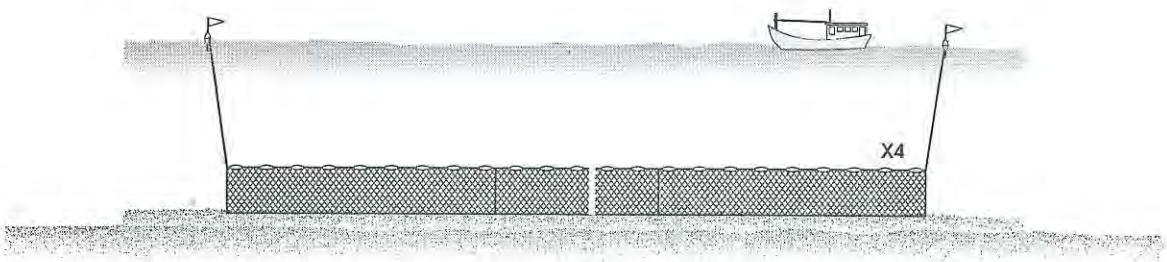
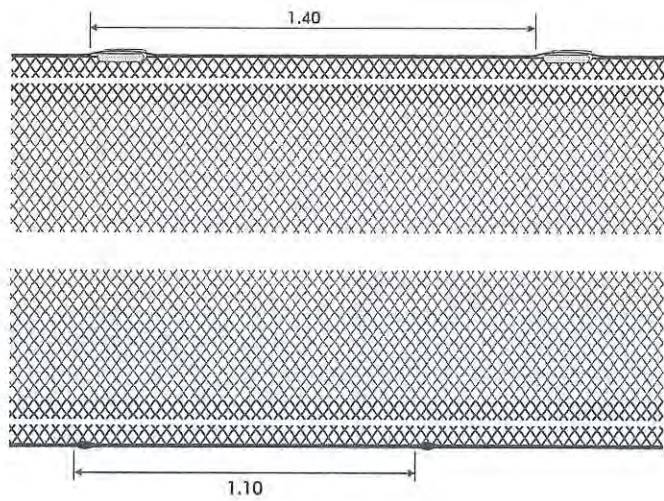
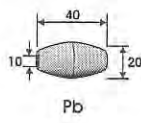
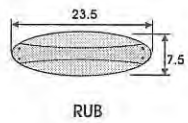
LOCATION
 Bangsare
 Chon Buri



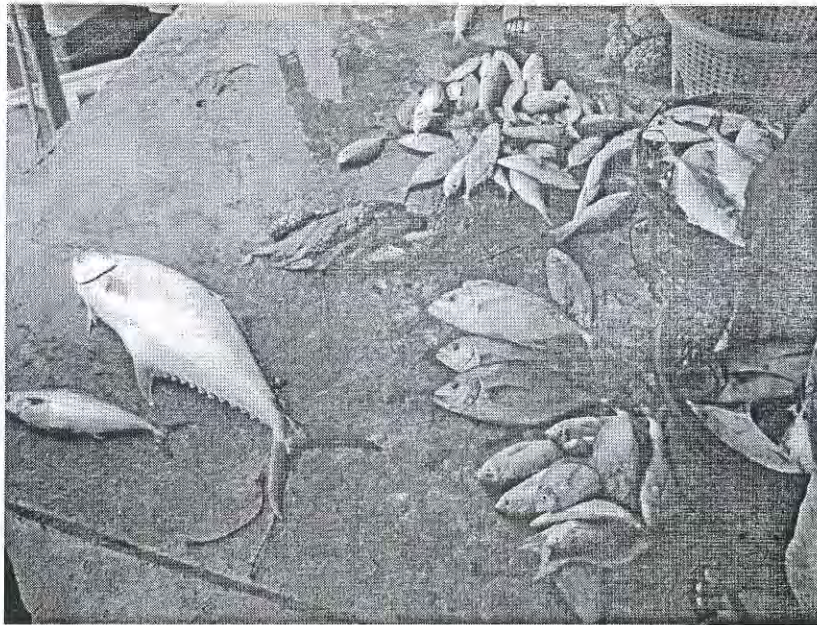
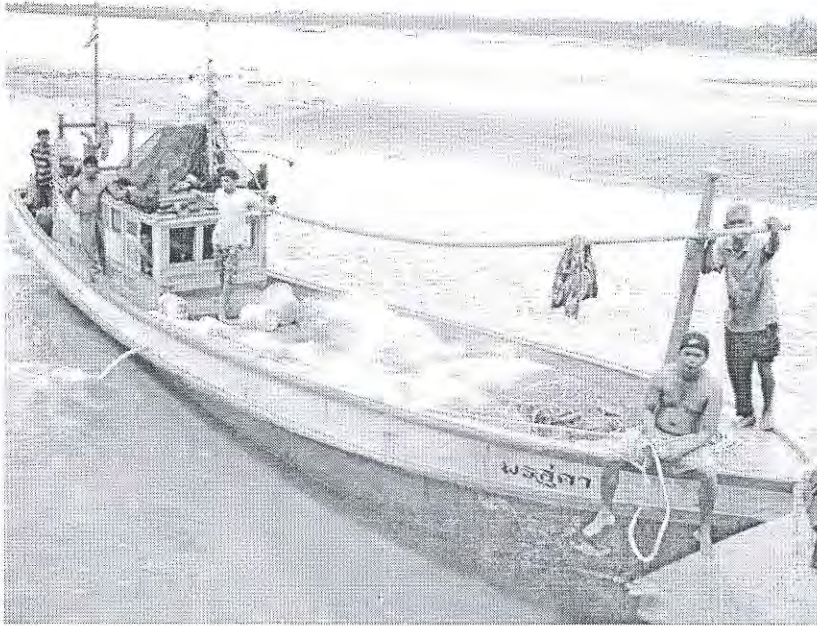


GILL NET	VESSEL		LOCATION
Bottom set	Loa	16 m	Ban Hua Learn
Threadfin, Queenfish, Snappers, Emperor	hp	185	<u>Chumporn</u>

2 x 80.00 PP Ø 5 mm Z+Z				
15	60.0 mm	2240	PF 380d/15	E = 0.55
		2240		15
100	65.0 mm	PA MONO Ø0.30 mm		100
		2240		
15	60.0 mm	2240	PF 380d/15	15
				E = 0.55



Rv. 2002



GILL NET

VESSEL

LOCATION

Bottom set

Loa

12 m

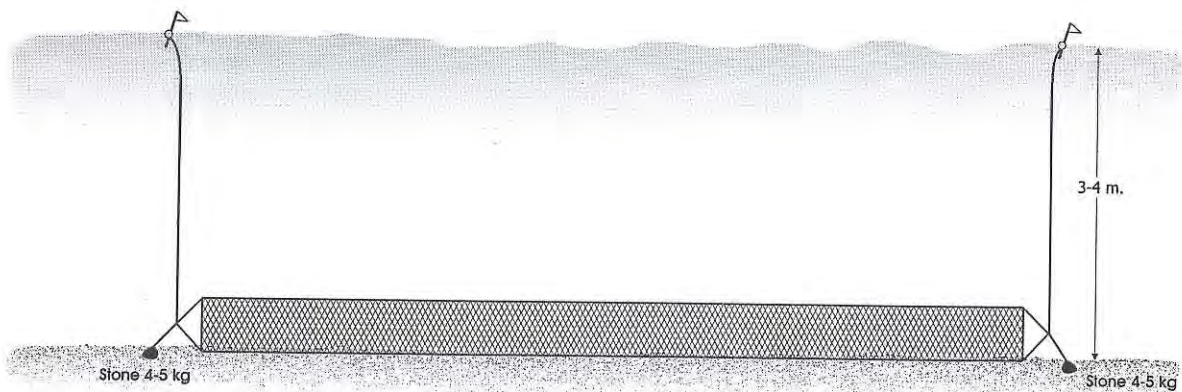
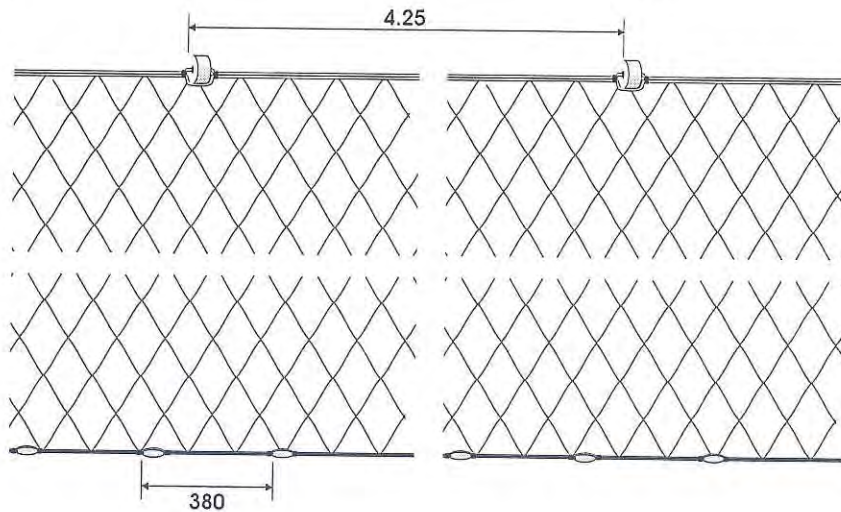
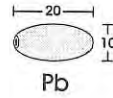
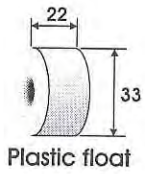
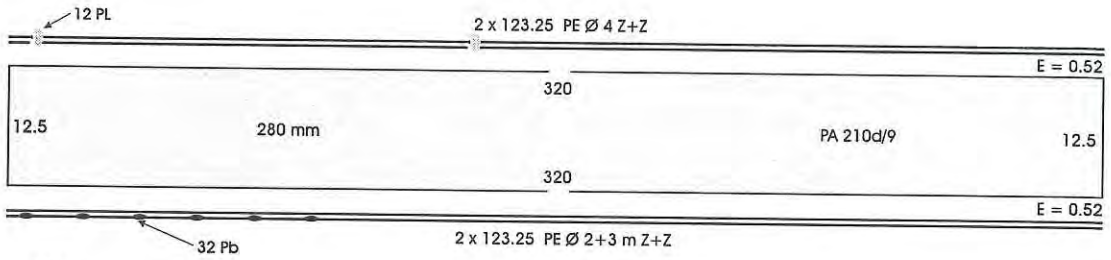
Pak Nakorn

Ray

hp

16

Nakonsri Thammarat

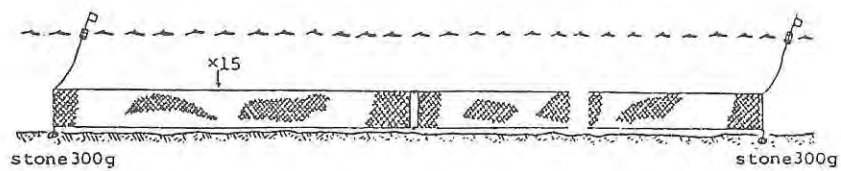
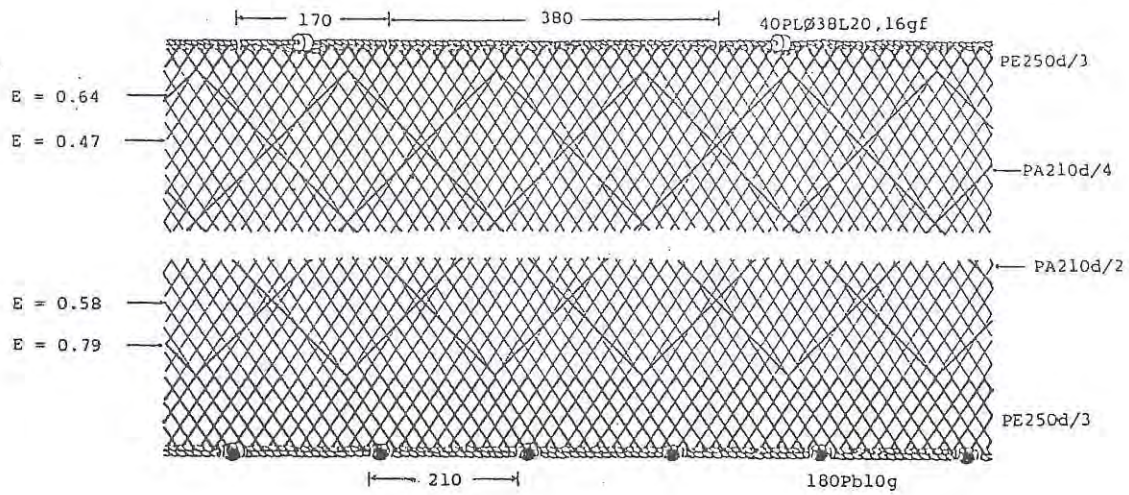
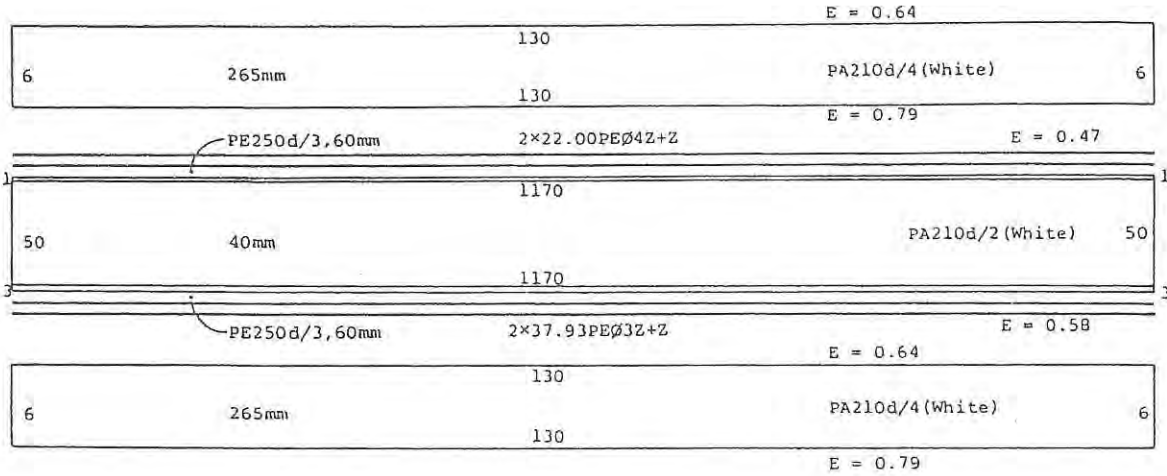


Rv. 2002

GILL NET
Trammel, Bottom set
Shrimp

VESSEL
Loa 10 m
hp 6

LOCATION
Ban Thungmaha
Chumphon

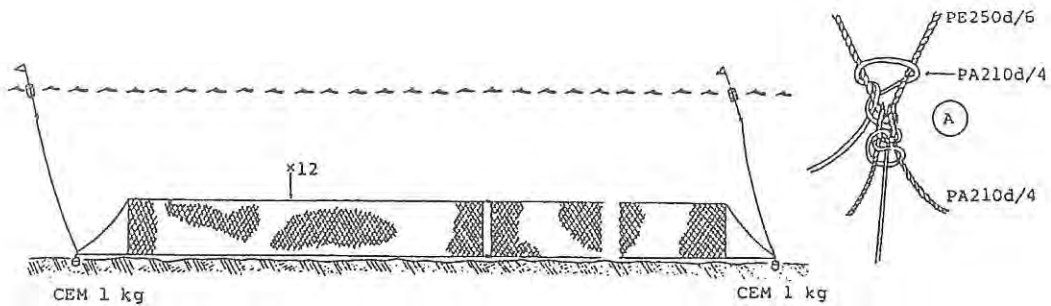
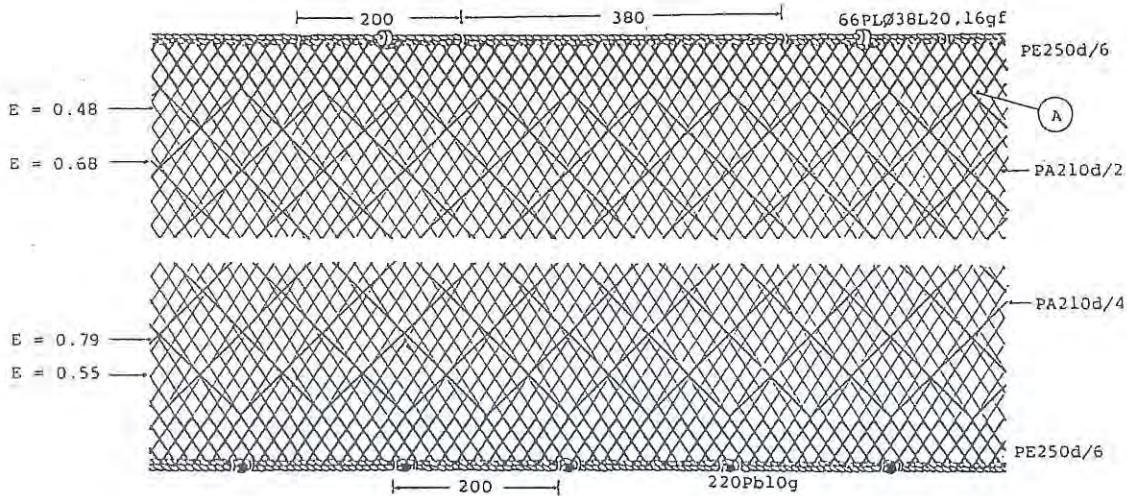


GILL NET
Trammel, Bottom set
Shrimp

VESSEL
Loa 10 m
hp 6 LT

LOCATION
Thasala
Nakhon Si Thammarat

			E = 0.68	
10½	140mm	400	PA210d/4 (White)	10½
		400		
	PE250d/6, 70mm	2×38.40PEØ4Z+Z	E = 0.79	E = 0.48
2				2
50	40mm	2000	PA210d/2 (White)	50
		2000		
2				2
	PE250d/6, 70mm	2×44.00PEØ3Z+Z	E = 0.68	E = 0.55
10½	140mm	400	PA210d/4 (White)	10½
		400		
			E = 0.79	

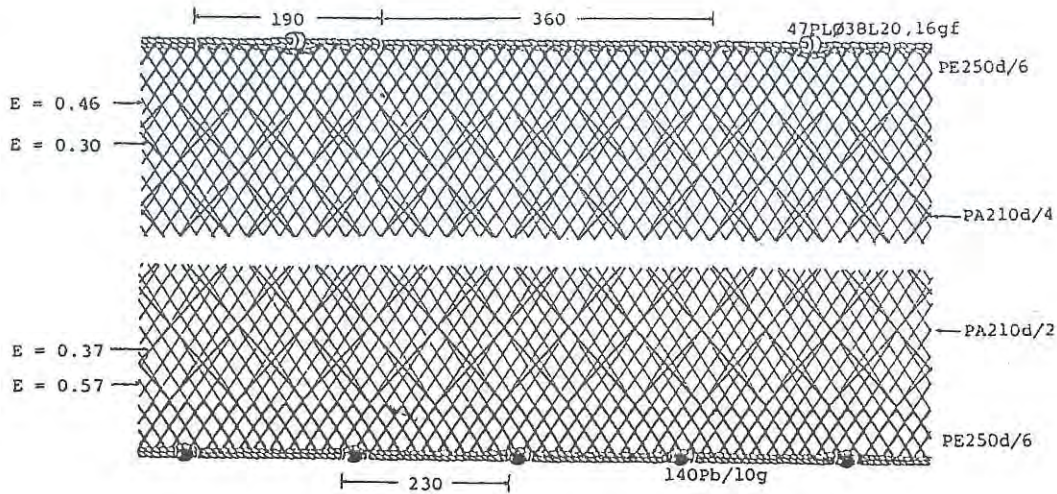
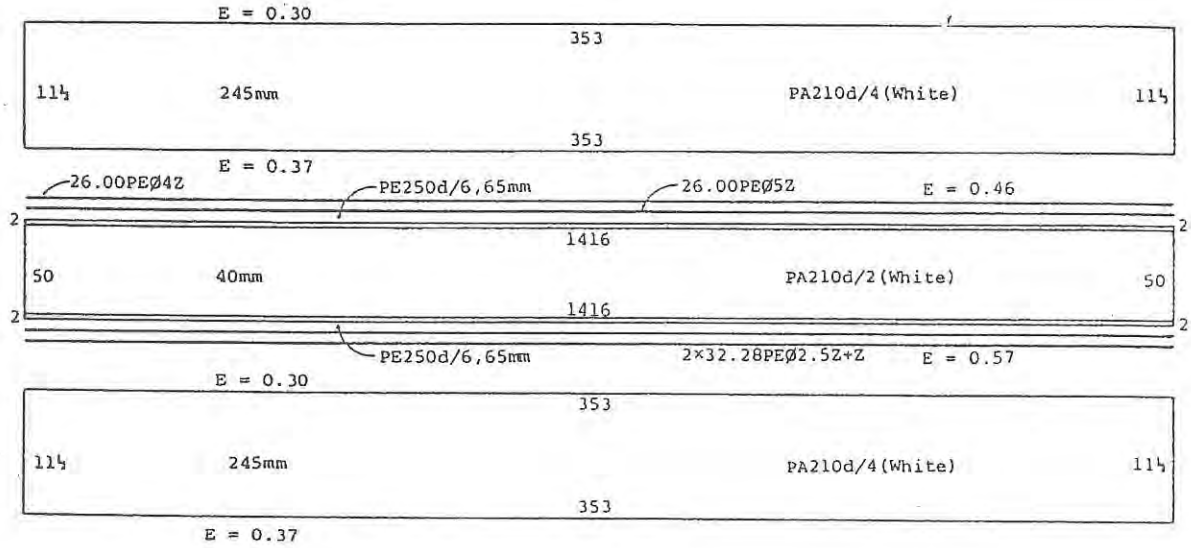




GILL NET
 Trammel, Bottom set
 Shrimp

VESSEL
 Loa 9 m
 hp 16

LOCATION
 Bangsaen
 Chon Buri



GILL NET

Trammel, Bottom set

Cuttlefish

VESSEL

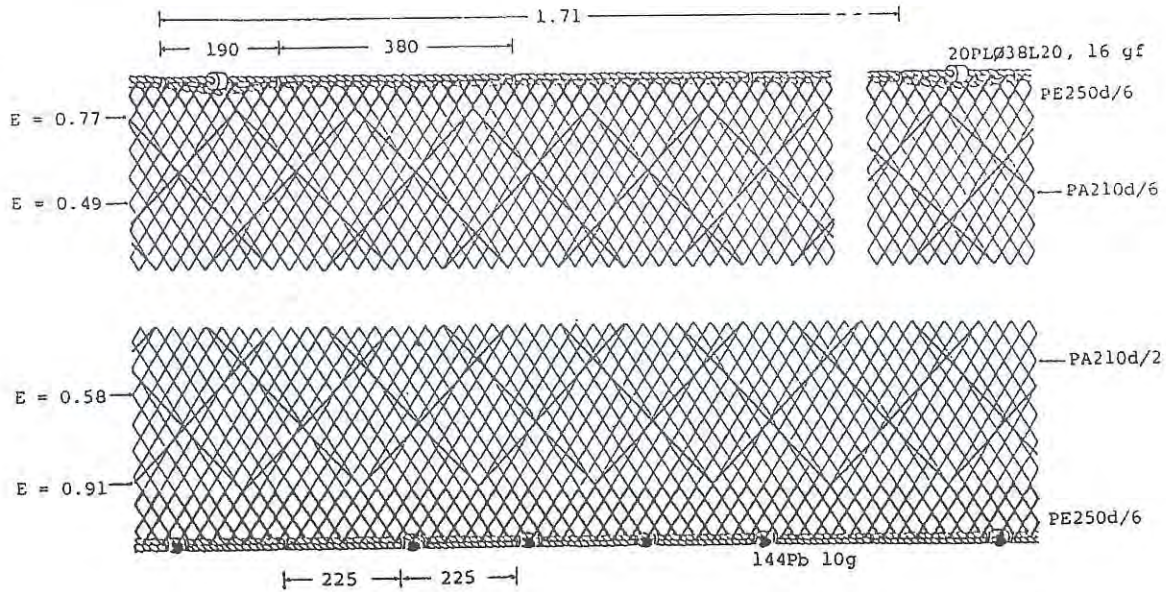
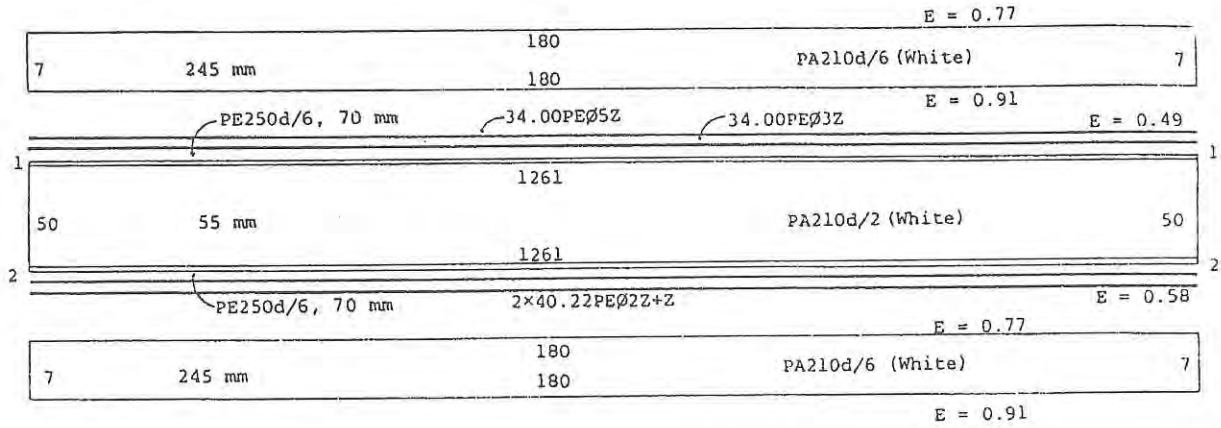
Loa 5 m

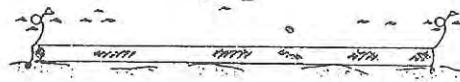
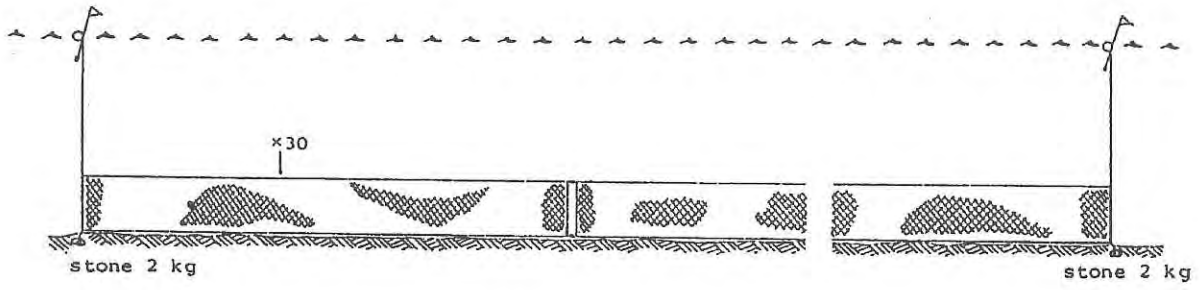
hp 4 LT

LOCATION

Huasai

Nakhon Si Thammarat





GILL NET

VESSEL

LOCATION

Trammel net

Loa

5 m

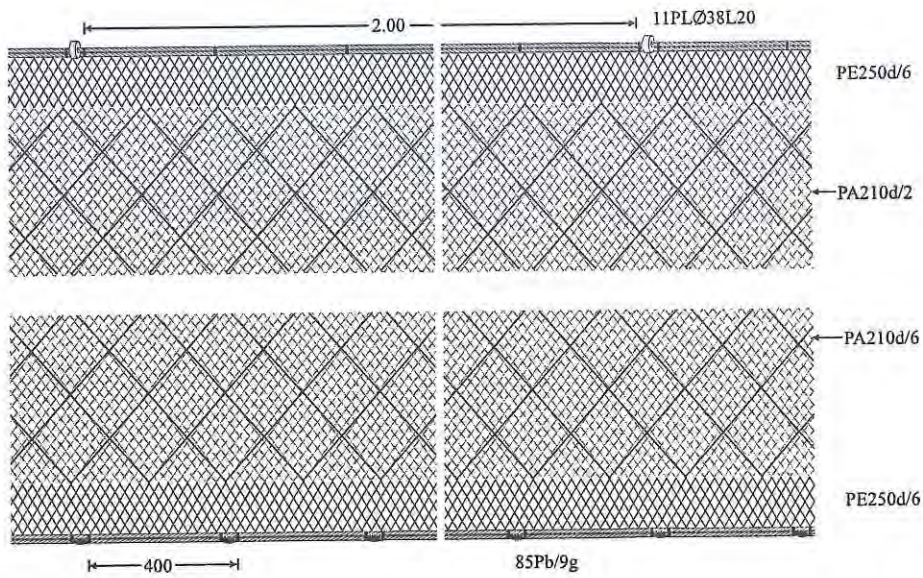
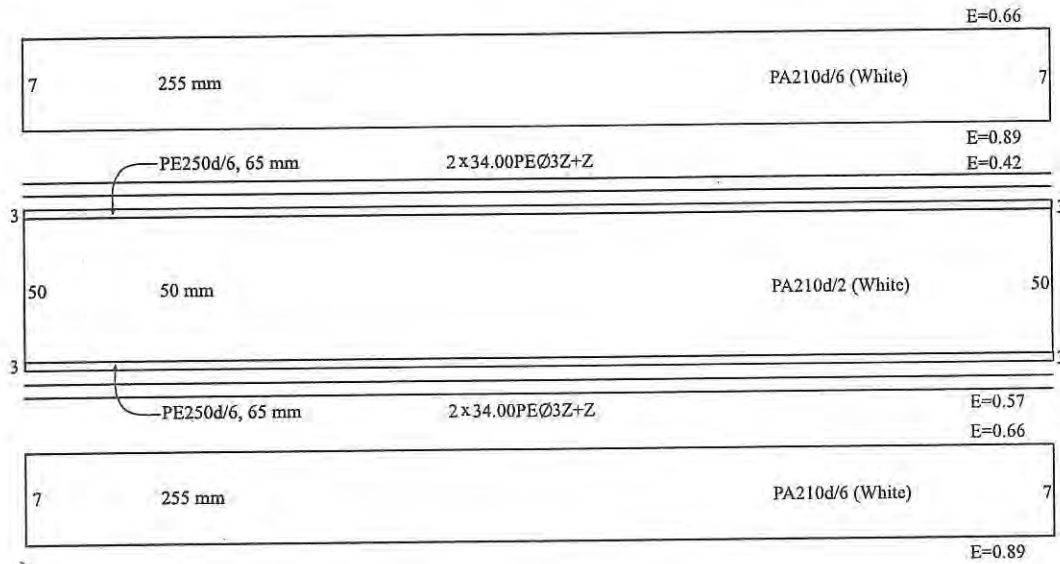
Tasala

Cuttlefish

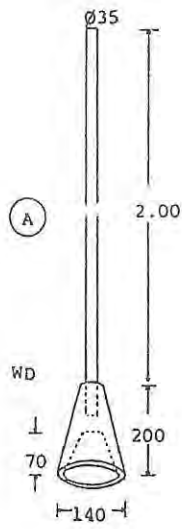
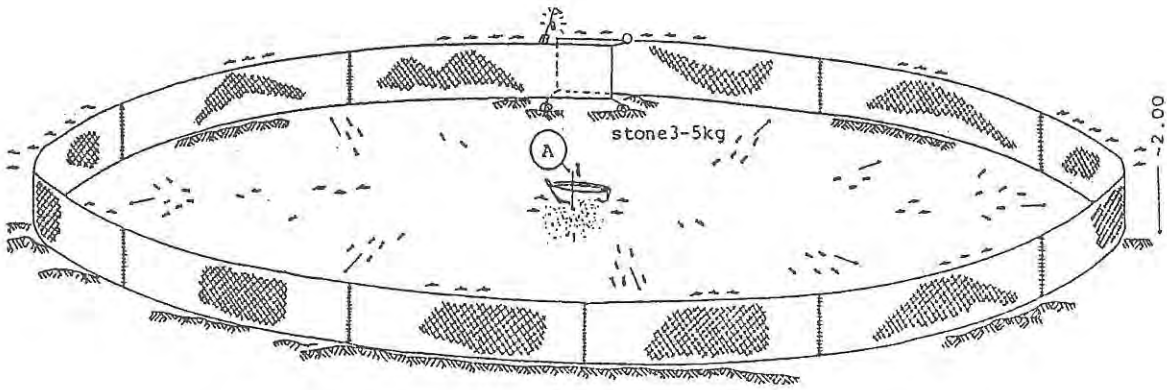
hp

13

Nakhon Sritammarat



Rv. 2002



GILL NET

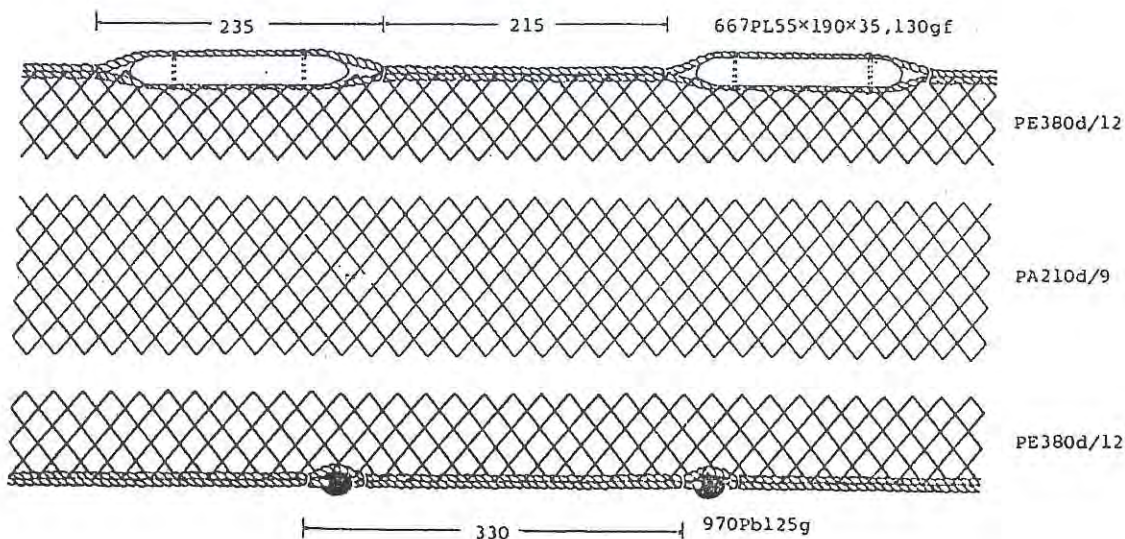
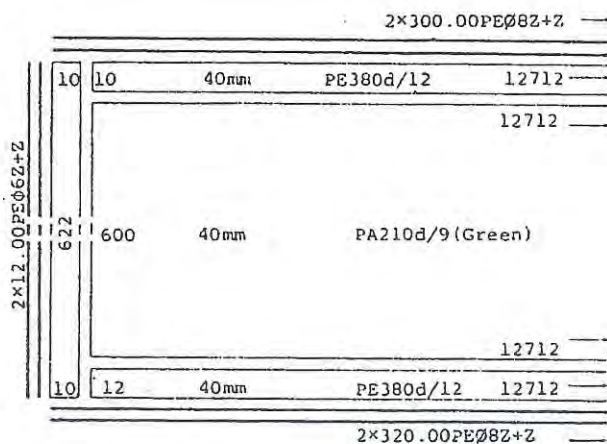
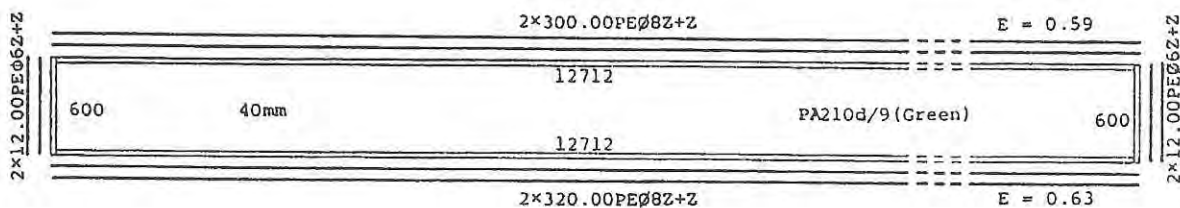
Bottom set, Encircling
Indo-Pacific mackerel

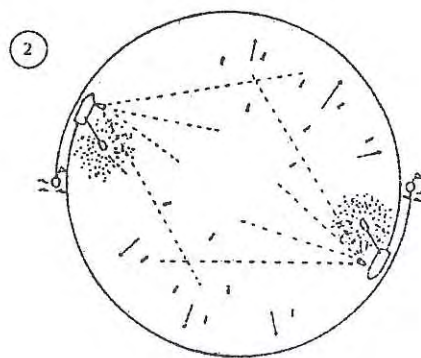
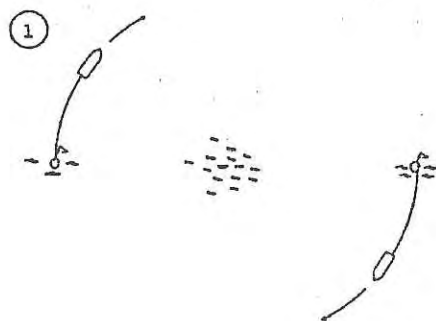
VESSEL

Loa 8 m
hp 24

LOCATION

Bangyaphlack
Samut Sakhon

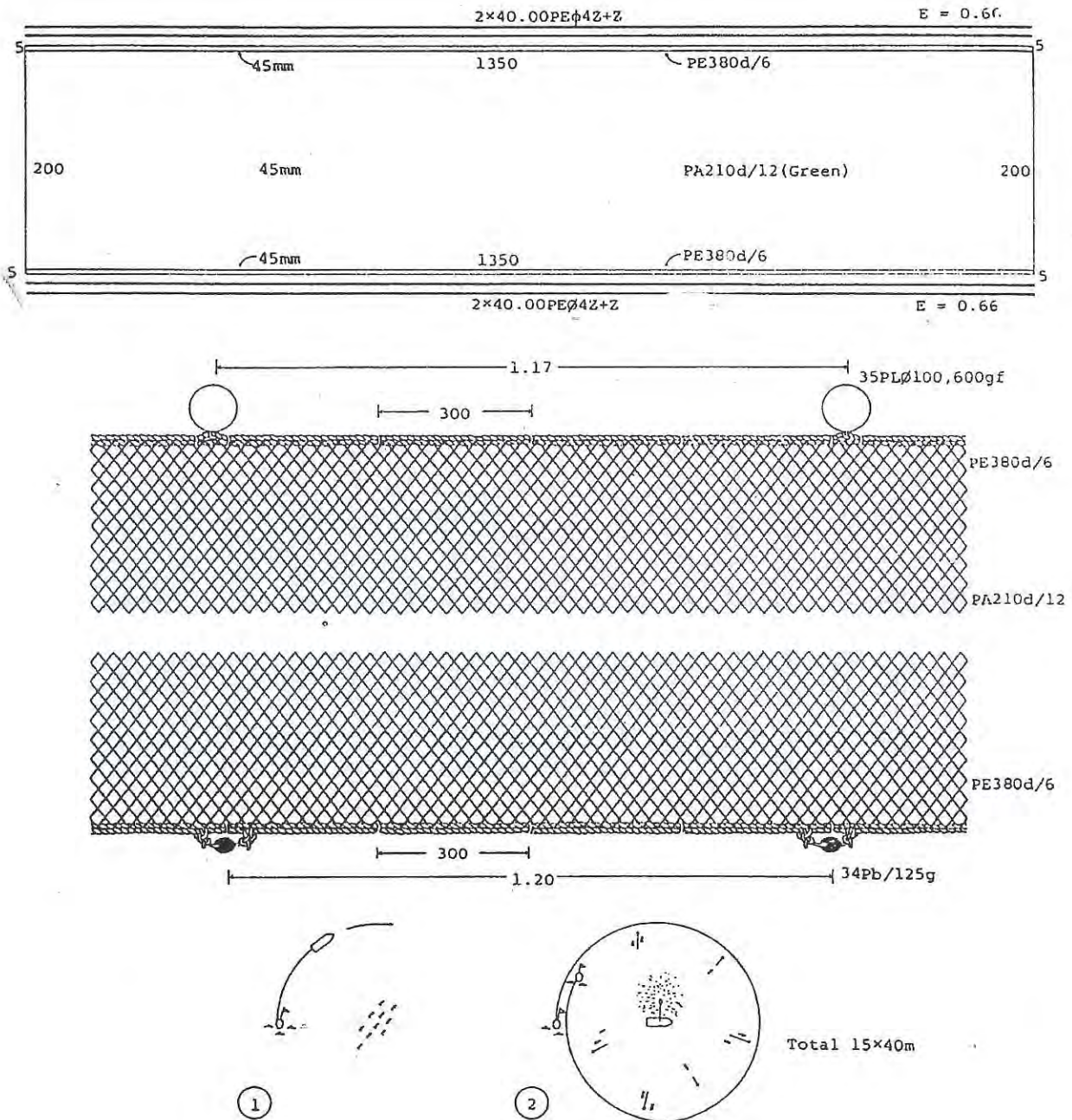




GILL NET
 Surface set, Encircling
 Indo-Pacific mackerel

VESSEL
 Loa 6 m
 hp 6

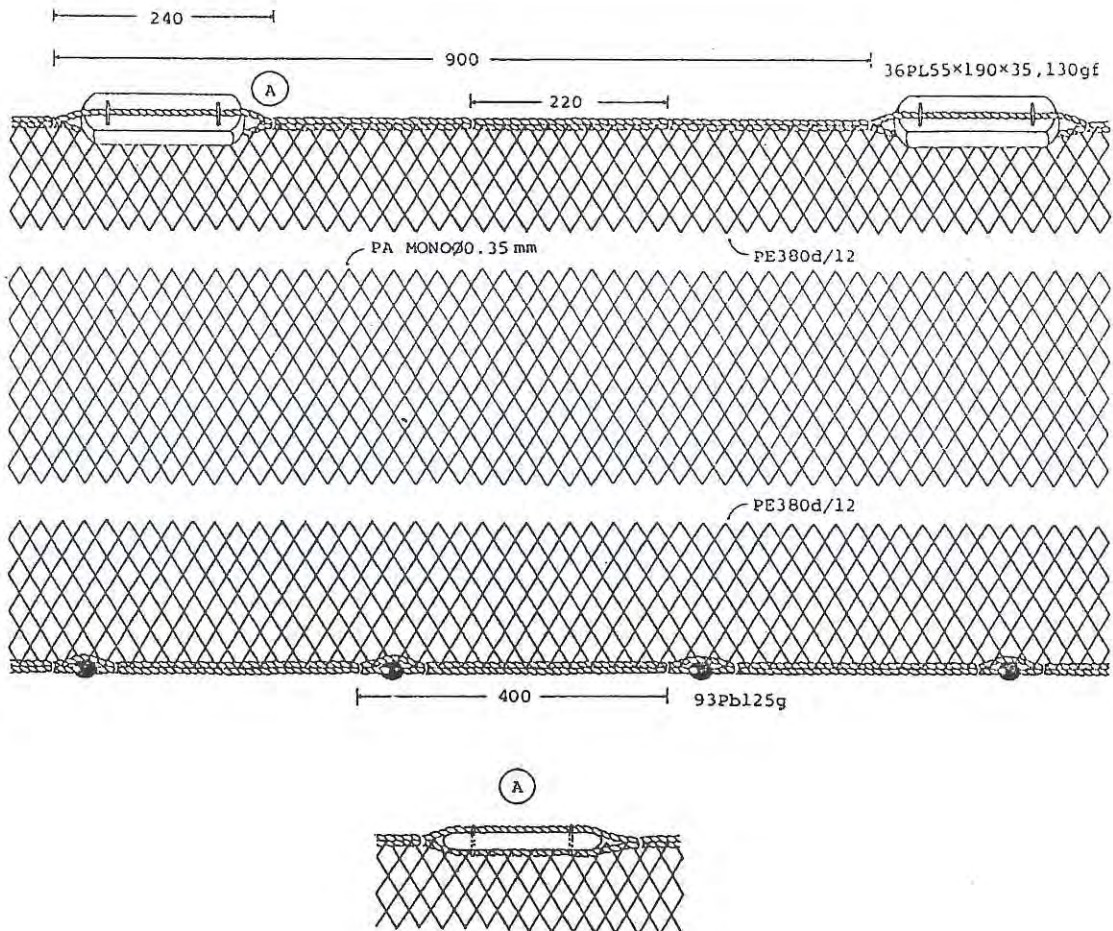
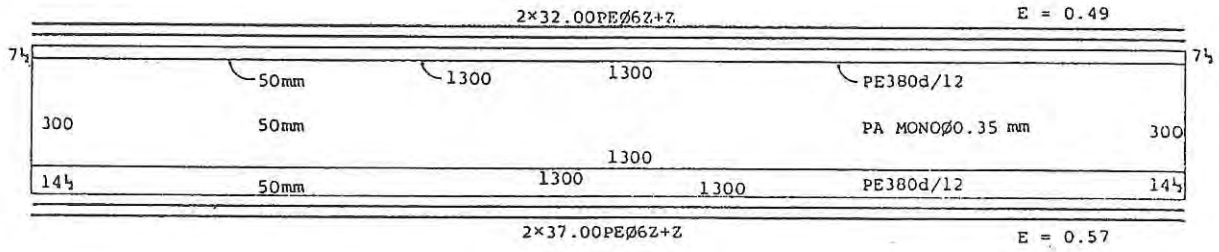
LOCATION
 Hau-hin
 Prachuap Khiri Khan

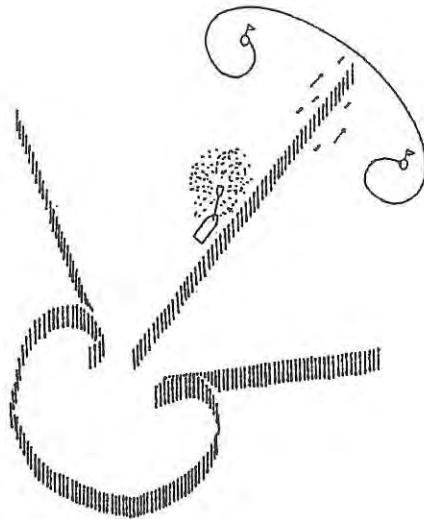
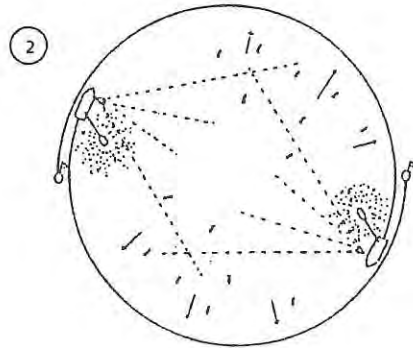
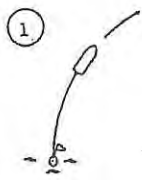
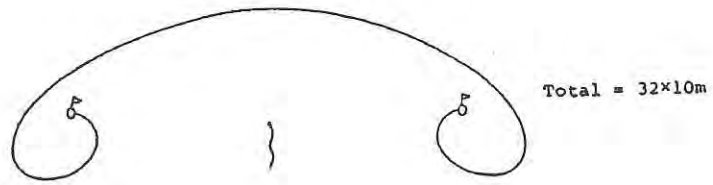


GILL NET
 Bottom set, Encircling
 Fourfinger threadfin

VESSEL
 Loa 8 m
 hp 24

LOCATION
 Bangyaprag
 Samut Sakhon





bamboo stake trap

7. TRAPS

**Masatake Okawara
Aussanee Munprasit**

**Revised by
Aussanee Munprasit
Nakaret Yasook**

CONTENTS

	Page
Trap fishing	295
Fishing gear and method	296
7.1 Mollusk trap	
7.2 Fish trap	
7.3 Crab trap	
7.4 Fyke net	
7.5 Bamboo stake trap	
7.6 Set net	
Design and specifications	301
Mollusk trap	301
<input type="checkbox"/> Sea snail	
<input type="checkbox"/> Squid	
Fish trap	304
<input type="checkbox"/> Grouper	
<input type="checkbox"/> Grouper, snapper	
Crab trap	307
<input type="checkbox"/> Mangrove crab	
<input type="checkbox"/> Blue swimming crab	
Fyke net	313
<input type="checkbox"/> Planktonic shrimp	
<input type="checkbox"/> Shrimp	
Bamboo stake trap	318
<input type="checkbox"/> Shrimp	
<input type="checkbox"/> Fish	
Set net	328
<input type="checkbox"/> Fish and squid	

TRAP FISHING

Various kinds of traps, such as squid trap, fish trap, crab trap fyke net and bamboo stake trap have traditionally been operated on a small scale in Thailand. The fishing statistical records showed a decline of catch in 1990 and 1997 these decreases were due to a drop in catch by fyke net and bamboo stake trap.

Table 7.1 Annual catches by different kinds of trap, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Fish trap	1,294	1,068	1,182	1,232	1,081	559	633	1,213
Crab trap	5,038	5,449	5,846	5,659	8,141	5,879	4,981	6,074
Fyke net	10,164	9,302	9,147	8,398	8,940	7,504	6,760	5,909
Bamboo stake trap	6,804	6,489	6,489	4,388	4,408	4,023	2,770	2,362
Squid trap	6,683	7,653	6,973	6,993	7,042	7,262	6,306	7,673
Total	29,983	29,961	29,637	26,670	29,612	25,227	21,450	23,231

(mt)

The main species of fish caught by each kind of trap in 1997 were as follows:

<u>Fish trap</u>	<u>Catch/year (mt)</u>
Cat-fish	138
Grouper	429
Red snapper	94
Others	552

Total	1,213
-------	-------

<u>Crab traps</u>	<u>Catch/year (mt)</u>
Blue swimming crab	2,465
Mangrove crab (mud crab)	3,550
Other crab	57
Others	2

Total	6,074
-------	-------

<u>Fyke net</u>	<u>Catch/year (mt)</u>
Non-penaeid prawns	3,388
Trash fish	1,027
Penaeid prawns	12
Others	1,482

Total	5,909
-------	-------

<u>Bamboo stake trap</u>	<u>Catch/year (mt)</u>
Trash-fish	1,147
Anchovy	304
Indo-Pacific mackerel	326
Indian mackerel	1
Jack, cavalla, trevallies	95
Others	489
<hr/>	
Total	2,362

<u>Shrimp trap</u>	<u>Catch/year (mt)</u>
Cuttlefish	7,673
<hr/>	
Total	7,673

The squid trap and the crab trap have a very high selectivity for species.

FISHING GEAR AND METHODS

7.1 Mollusk trap

In some parts of Thailand the traditional fish traps are now operated for squid and this kind of fishing seems to be spreading. The shape of the trap used for this purpose is semi-cylindrical. The top of the trap is covered with coconut leaves to provide shade. The trap is suspended at one-third of the water depth under the surface. A float with a bamboo pole marking the position is used to suspend the trap in water.

Then in 1997, while collapsible trap was widely used among the small scale fishermen, rectangular net case was modified to be more simple to catch sea snail (*Babylonia areolata*) with bait

7.2 Fish-trap

Fish-traps or "pots", as they are sometimes called, of various shapes and sizes are operated in Thai coastal waters. According to their shape, three main groups can be distinguished: semi-cylindrical, rectangular and cylindrical traps. The entrance to a trap is usually either funnel-shaped or wedge-shaped. Small traps are about 55 cm long, 27 cm wide and 22 cm in height or diameter. Large traps are about 200 cm long, 100 cm wide and 85 cm high.

Rattan is traditionally the most widely used material for making trap frames. This natural material is not only readily available but is also strong and pliable. This last quality makes it particularly useful for building frames of cylindrical or semi-cylindrical traps. Wood is used for frames of rectangular traps. Bamboo is another commonly used material for traps.

Nowadays, polyethylene netting is the main material for comparatively smaller traps, whereas the mesh of larger ones is made of steel wire. Polyethylene nets with rhomboid mesh have mesh-size of about 4.5 – 12.01 cm. The wire netting normally has hexagonal meshes, whose one leg (bar) is about 2.0 – 2.5 cm long.

As many as 120 traps can be shot in the course of one operation. Each trap has its own float and float-line, and each is shot separately from the others. Small-sized traps are usually baited and are hauled daily. Large traps, on the other hand, do not contain any bait and are kept on the bottom for several days continuously. Sometimes the float-line is made shorter than the water depth so that it does not show on the water surface. In this way the trap is more likely to remain in position until its owner returns to look for it. In such a case fisherman must know the exact setting position of their traps, by means of the bearings of objects on land.

The traps which have a short float-line and submerged floats are hauled by using a special method. When the boat comes near the place where the trap is set, a fairly long line, about 50 m long and with sinkers attached at both ends, is shot to surround the float-line of the trap. The float of the trap is large enough to be hooked by this surrounding long line, which is then used to pull the trap to the surface.

7.3 Crab-trap

The crab-trap used widely in Thailand has a cylindrical body narrowing into a cone at one end, and with an entrance at the other end. The trap can either have a single entrance, or a two entrances, one of them in the middle of the trap. The shape of entrance is always funnel-like. Crab traps are made of split bamboo. The length of the trap is about 75-100 cm, with the maximum diameter of the cylindrical part about 26-28 cm. The diameter of entrance at the narrowest point is about 8-9 cm wide gaps. A piece of fish or some minced fish is used as bait. A bamboo skewer with bait is placed in the center of the trap through two small loops which are provided for that purpose. About 20 traps are attached on one set of main line at 5 m intervals. The traps are hauled once or twice a day.

In 1997, while the traditional crab traps are still being used in the rivers and mangrove area, the collapsible type is widely used in the sea, target on blue swimming crab. This collapsible crab trap is box-shape, made of iron or aluminum frame and covered with dark color net. Trap size is 300 mm X 450 mm X 20 mm with two horizontal entrance at both ends. Fishes are used as bait, fixed at the center of the trap. Some large boats could operate up to 5,000 traps in one haul (time)

7.4 Fyke-net

There are two types of fyke-nets: mobile and stationary ones. A mobile fyke-net is anchored in the fishing ground for the duration of a fishing operation, whereas the frame of a stationary net remains in position all through its useful life.

A fyke-net is usually operated in shallow waters, 3-6 meters deep, to catch shrimps, planktonic shrimp and miscellaneous fish. The net is cone-shaped, similar in construction to a castnet without a sinker. The size of the opening varies between 3 x 5 and 6 x 10 meters for the net opening, and 15 to 30 meters in length. The mesh-size also varies, even in different parts of the same net. Generally, the cod-end of the net is constructed of 2 x 2 mm mesh-size polyethylene minnow netting, while the rest of the net has a larger mesh-size.

The wing fyke-net for planktonic shrimp is a little different from other fyke-nets. This small mobile gear has wings which other fyke-nets do not have, and is set in very shallow waters (1-3 m depth) with two bamboo or wooden poles. The whole set is made of minnow netting which is normally employed only for the cod-end of a larger fyke-net.

Fyke-nets are operated either by day or by night, all the year round, usually from after the high tide to the lowest tide. The cod-end is hauled frequently to collect the catch. The gear can be found in many places in Thailand, for example mobile fyke-nets in Paknam, Samut Prakan province, the wing fyke-net for planktonic shrimp at Samut Songkhram and Pak Nakhon in Nakhon Si Thammarat province, and stationary fyke-nets in the Songkhla lagoon and Ban Khokkai, Pangnga.

7.5 Bamboo stake trap

The term 'bamboo stake trap' includes a variety of rather large and complex stationary fishing gears used in coastal waters up to 20 meters depth. A common characteristic of all such gears, irrespective of size, is that they consist of three parts: leaders, playground and cod-end. Leaders, whose purpose is to guide the fish in to the trap, are made of bamboo stakes, netting or branches. There are 2-5 leaders in a set. Their length varies from 10 to 800 meters, depending on the size of trap. The leaders guide the fish into the playground, which is a C-shaped or triangular enclosure constructed of bamboo or wooden stakes driven into the sea bed, with or without the polyethylene netting cover. The exit from the playground takes the fish into the cod-end, from where they are scooped or otherwise removed. The cod-end is semicircular, with a bamboo or palm-tree stake frame and polyethylene or chicken-wire netting. A funnel-shaped, no-return entrance prevents the fish from escaping. Some cod-ends have a part which can be hauled, to collect the catch.

Bamboo stake traps are usually positioned so that their main leader (the longest one) is perpendicular to the shore, and the opening of the trap faces the current at the ebb-tide.

According to the method of operation, bamboo stake traps can be classified as follows:

- Ebb-tide bamboo stake trap,
- Bamboo stake trap with net operation, and
- Bamboo stake trap with a removable bag-net.

The ebb-tide bamboo stake trap is a small-scale gear, usually set on a sand-bar at the mouth of a river, in up to 5 m water depth. The leaders are 10-400 m long, made of polyethylene netting. The play-ground is from 2.5 x 4 to 8 x 10 m large. The size of the cod-end is between 1.5 x 2.5 and 2 x 3 m. Both the playground and the cod-end are covered with polyethylene netting. The height of the trap is 3 to 5 meters. The catch, which includes shrimps, cuttlefish, anchovies and trash-fish, is taken out by a scoop-net daily at spring-tide and once every few days at neap-tide. Sometimes a luring lamp is used at the cod-end to attract shrimps and squid. The gear is found in Samut Sakhon, Samut Songkhram and Krabi provinces.

The bamboo stake trap with net operation is a large-scale gear, used in coastal waters with 5-20 m depth. It has four or five bamboo stake leaders, 100-300 m long. There is a small playground (this is sometimes omitted) and a large cod-end, between 16 x 25 to 25 x 40 m in size, covered with polyethylene netting and chicken-wire netting at the bottom. A rectangular purse-seine is used for fishing operation. This net has 8 mm mesh-size, nylon 210 d/5 rachel netting. A long pole serves to push the net so that it surrounds the fish in the cod-end. The net operation is carried out twice daily, at high and low tide. The catch consists mainly of Indo-Pacific mackerel, anchovies, pony-fish, croakers and trash-fish. The gear used to be very popular in the past, and can still be found at Leam Than in Chon Buri province.

The bamboo stake trap with a removable bag-net is the largest stationary trap. Its construction differs from the bamboo stake trap with net operation only in the cod-end. In the present case, the cod-end is a C-shaped enclosure made of coconut tree-trunks, and a removable bag-net is set in the cod-end. The size of the cod-end is 30 x 50 meters. Four bamboo stake leaders, 700-750 m long, stretch between the shore and the playground of the net. The playground covers an area of 30 x 40 m, and the funnel-shaped entrance to the cod-end is 2.5 m wide. The trap is set at about 10-20 meters depth. The bag-net, which is made of 10 mm mesh-size rachel netting, is hung inside the cod-end enclosure in such a way that its upper edge is fastened to the top of the poles and its bottom edge is held down by ropes passing through pulleys at the bottom of each pole. At the entrance to the cod-end, the net is stretched on six bamboo poles by means of 10-15 iron rings and weighted down with cement sinkers. The bag net with catch is lifted when required. The catch are anchovies, Indo-Pacific mackerel, squid etc. The fishing season is between April and January, in waters off Samut Sakhon and Samut Songkhram.

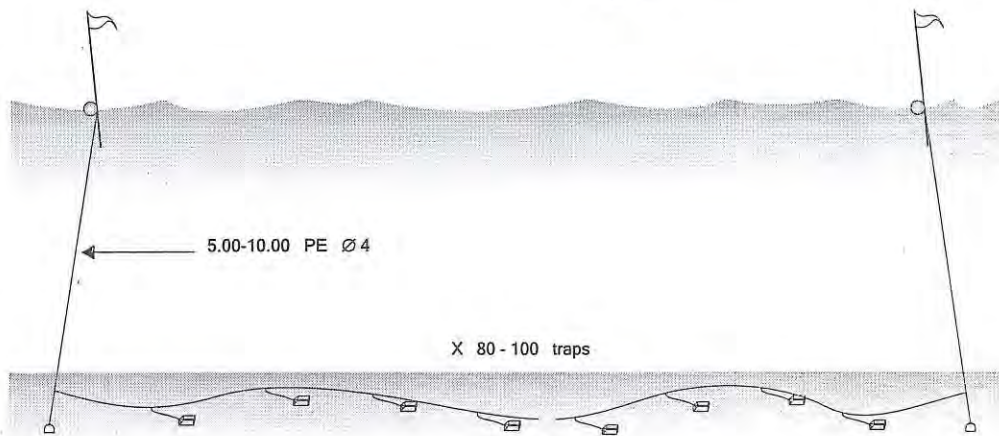
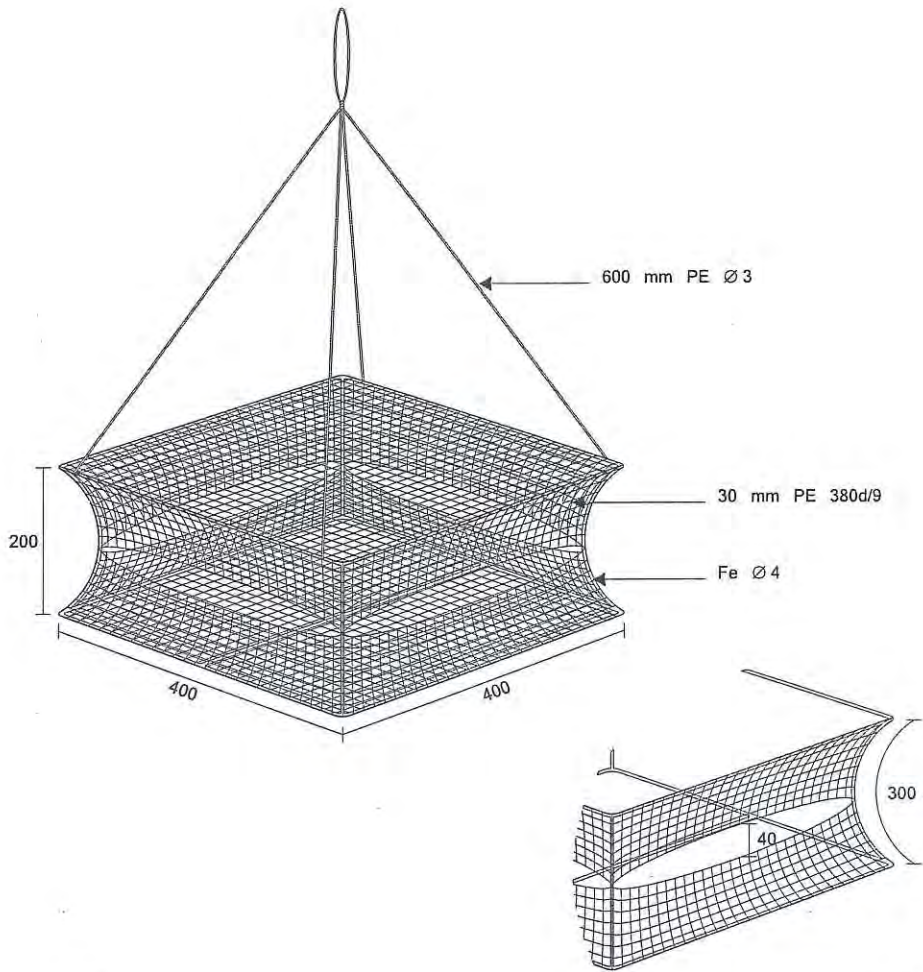
7.6 Set-Net

Set-Net is a kind of stationary fishing gear its function and catching mechanism is the same as bamboo stake trap but different in the construction. This gear is original from Japan, its one of the traditional fishing which its still a common used in Japan at present. It had been introduced to Thailand 2 times first in 1950, Otoshi-ami, Kangkaku-ami or maru-ami had been tried in Thailand at Koh Samet, Rayong province by Commander Sawang Chareonphol. And the second in 1983, shallow water set-net name Choko-ami had been tried again at Koh Samet, by Ban Phe Marine Fisheries Station. But those two trial were not satisfied by the local fishermen. At that time due to the risk fishing ground and others active fishing gears can gain more money and more easy to work with them for the fishermen.

Then, in 2003 Otoshi-ami was introduced to Thai fishermen again. At that moment, the decline of coastal fisheries resource was occurring everywhere both in the Gulf of Thailand and Andaman Sea. Introduction of Set-Net fishing at that time has objectives to develop coastal fisheries management and recreation of the coastal fisheries resources and their fishing ground.

Otoshi-ami type of 45 meters width, 130 meters in length with 250 meters long of leader net was introduced to 13 meter depth of water of Hard Mae Rumpheung fishing ground. It was operated in day-time by groups of fishermen from small scale fisherman groups of the area. The small scale fishermen were trained for the basic knowledge of fisheries cooperative mechanism from their own practical work in this pilot project. Fishing operation is done by 9-11 fishermen with 3-4 small-scale fishing boats (6 meters long). Catch are mackerel, sardine, travelly, squid and miscellaneous fishes.

TRAP	VESSEL		LOCATION
Sea snail trap	Loa	7 m	Cha am
Sea snail	hp	16	<u>Phetchaburi</u>

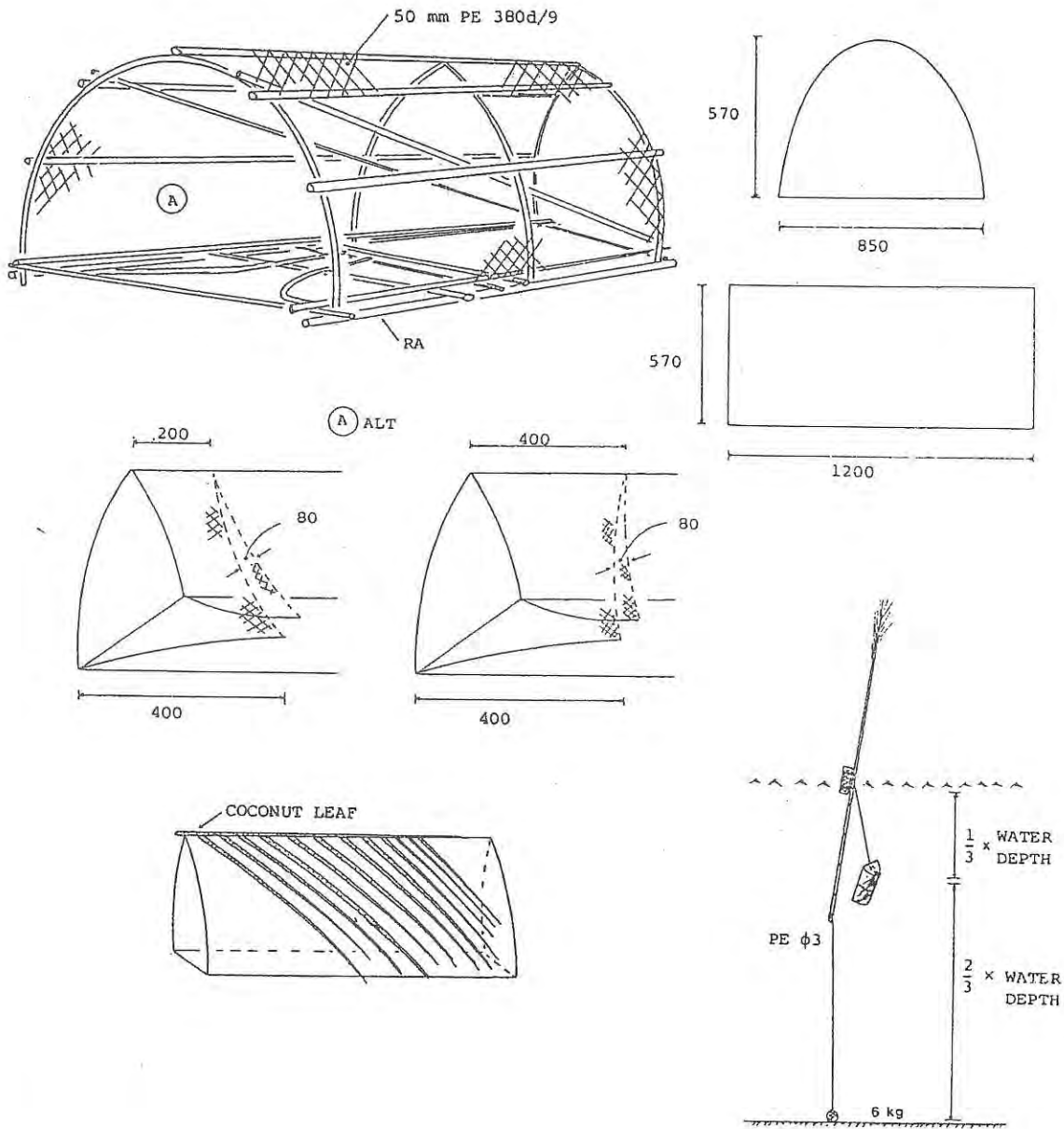


Rv. 2002

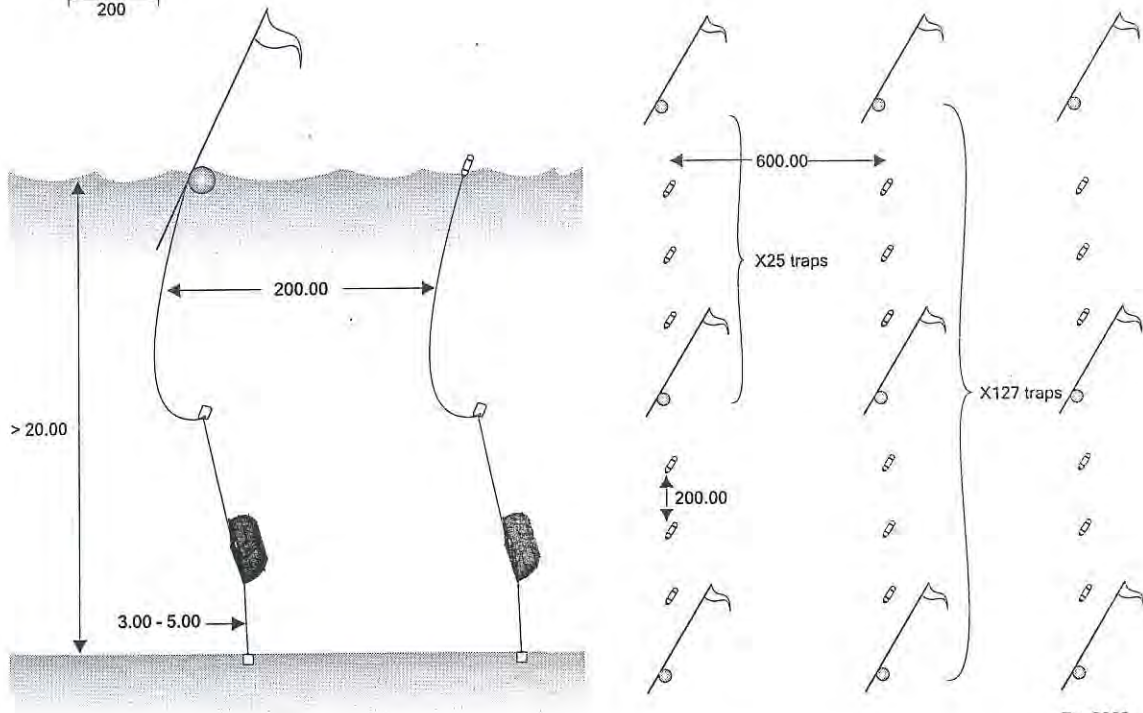
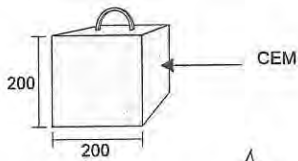
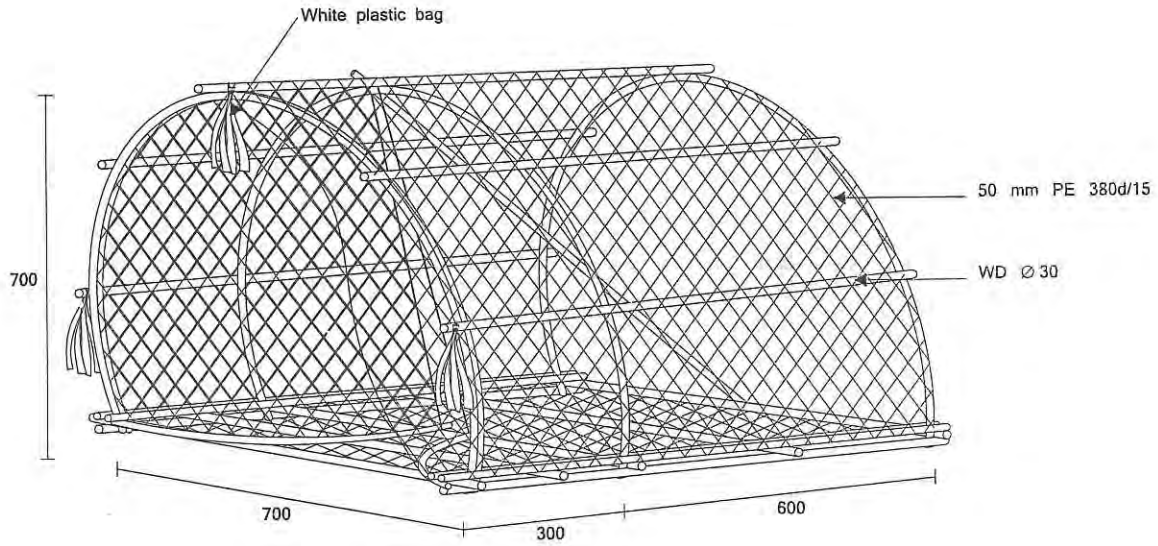
TRAP
Squid trap
Squid

VESSEL
16 hp

LOCATION
Khungkraben
Chanfāburi



TRAP	VESSEL	LOCATION
Squid trap	Loa 17 m	Ban Laem
Squid	hp 315	Phetchaburi

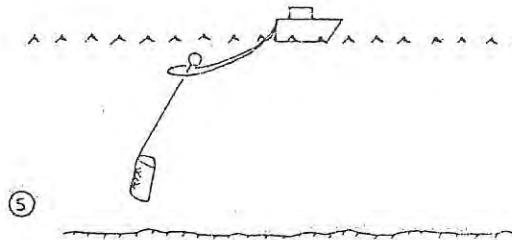
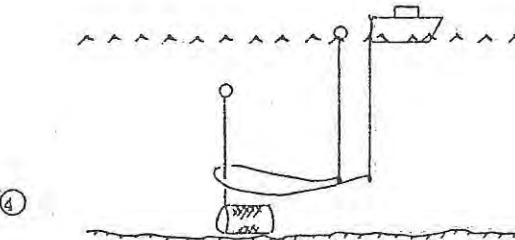
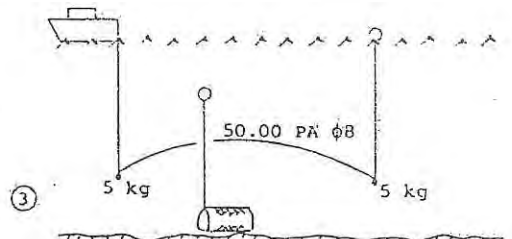
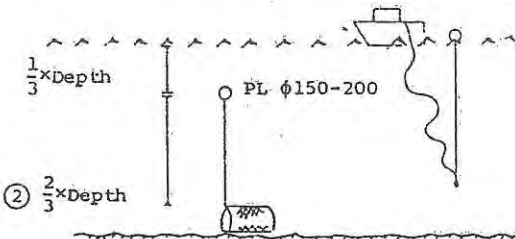
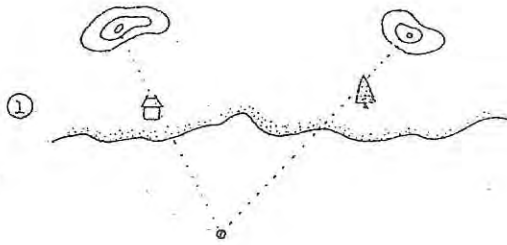
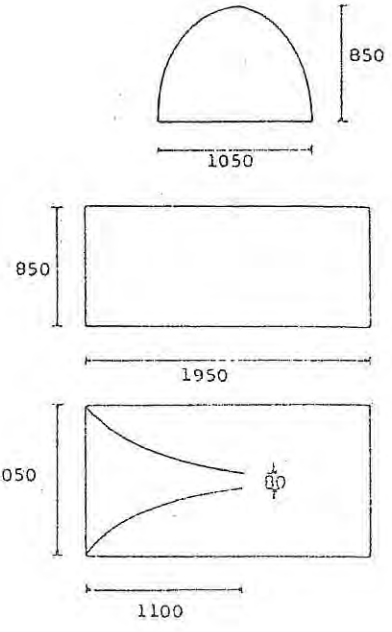
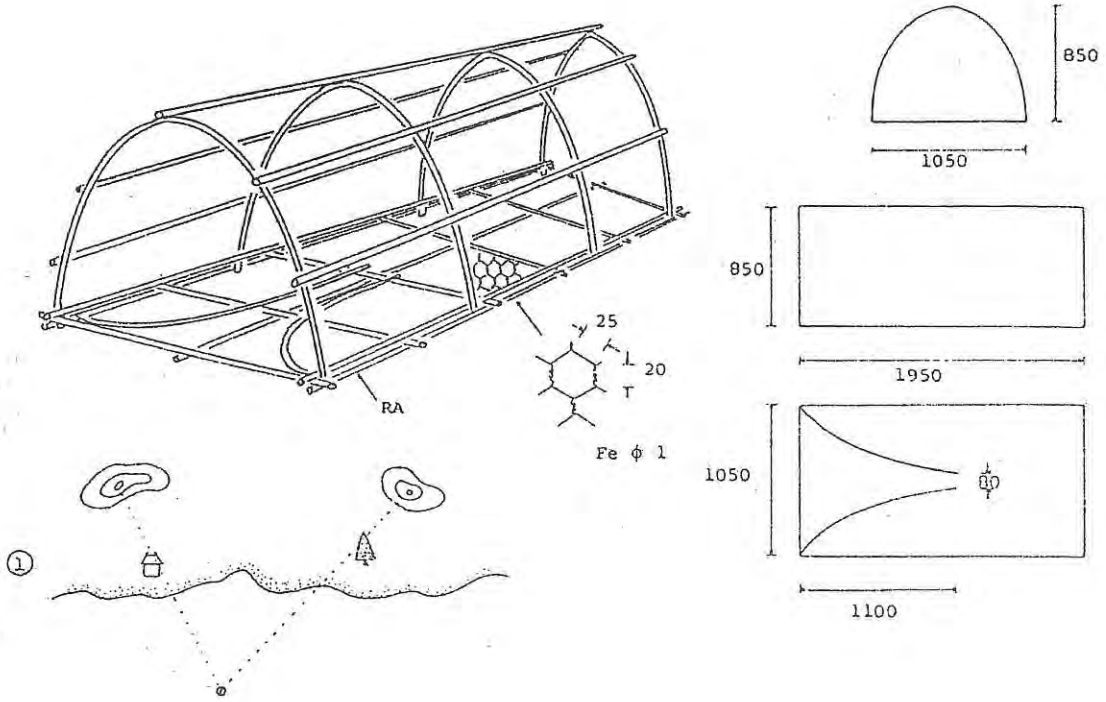


Rv. 2002

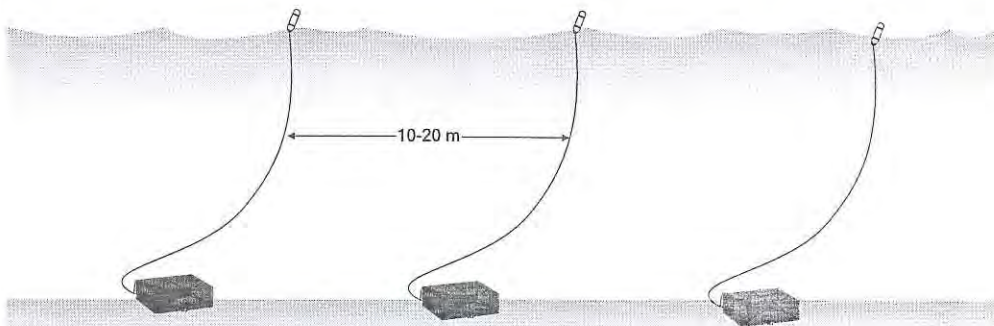
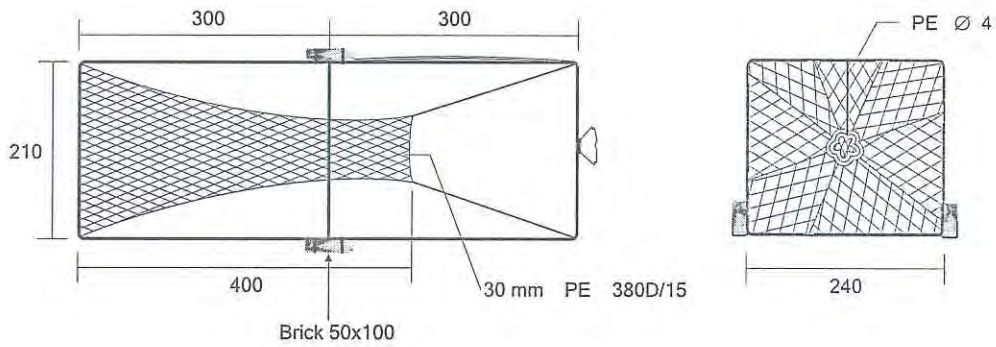
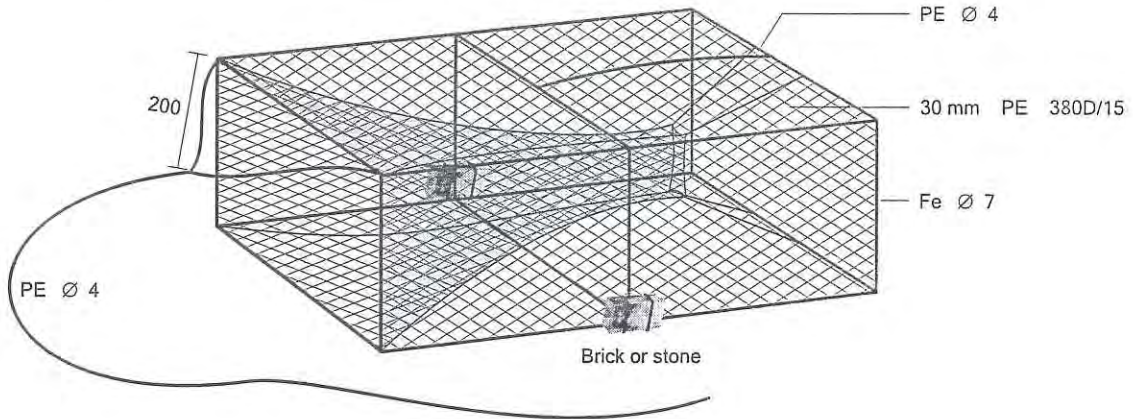
TRAP
Fish trap
Grouper, Snapper

VESSEL
Loa 8 m
hp 6

LOCATION
Ao Makhamom
Rayong



TRAP	VESSEL		LOCATION
Fish trap	Loa	10 m	Ranong
Grouper	hp	10 LT	<u>Ranong</u>

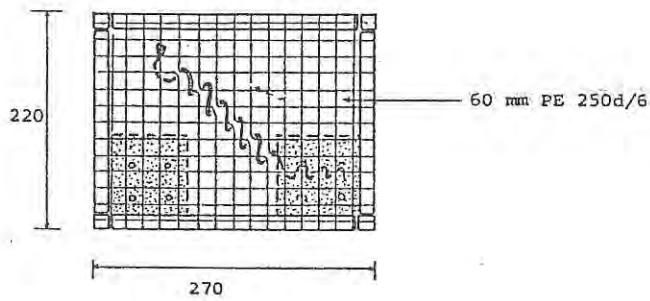
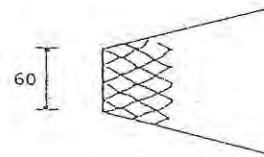
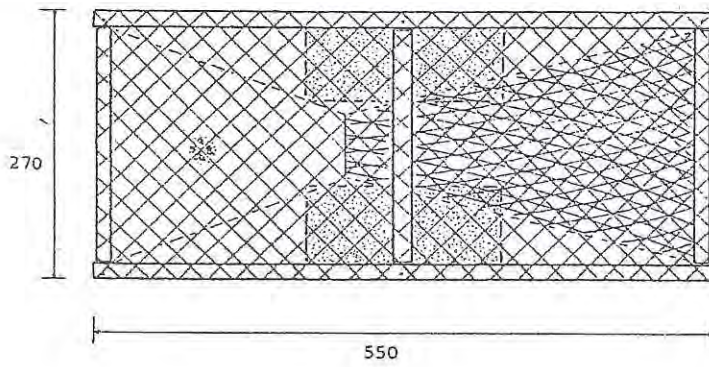
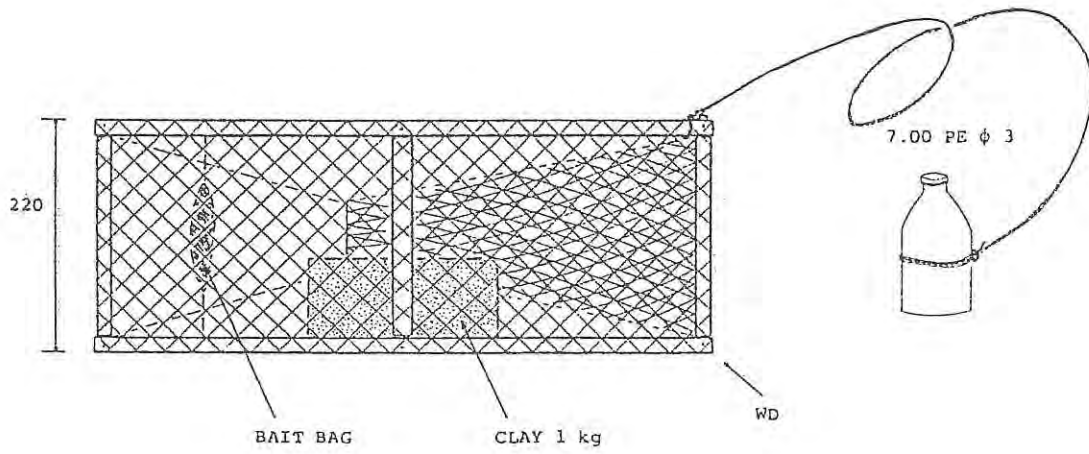


Rv. 2002

TRAP
Fish trap
Grouper

VESSEL
Loa 8 m

LOCATION
Ban Pakbara
Satun



TRAP

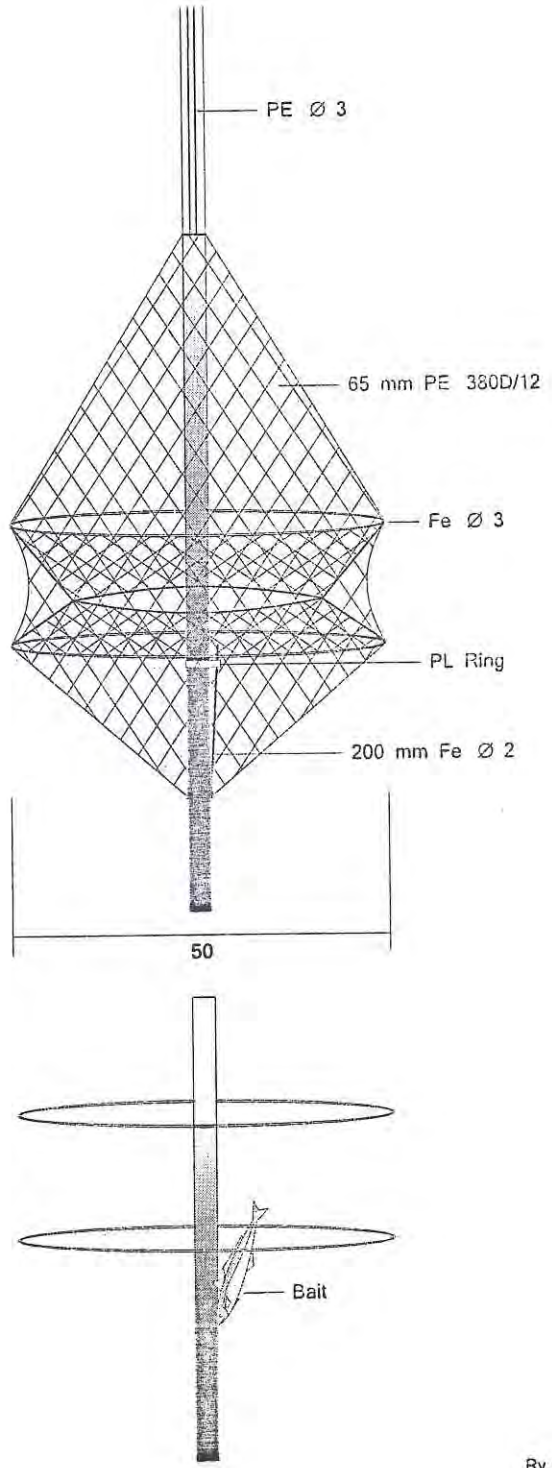
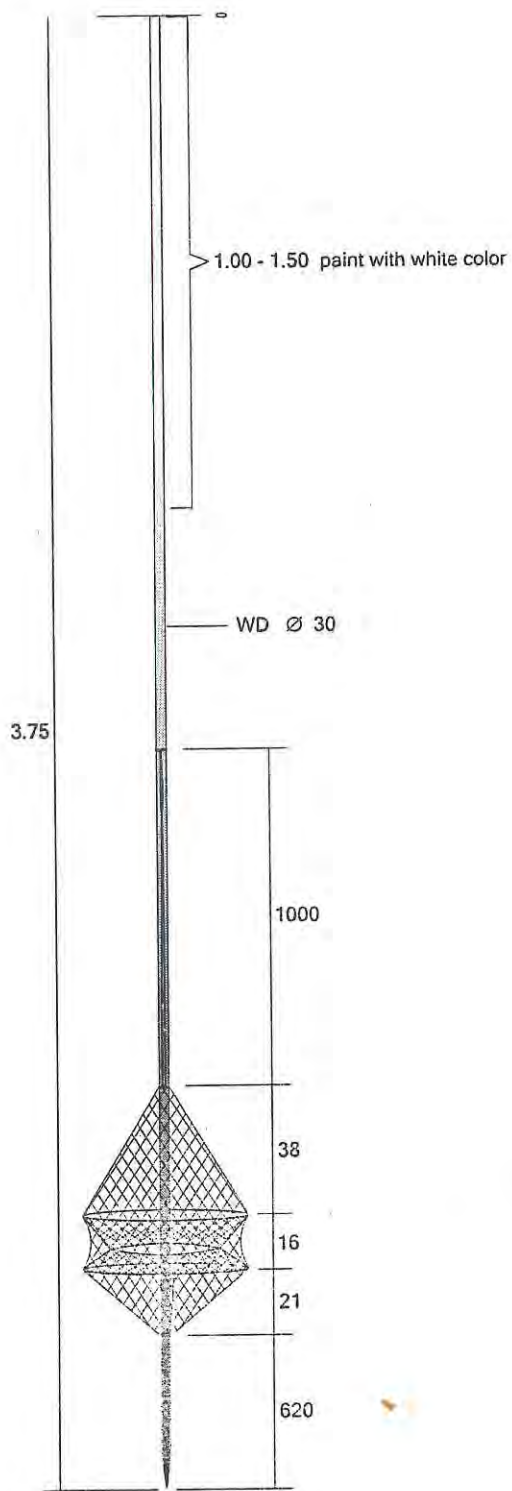
Crab trap
Mangrove crab

VESSEL

Loa 8.5 m
hp 11 LT

LOCATION

Ban Pak Nakhon
Nakhon Si Thammarat

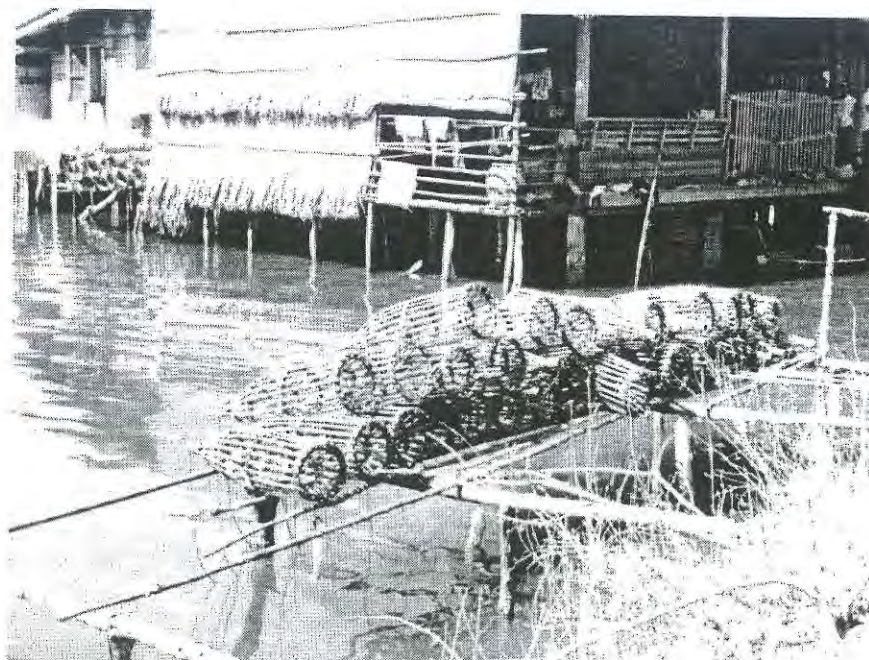
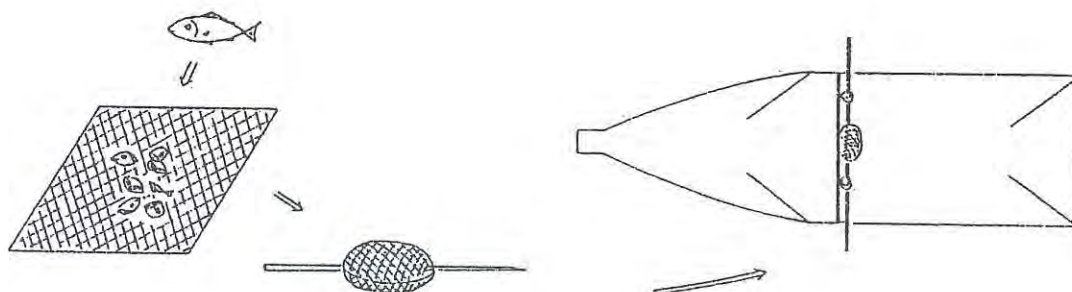
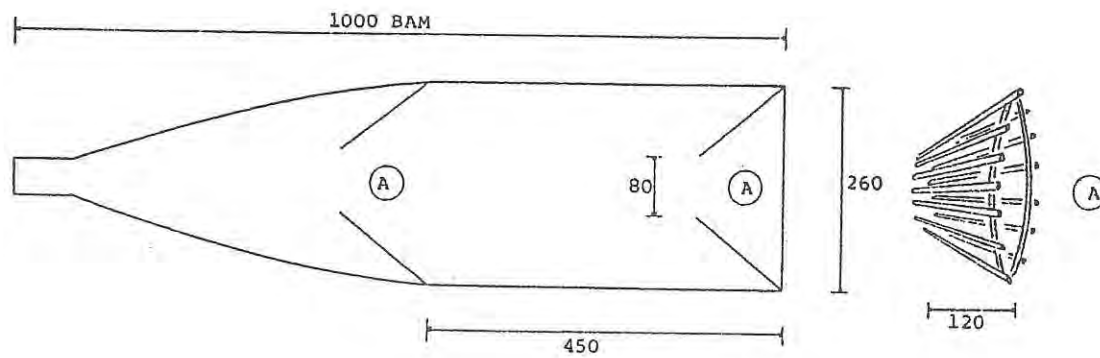


Rv. 2002

TRAP
Crab trap
Mangrove crab

VESSEL
Loa -

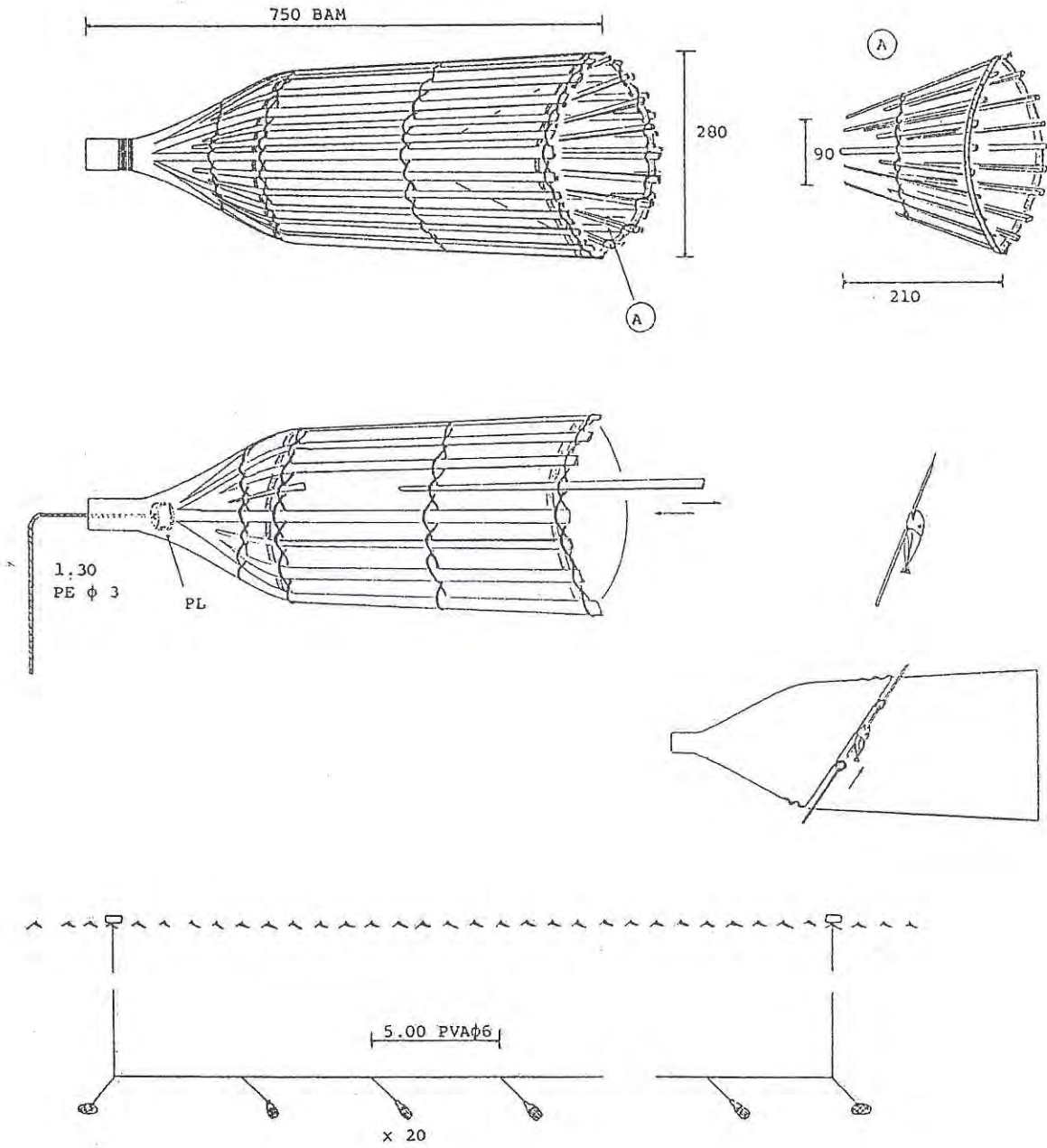
LOCATION
Khao Niwes
Ranong



TRAP
Crab trap
Mangrove crab

VESSEL
Loa 5 m

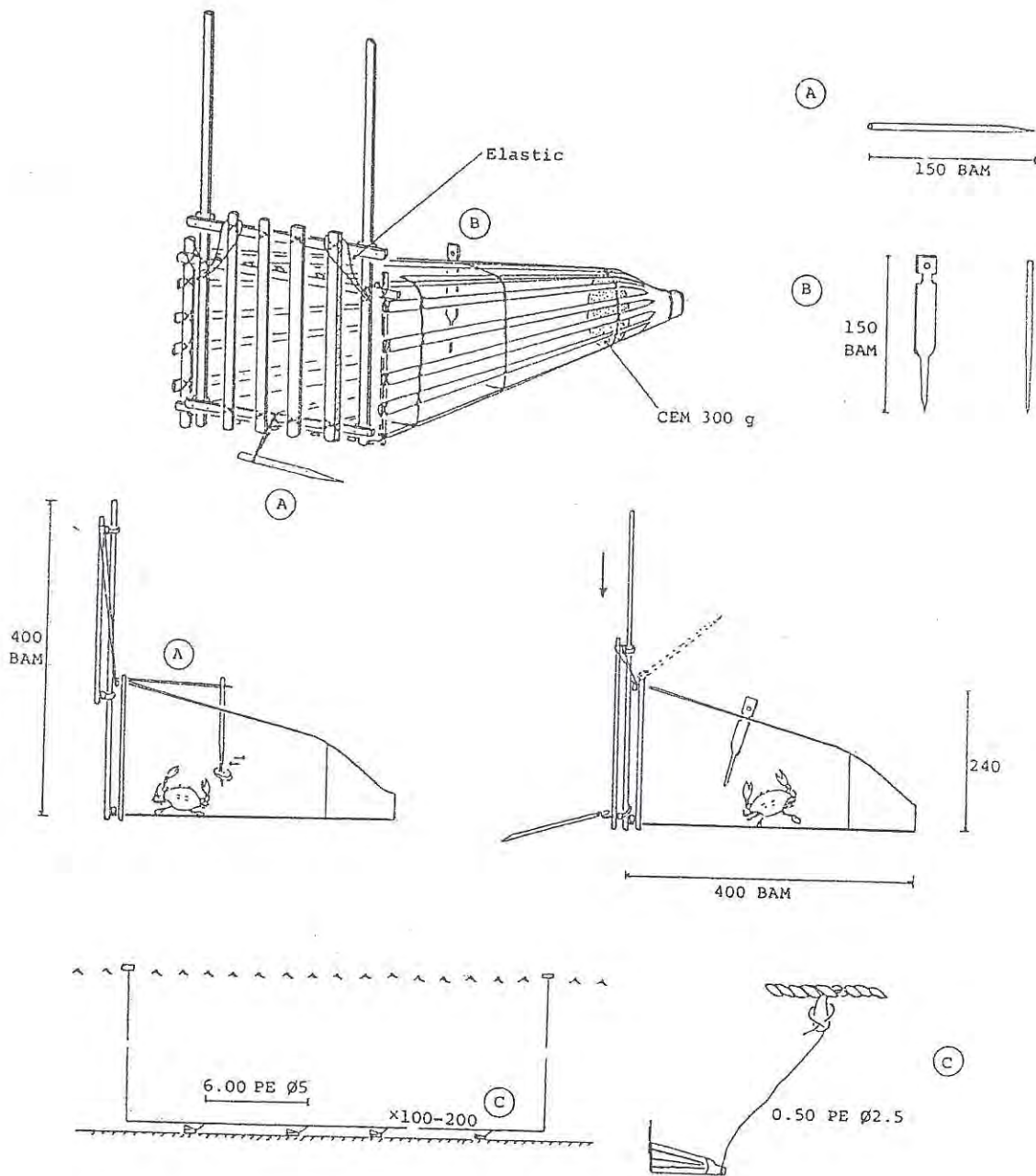
LOCATION
Hard Amara
Samut Prakarn



TRAP
Crab trap
Mangrove crab

VESSEL
Loa 6 m
hp 4 LT

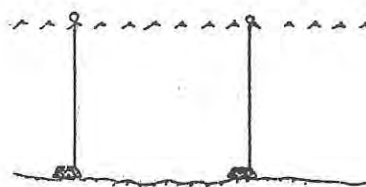
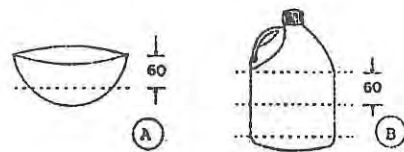
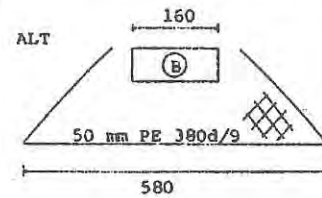
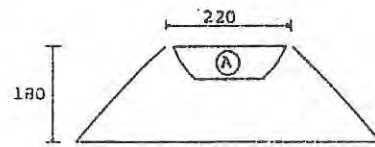
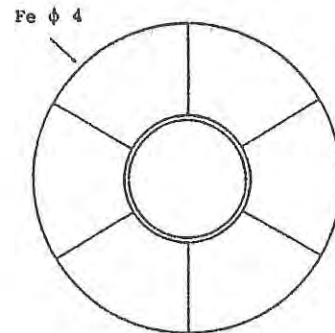
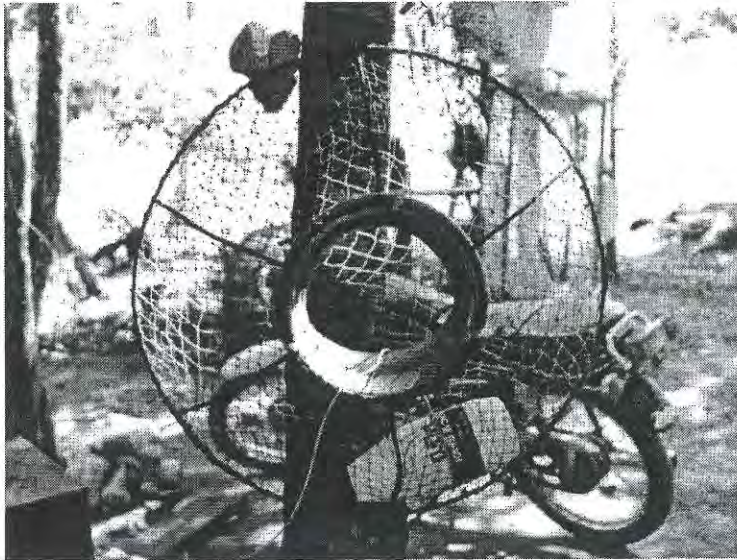
LOCATION
Ban Pak Nakhon
Nakhon Si Thammarat



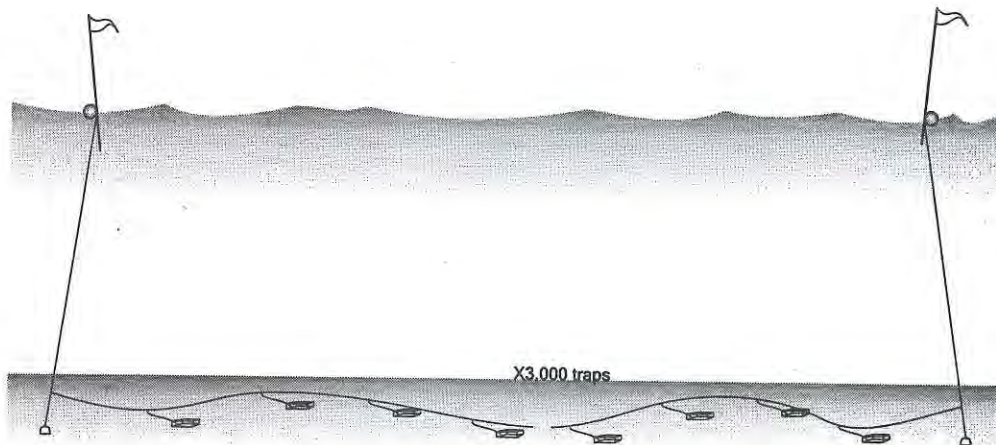
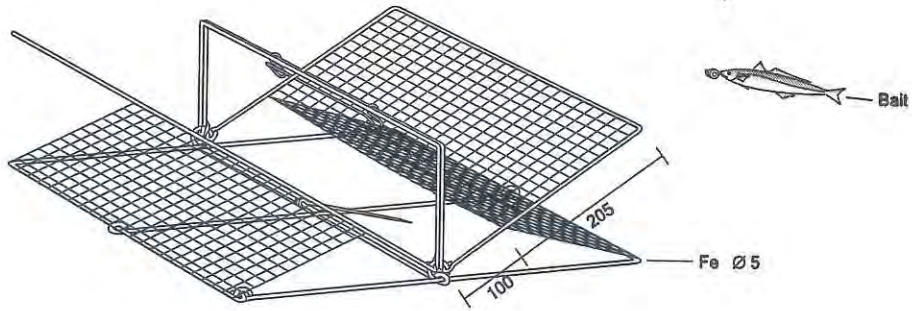
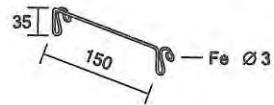
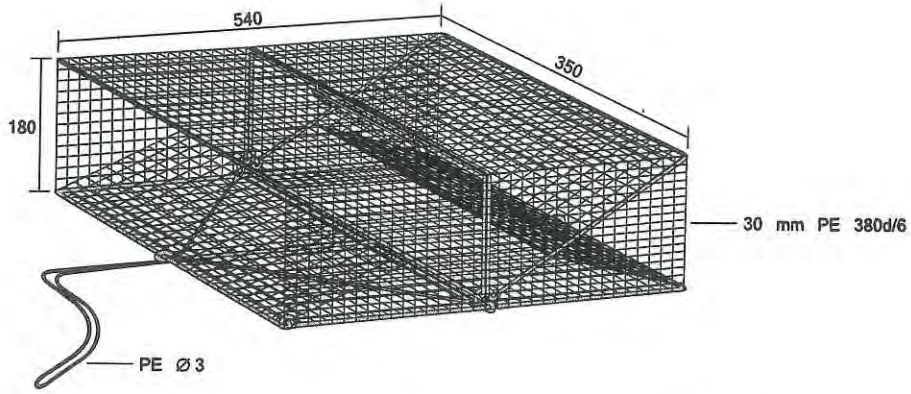
TRAP
Crab trap
Blue swimming crab

VESSEL
Loa -

LOCATION
Khungkraben
Chanthaburi



TRAP	VESSEL		LOCATION
Collapsible crab trap	Loa	17 m	Ban Phe
Blue swimming crab	hp	235	Rayong



Rv. 2002

TRAP

Fykenet, mobile fykenet

Pong Kuier

Planktonic shrimp

VESSEL

Loa 6 m

hp 5 LT

LOCATION

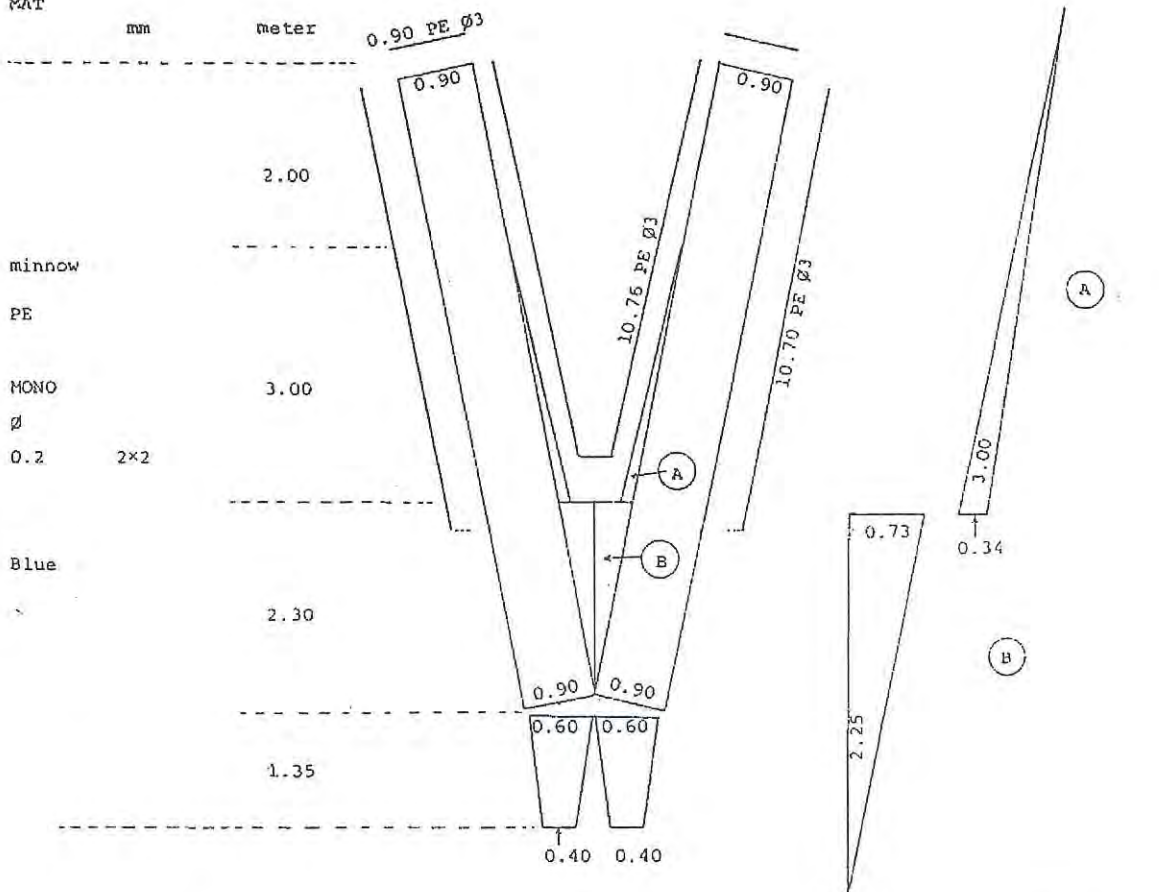
Ban khlong khon

Samut Songkhram

MAT

mm

meter



minnow

PE

MONO

Ø

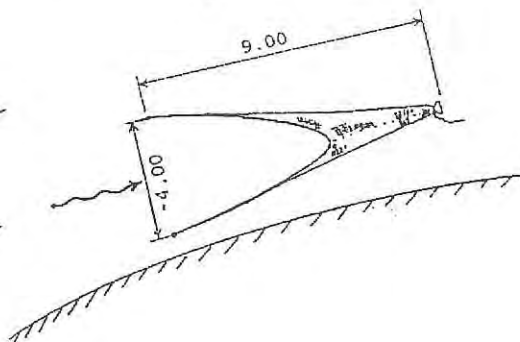
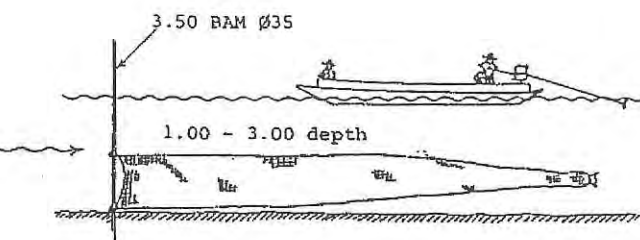
0.2

2x2

Blue

2.30

1.35



TRAP

Wing fyke net
Rawu sailman

VESSEL

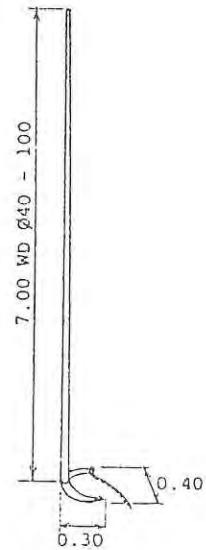
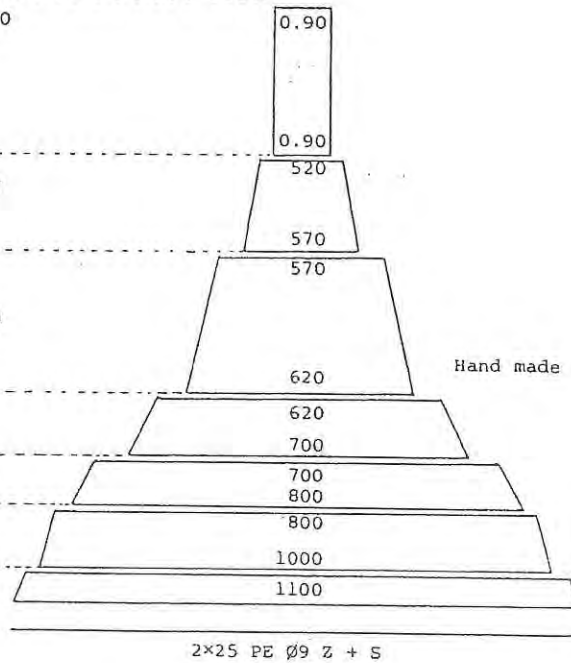
Loa 6 m
 hp 4 LT

LOCATION

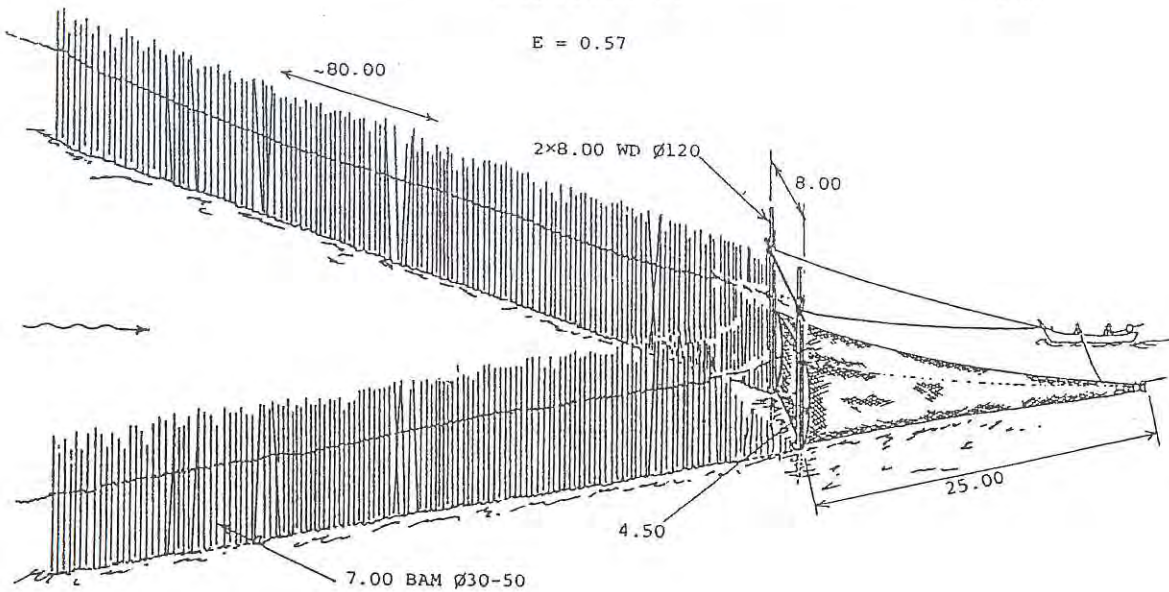
Ban Khokkhai
Phangnga

Shrimp, Brackish water fish

MAT	mm	
Denier minnow	2x2	7.00
PE		
Ø0.2		
Blue		
PE		
250/3	15	267
Green		
PE		
380/4	20	300
Green		
PE		
380/4	30	83
Green	40	50
PE		
380/6	40	63
PE 380/9	40	25



$E = 0.57$



TRAP

Fyke net
Pong pang

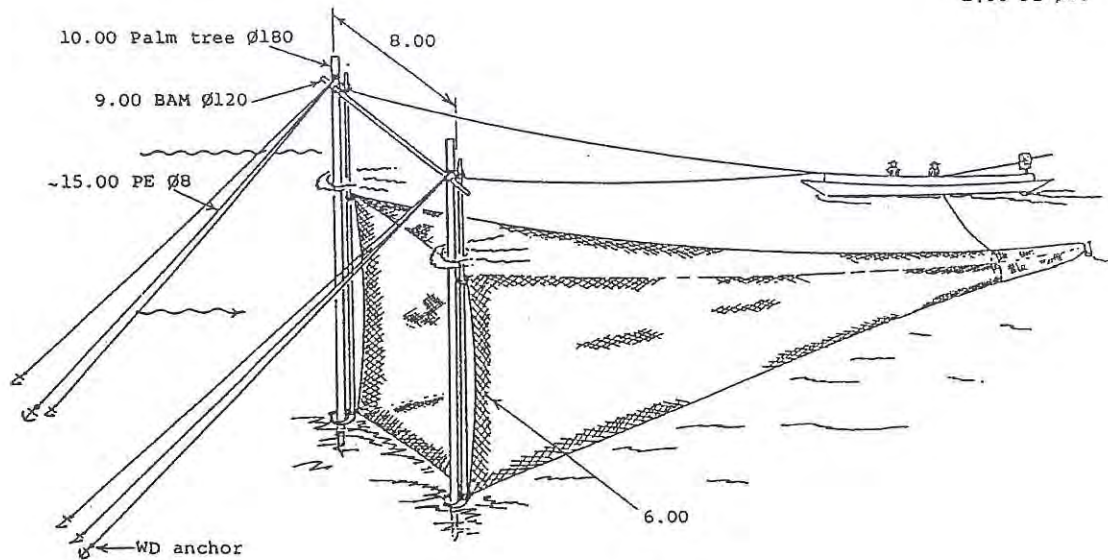
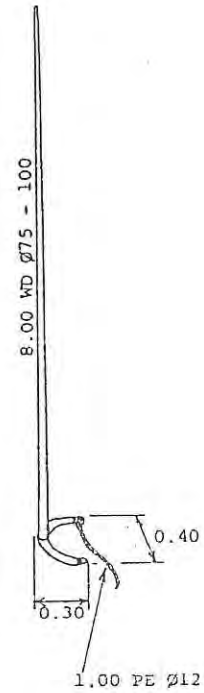
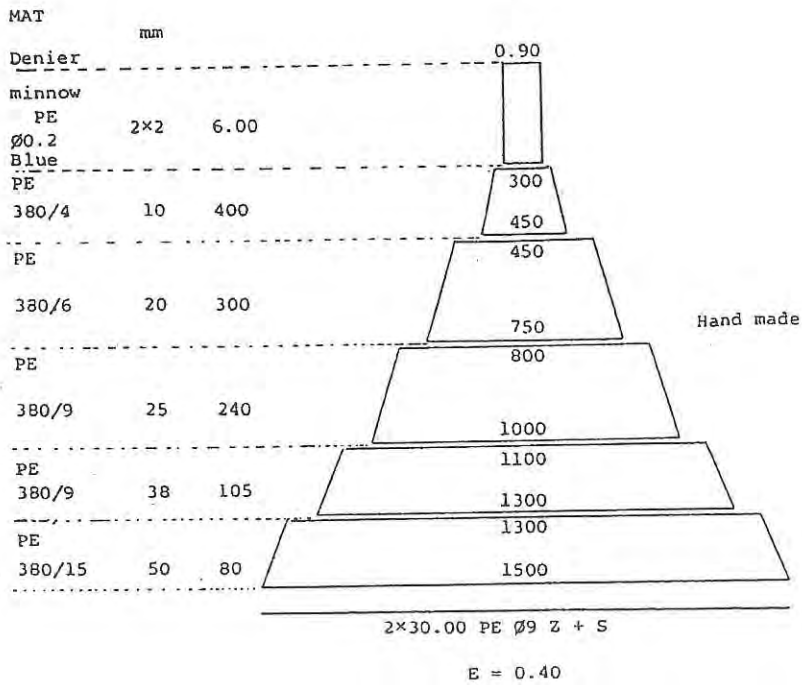
VESSEL

Loa 10 m
hp 10 LT

LOCATION

Songkhla
Songkhla

Shrimp, Brackish water fish



TRAP

Ebb tide bamboo stake trap
Po Num Haeng

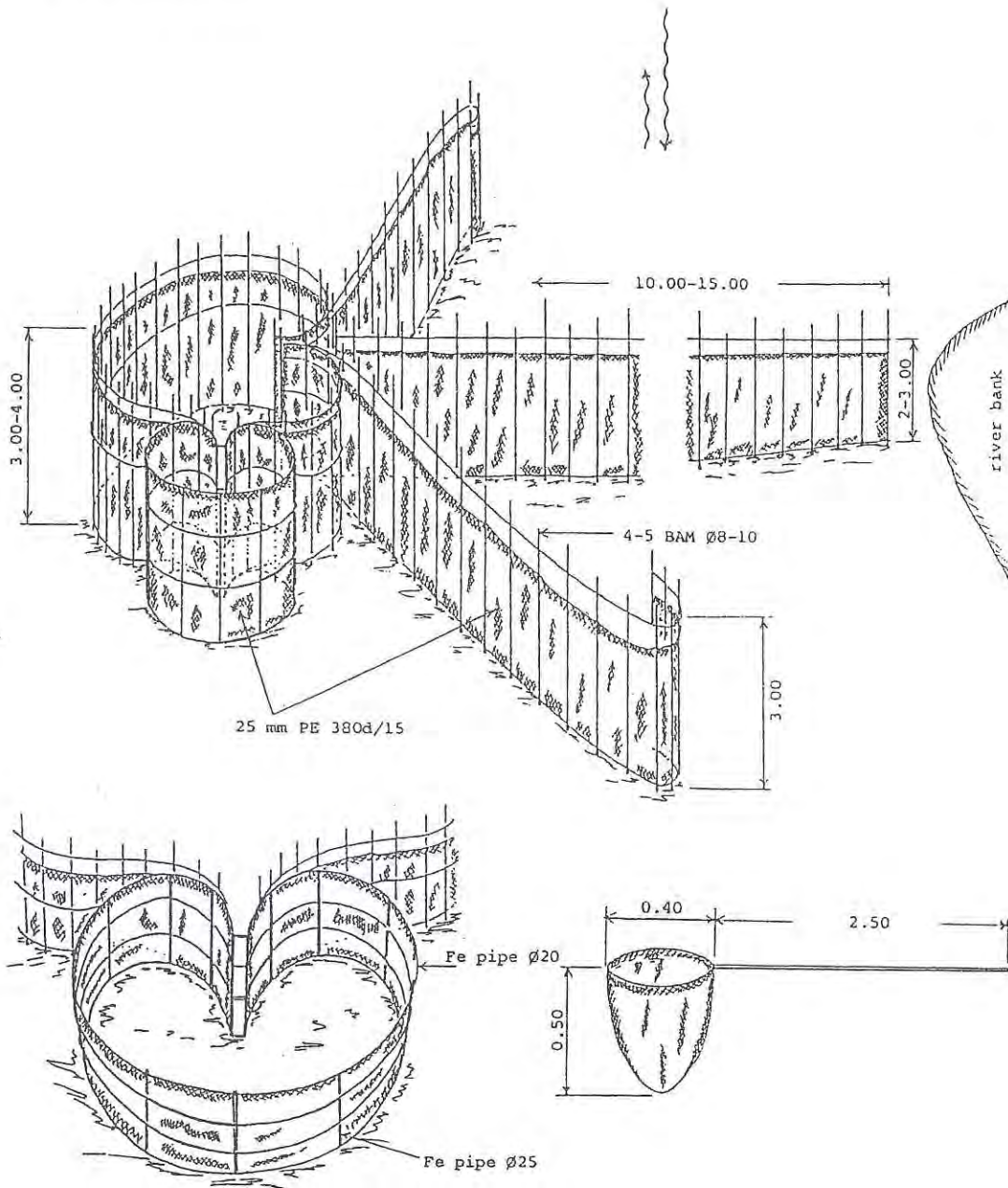
VESSEL

Loa 3-5 m or none
hp -

LOCATION

Samut Sakhon
Samut Sakhon

Shrimp, Crab, Horseshoe crab



TRAP

Shallow water bamboo stake trap
Po Num Taur

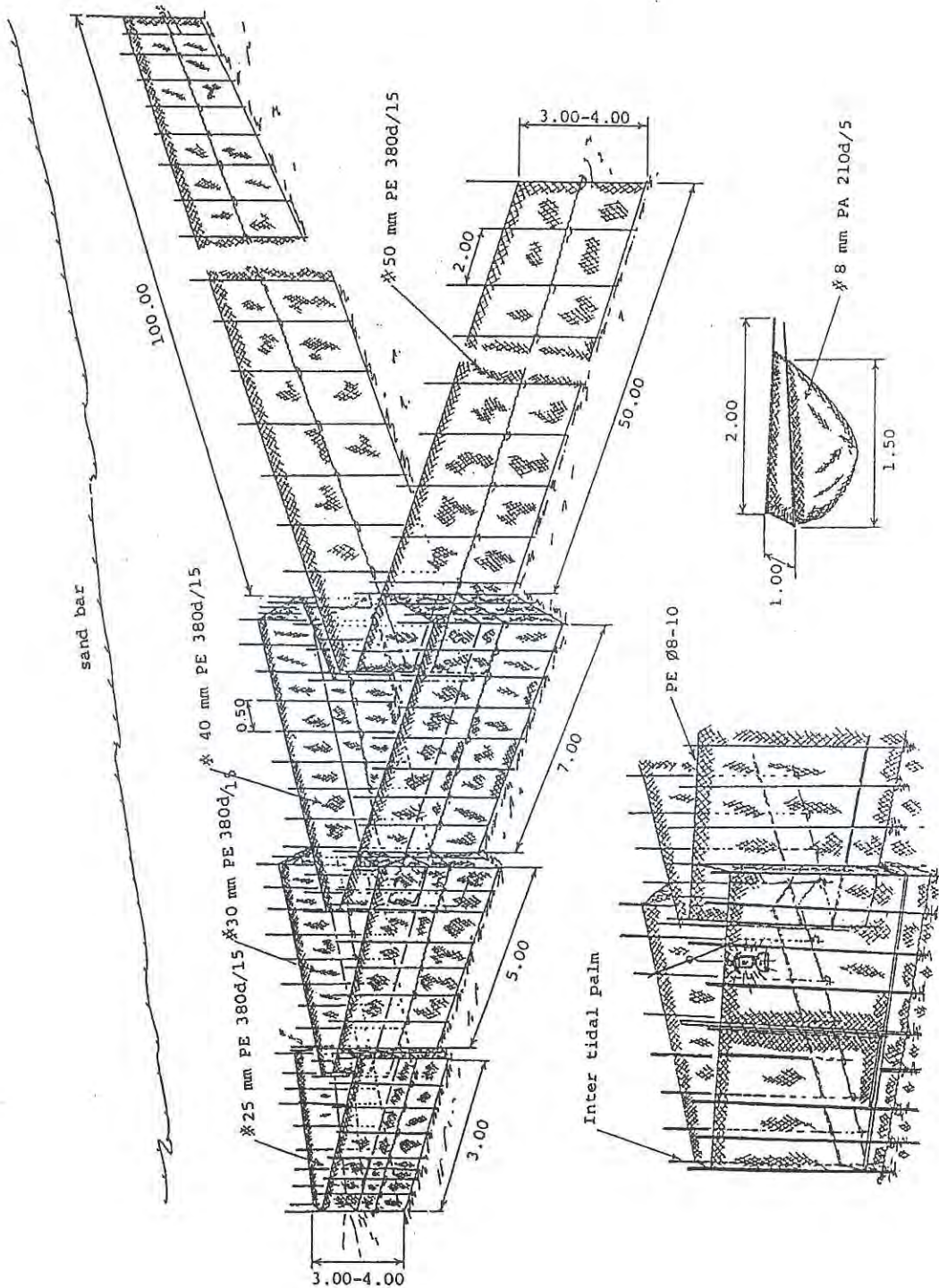
VESSEL

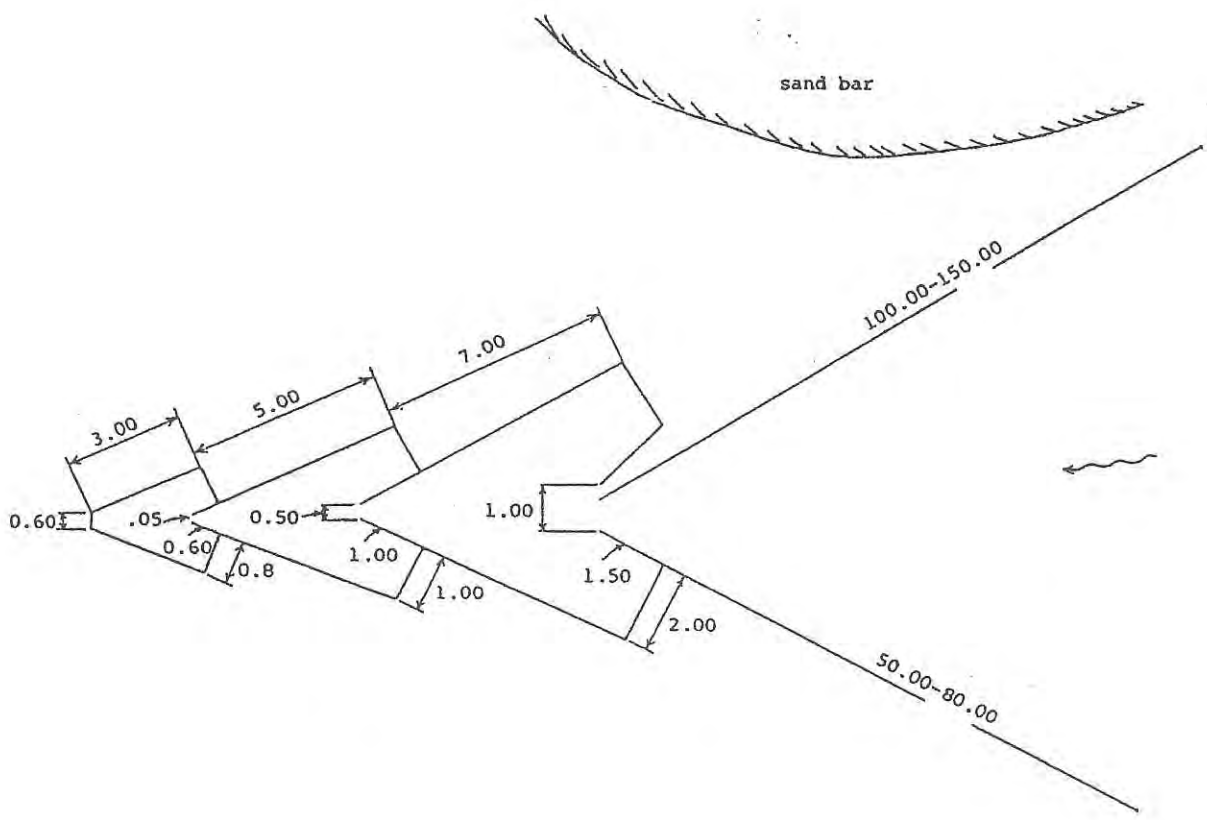
Loa 5 m
 hp 4 LT

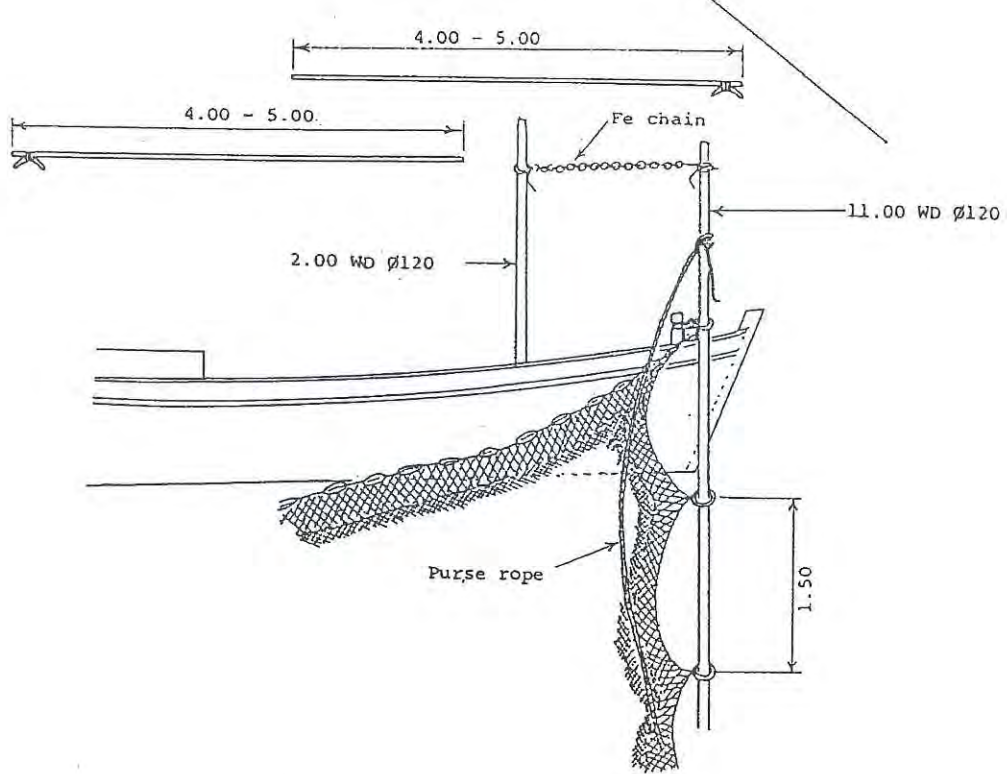
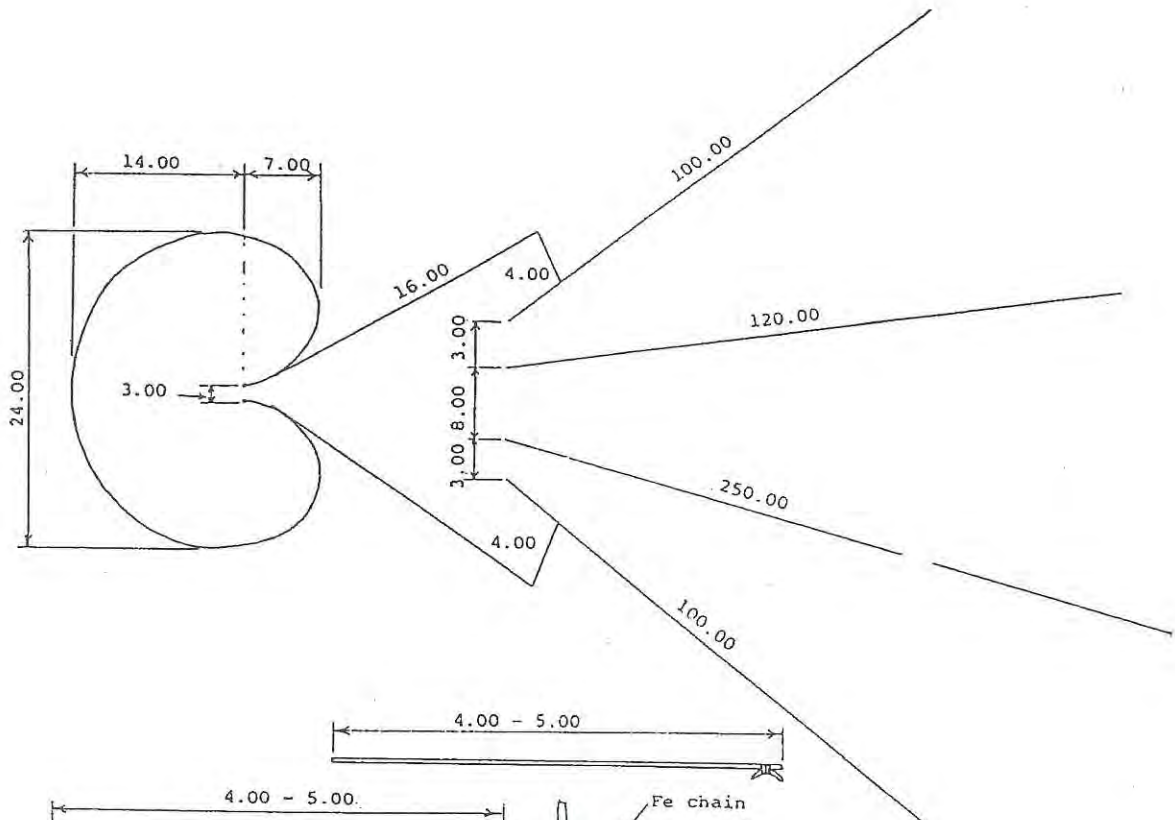
LOCATION

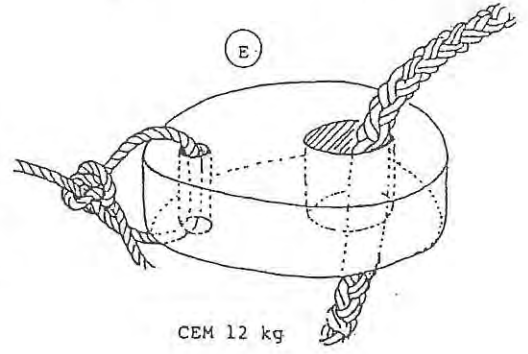
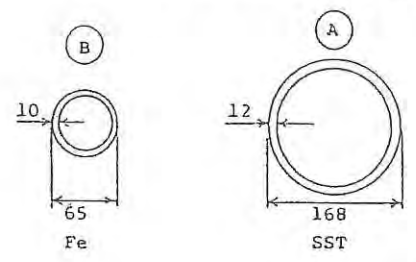
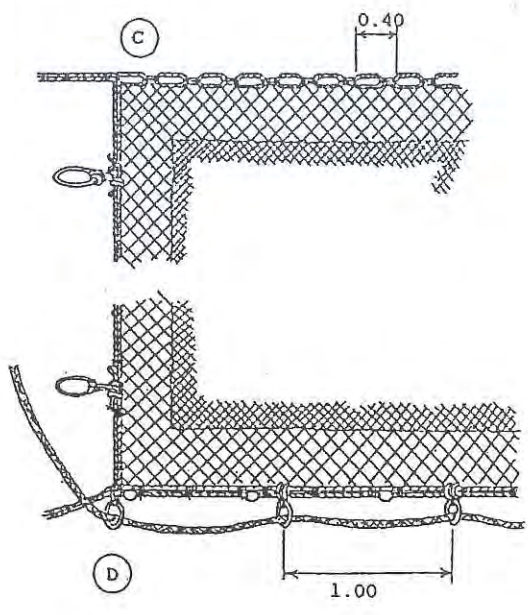
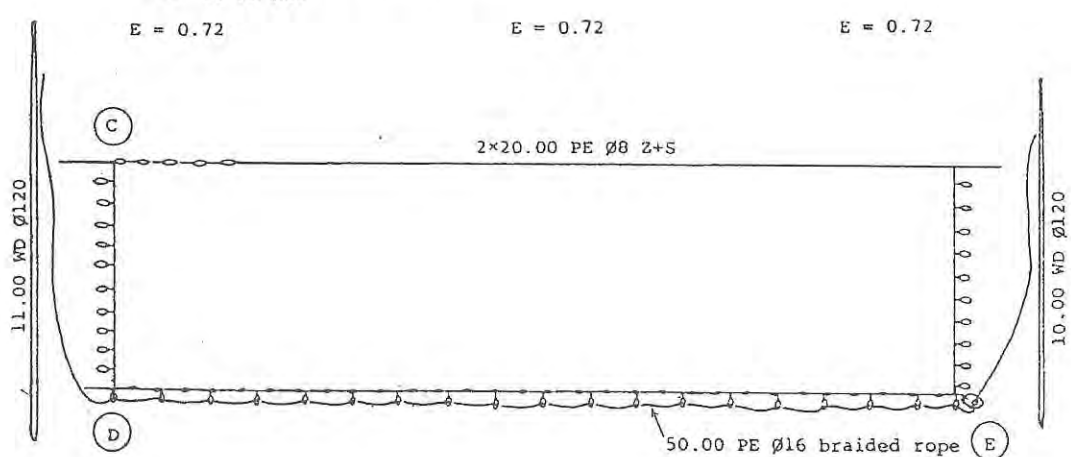
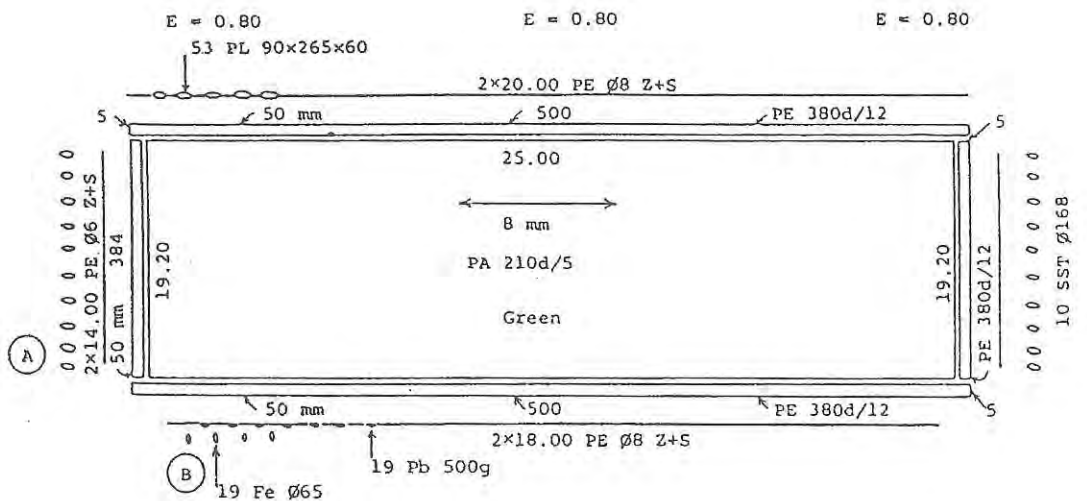
Krabi
Krabi

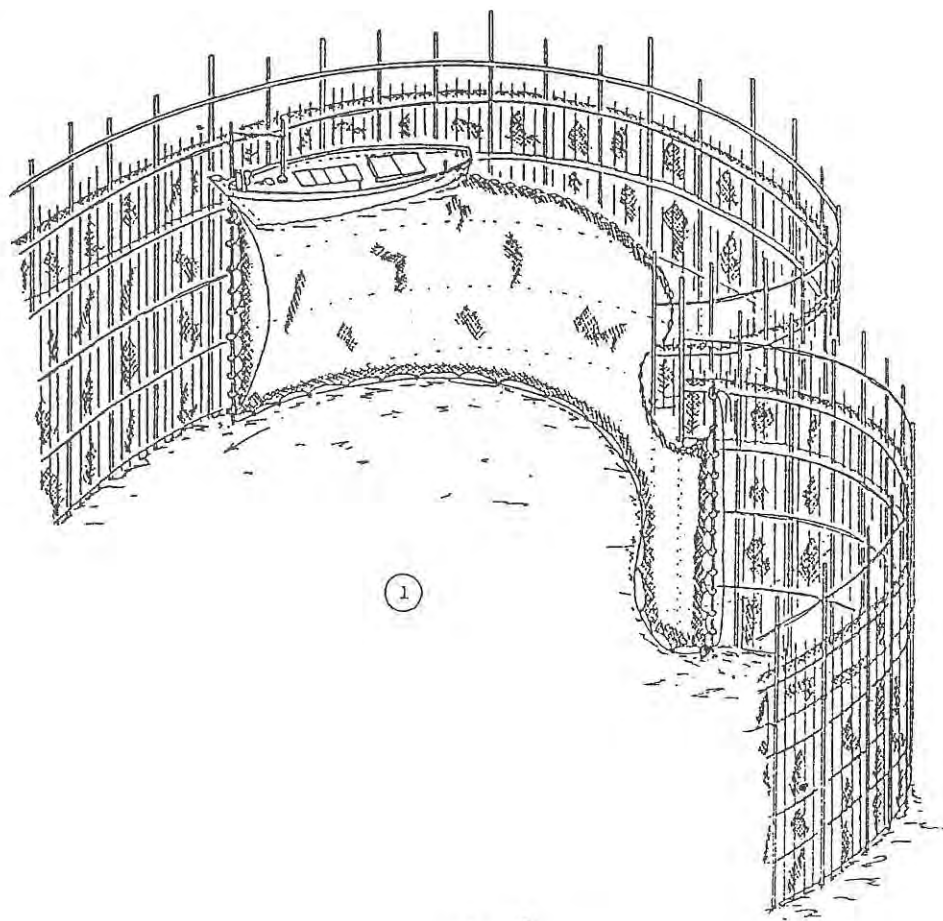
Shrimp, Squid, Cuttlefish, Crab,
 Misc. fish



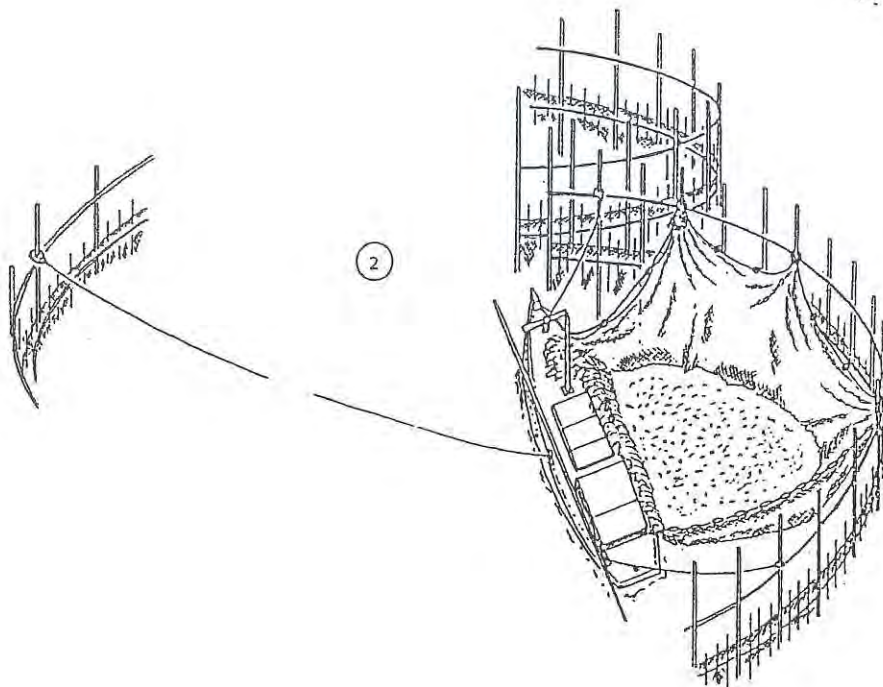








1



2

TRAP

Bamboo stake trap with lifting
bag net

PÒ YOK

VESSEL

Loa 14 m

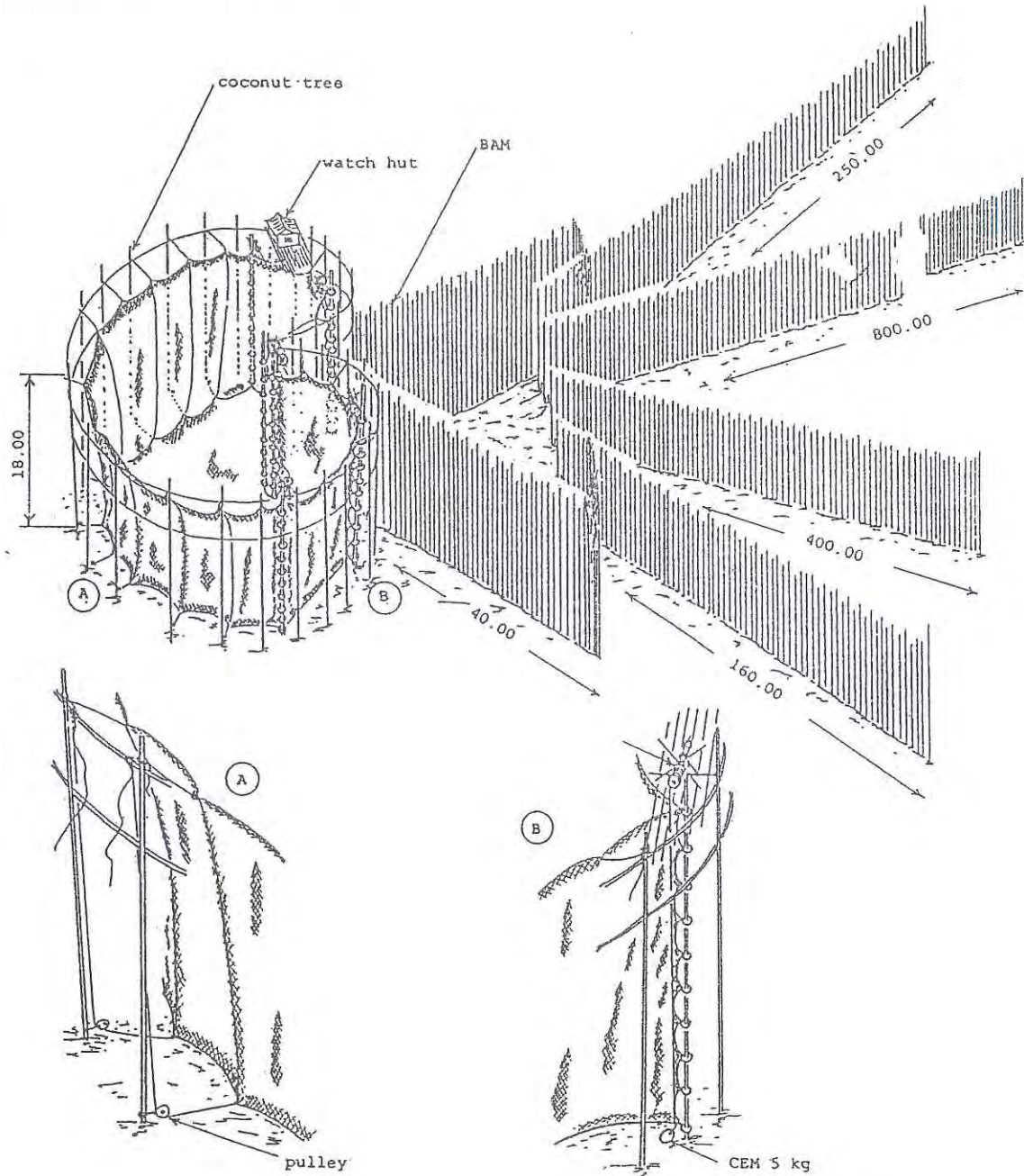
hp 20

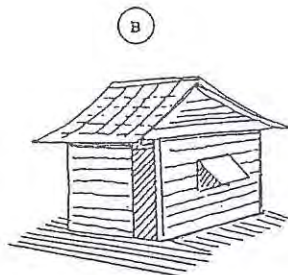
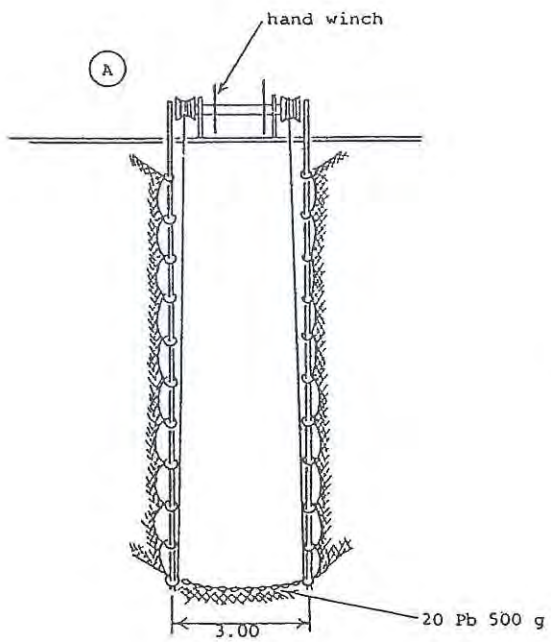
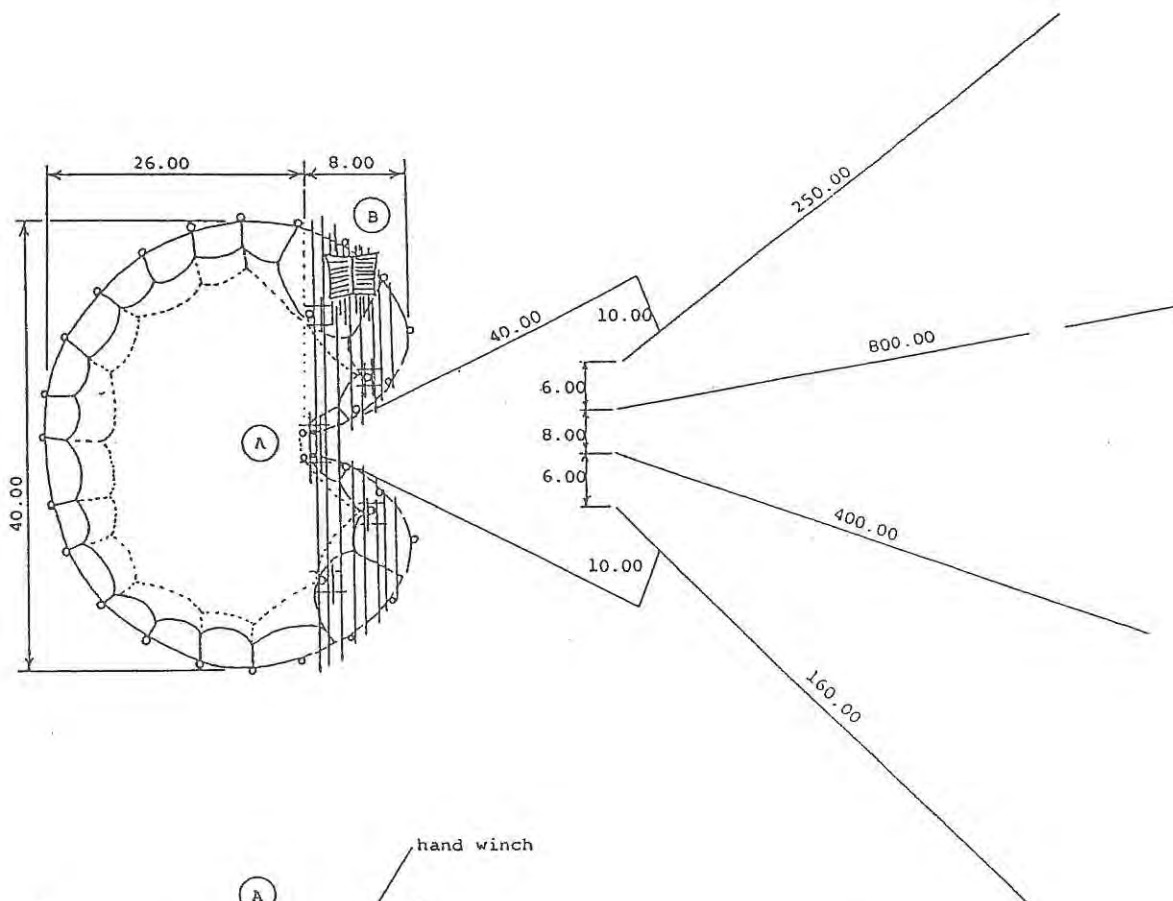
LOCATION

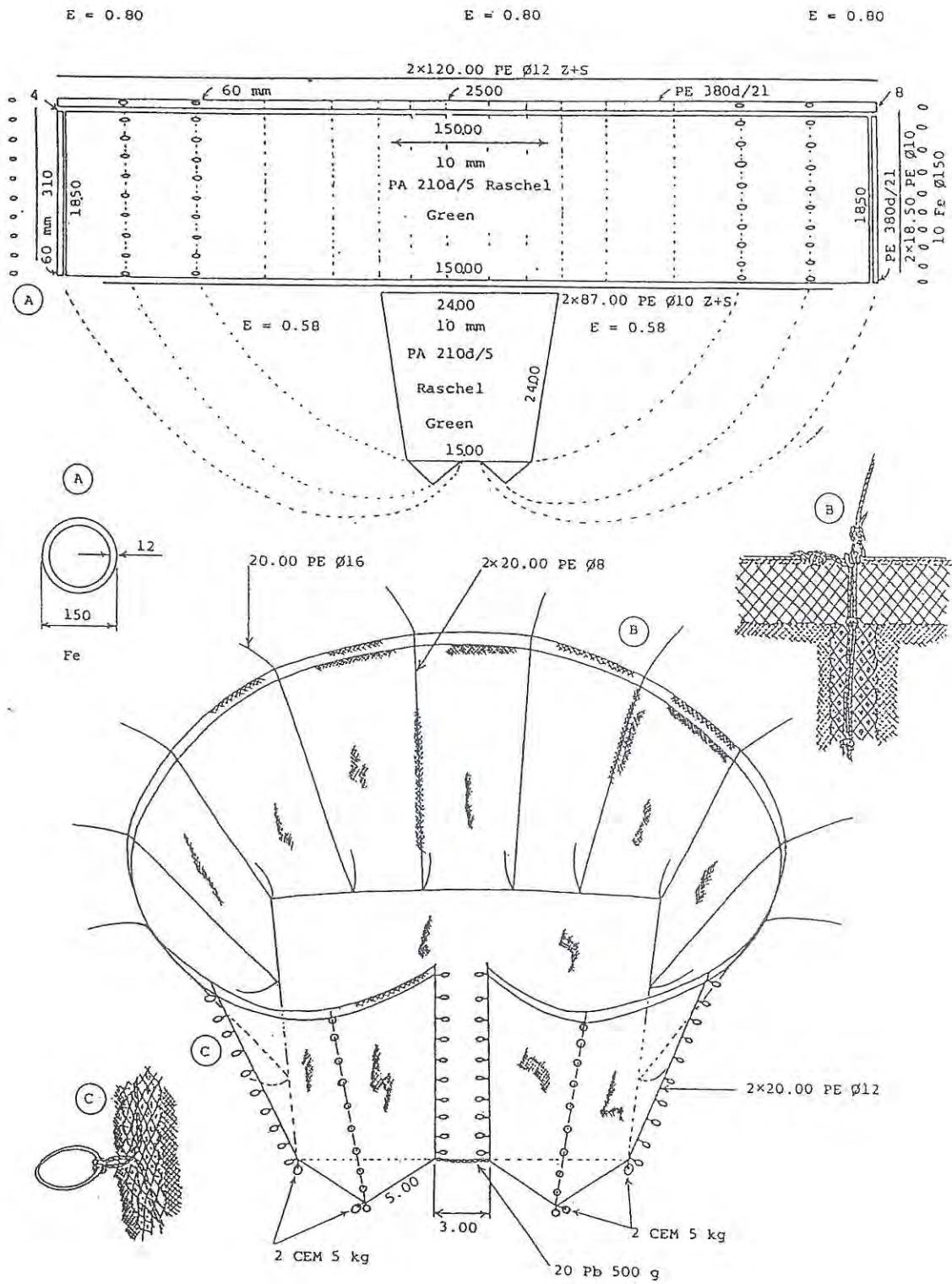
Samut Songkram

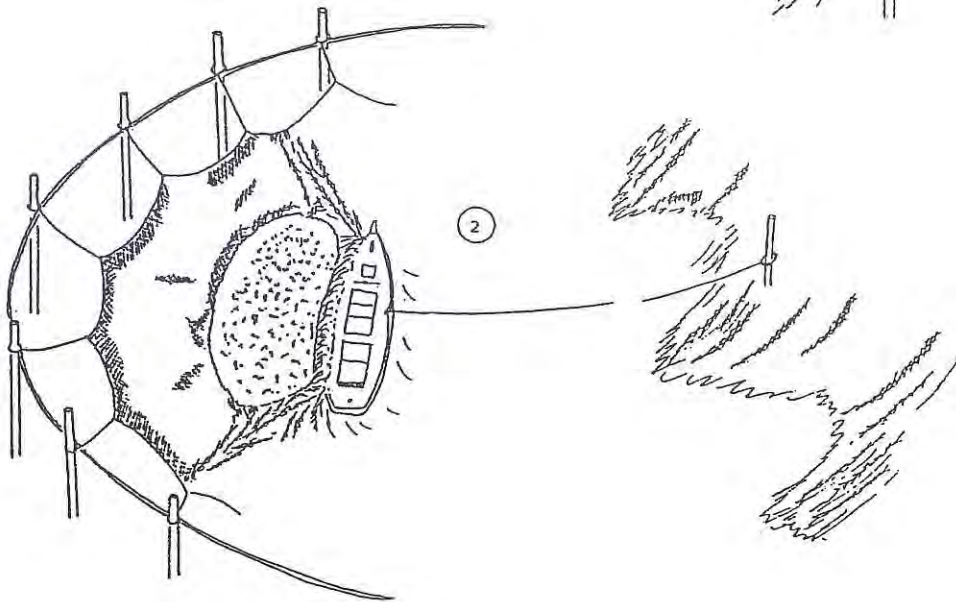
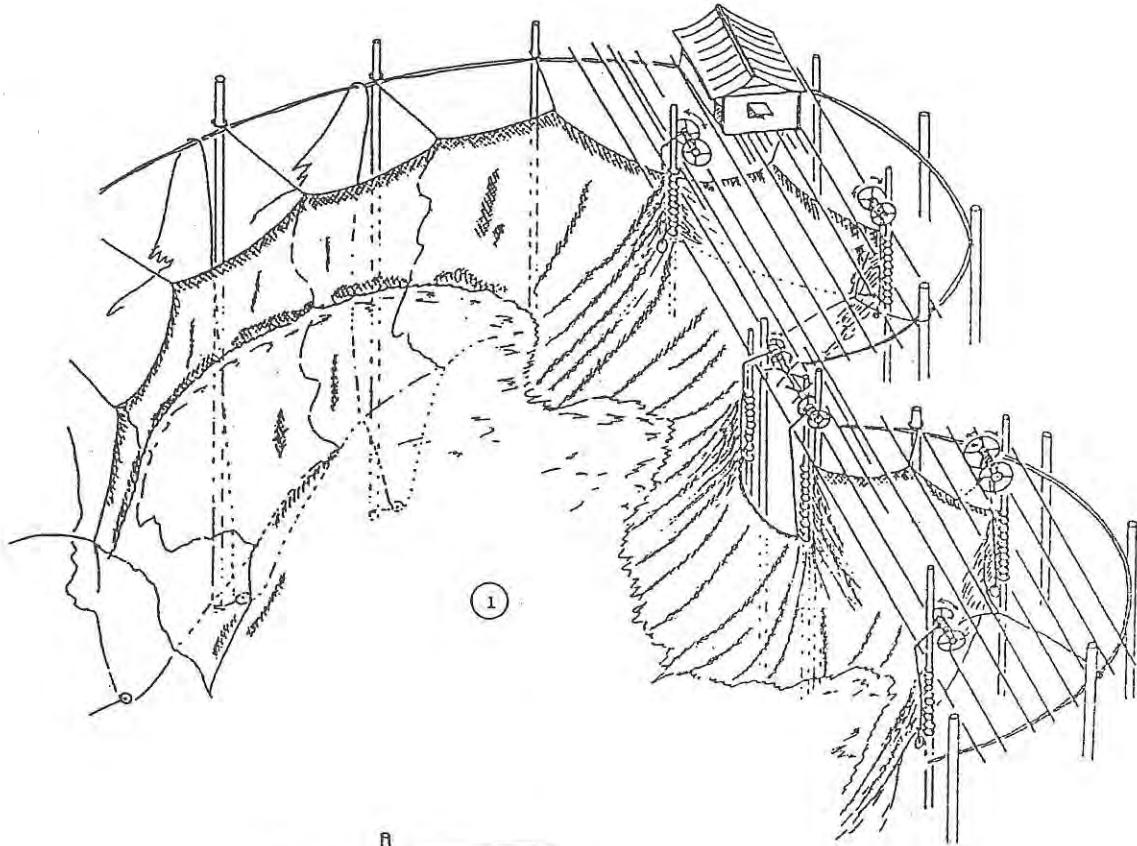
Samut Songkram

Anchovies, Indo-pacific mackerel









TRAP

Set Net

Mackerel, Sardine,
Trevally, Squid

VESSEL

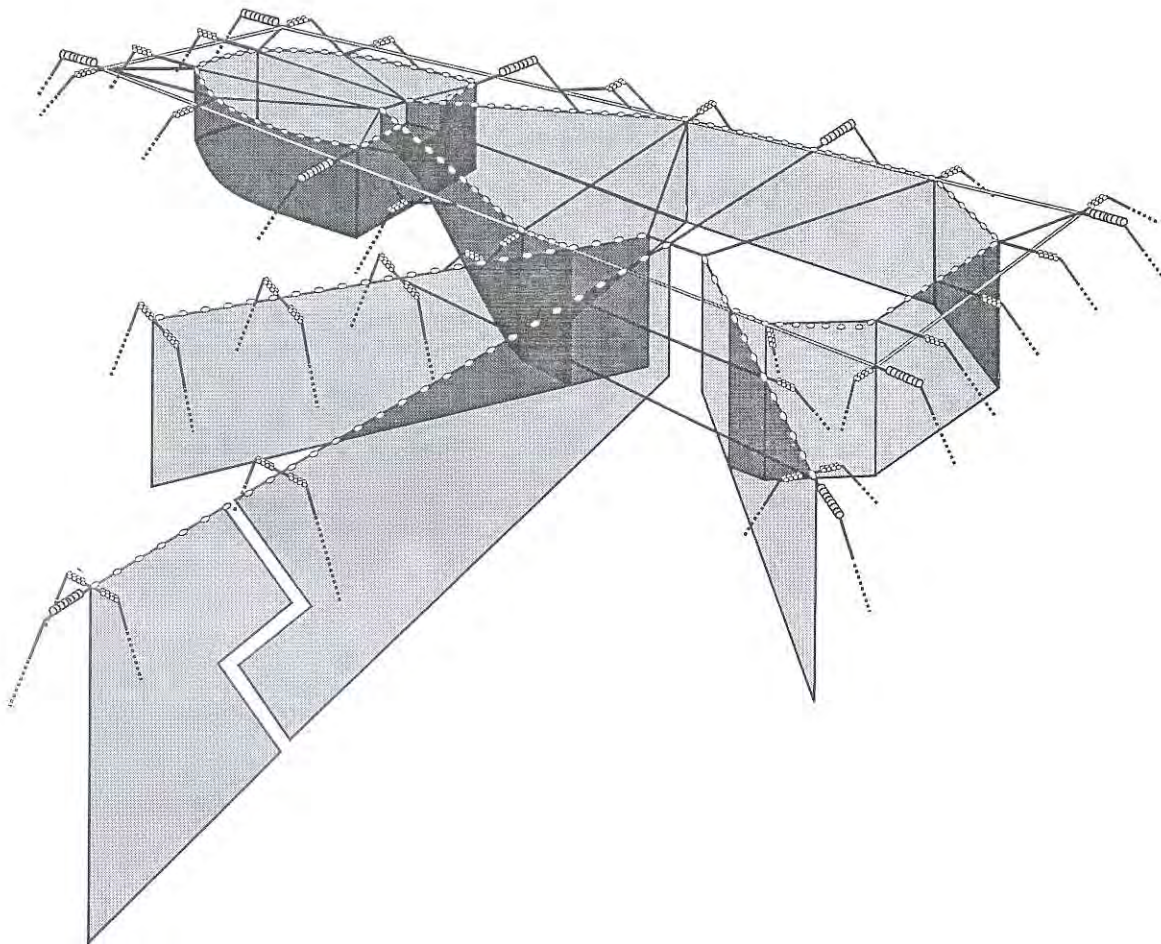
Loa 4 x 7 m

hp 4 x 18-40

LOCATION

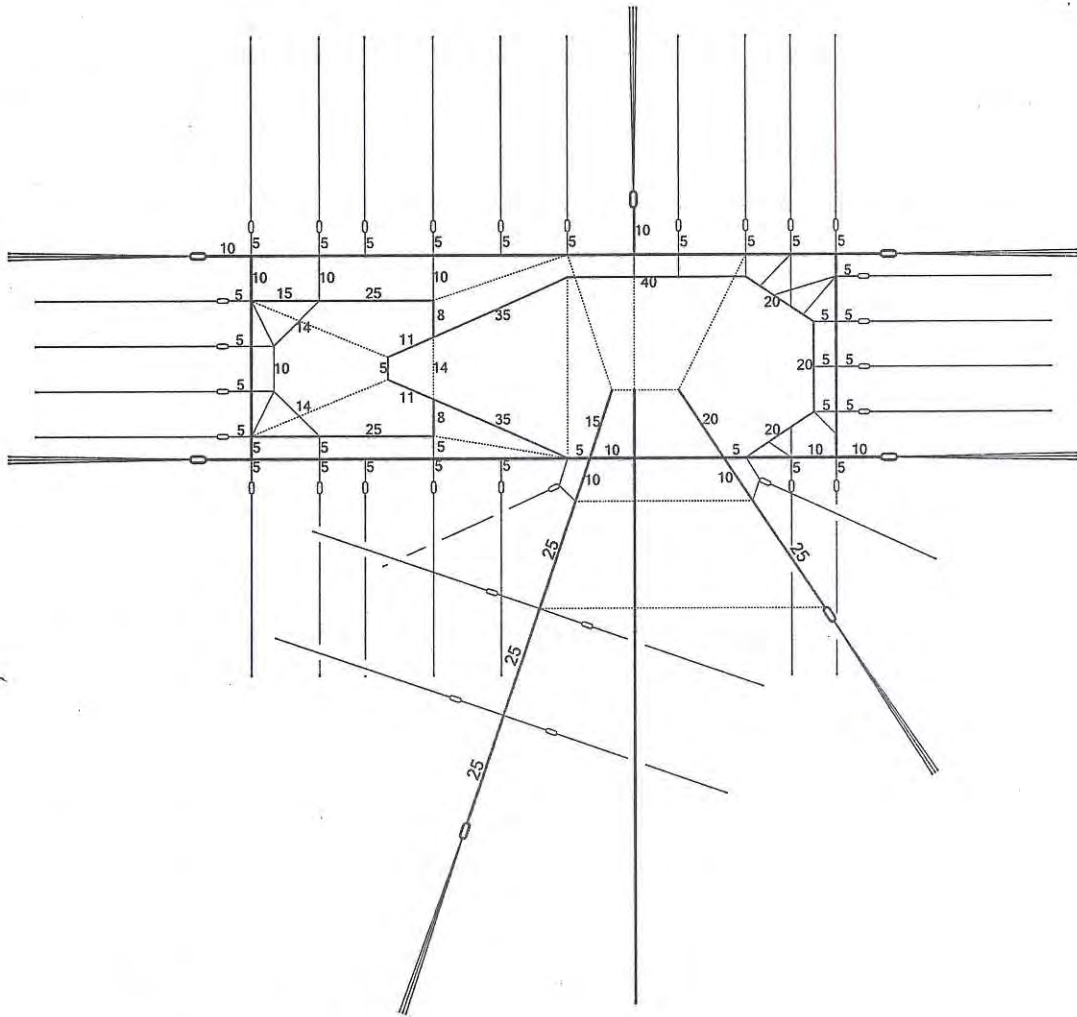
Ban Phe

Rayong



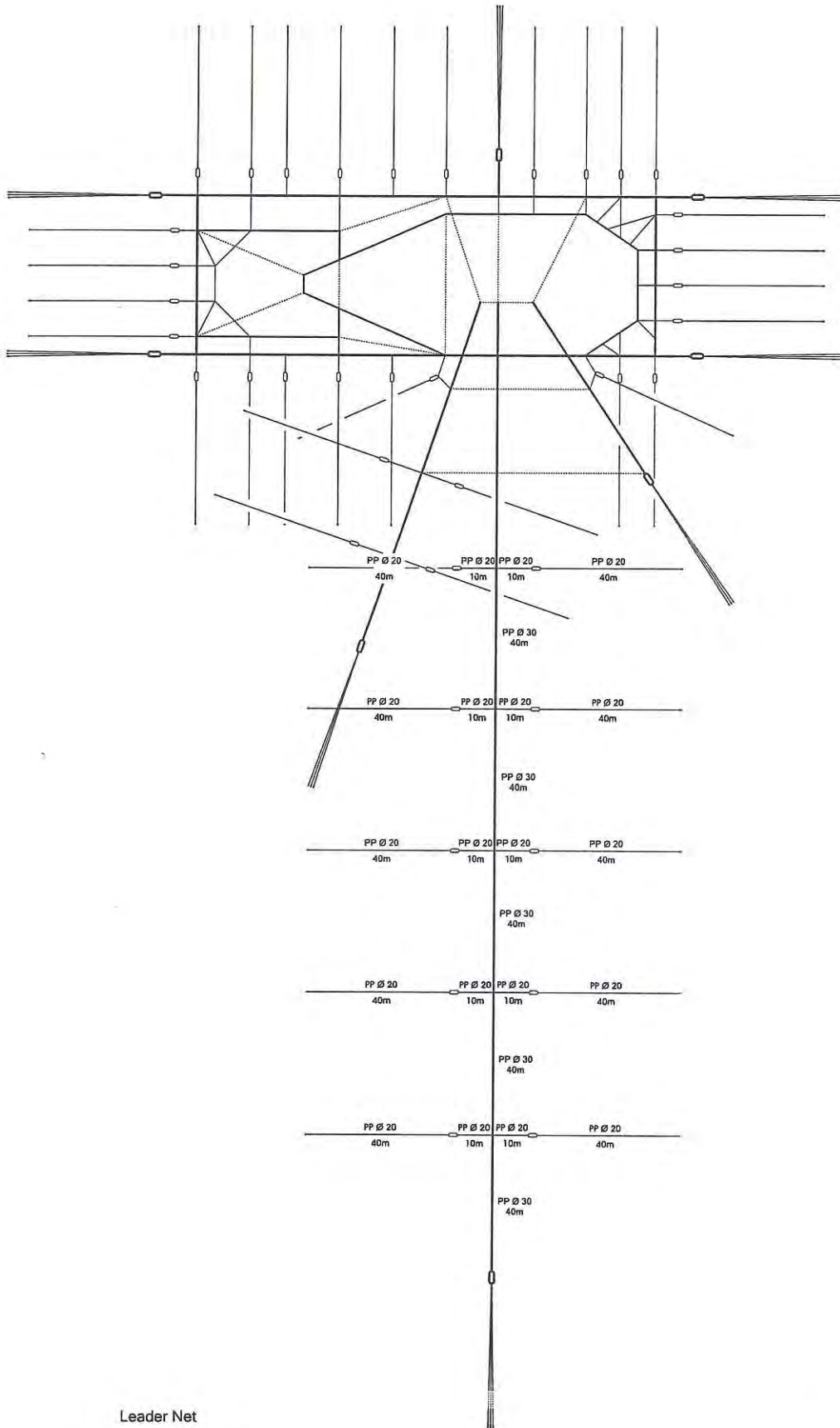
Otoshi Type

Rv. 2003



Main net

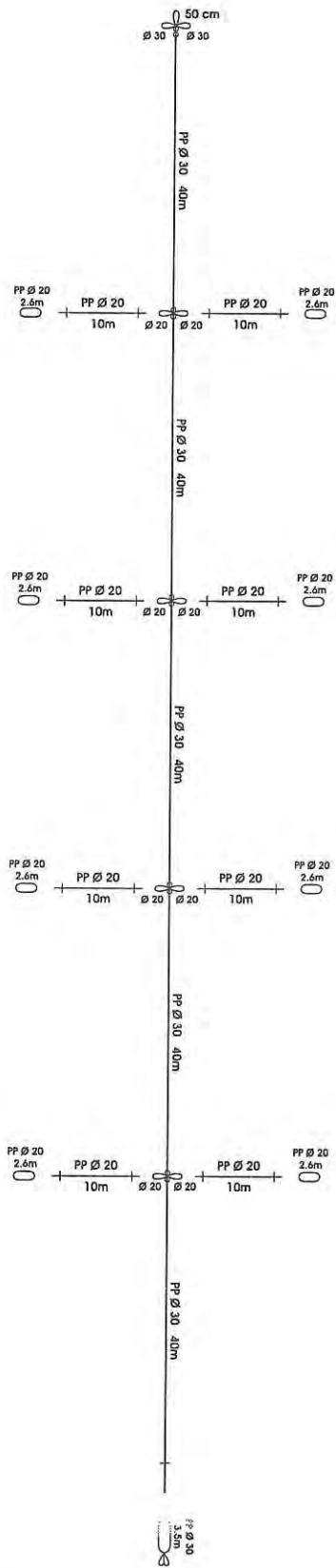
Frame rope arrangement



Leader Net

Frame rope arrangement

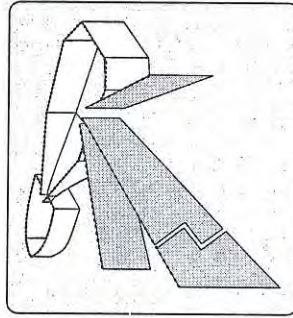
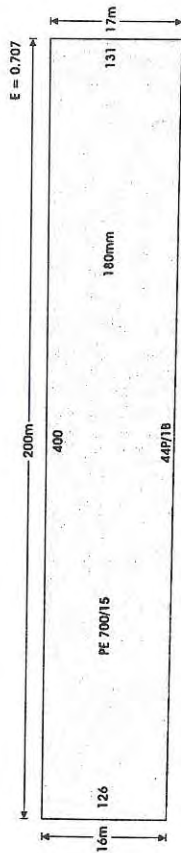
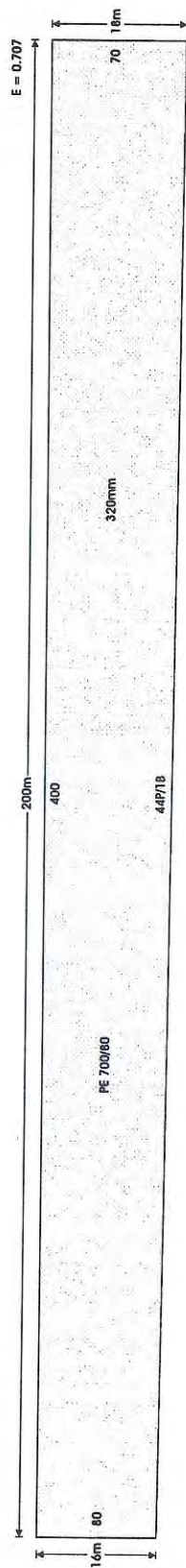
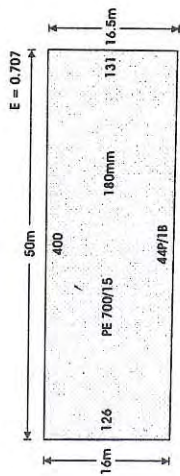
Rv. 2003



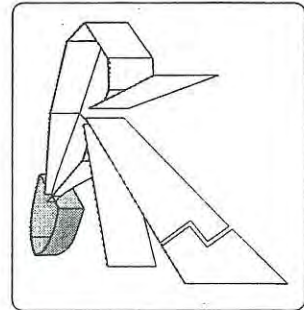
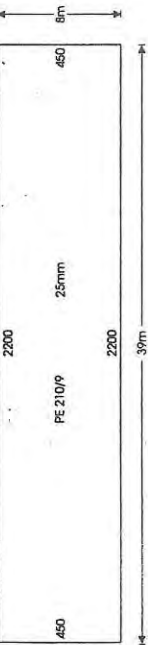
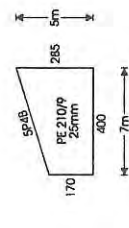
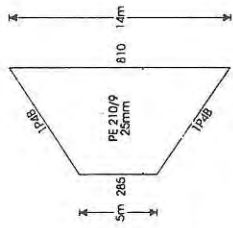
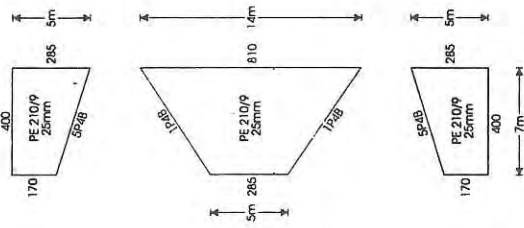
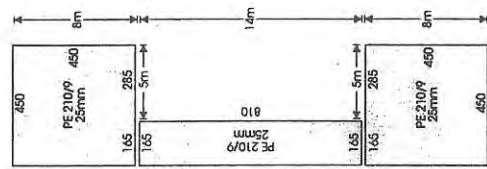
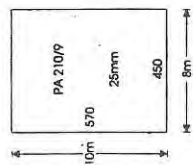
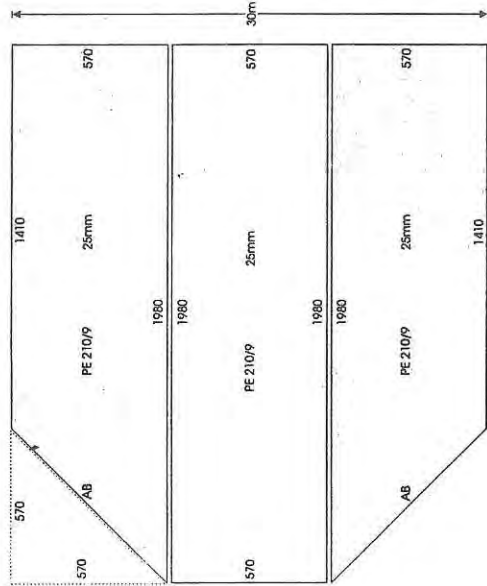
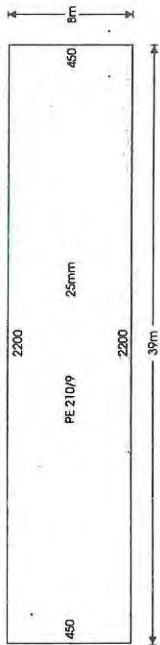
Leader net

Frame rope arrangement

Rv. 2003



Leader net



Bag net

8. HOOKS AND LINES

Masatake Okawara

**Revised by
Pratakphol Prajakjit**

CONTENTS

	Page
Hook and line fishing	339
Fishing gear and methods	340
8.1 Handlines	
8.2 Pole	
8.3 Trolling	
8.4 Longlines	
Designs and specifications	343
Handlines	343
□ Squid	
□ Threadfin bream	
□ Trevally	
□ Mackerel, sardine	
□ Spanish mackerel, barracuda	
Pole	352
□ Squid	
Trolling	353
□ Squid	
□ Spanish mackerel	
Longlines	354
□ Marine catfish	
□ Fourfinger threadfin	
□ Snapper, grouper	
□ Spanish mackerel	
□ Ray	

HOOK AND LINE FISHING

The fishery statistical records from 1990 to 1997 indicate that the marine production by hook and line fishing in Thailand had been falling (Table 8.1). A steady decreasing trend is obvious particularly in longline fishing. The catch by longline fishing decreased sharply in 1990 to 1995, but in 1996 it recovered and even surpassed the level of catch in 1997.

Table 8.1 Annual catch by three kinds of hook and line fishing.

	1990	1991	1992	1993	1994	1995	1996	1997
Longline	3,314	3,257	2,642	2,282	1,831	1,790	2,538	1,881
Hook	3,150	2,946	3,118	2,918	2,869	3,433	3,470	3,498
Squid hook	420	427	489	489	579	565	486	463
Total	6,884	6,630	6,249	5,689	5,279	5,788	6,494	5,842

The main species of fish caught by hook fishing and longline fishing in 1997 were as follows:

<u>Hook</u>	<u>Catch/year (mt)</u>
Grouper	261
Barred Spanish mackerel	981
Threadfin bream	193
Jacks, Cavalla, Trevallies	141
Red snapper	44
Hardtail scad	26
Others	1,852
<hr/>	
Total	3,498

<u>Longline</u>	<u>Catch/year (mt)</u>
Red snapper	9
Grouper	42
Marine catfish	566
Shark & Ray	572
Catfish	556
Others	136
<hr/>	
Total	1,881

FISHING GEAR AND METHODS

8.1 Handlines

The handline consists of a main line, branch line or lines, one or more hooks and sinkers. There are two types of handline. One is the gear which has a sinker between the main line and the branch line, and it usually has one or two hooks (type A). This handline is used for catching quite large fish, such as Spanish mackerel, trevally, grouper bottom end of the mainline, and several branch lines are spaced evenly along the main line above the sinker. This type of handline is used usually to catch small-sized fish, such as sardine and mackerel.

Nylon monofilament is generally used for both the main line and branch lines. However, for catching fish which have a sharp teeth, such as barracuda and Spanish mackerel, branch lines are made of stainless steel wire. The length of a branch line, which is the line below the sinker for type A handline, varies from 1.5 to 3.0 meters. The branch lines for type B handlines are generally very short, ranging from 3 cm to 10 cm. There may be 8 to 20 branch lines on one main line, spaced at intervals of about 16-27 cm.

The hooks used for handline are almost the same in shape, with along shank. They differ in sizes however; for catching larger fish the hooks are about 3.5-5.5 cm long, whereas for small fish caught by type B handline the hooks are only about 2.2-2.4 cm long. The small hooks for type B handline have some lures attached to them, made of plastic and nylon multifilament.

The sinker for a handline is usually made of lead and is cone shaped, its size depending on the size of the whole gear. Sometimes a 15 cm long iron bar is used as a sinker, particularly in waters with the rocky bottom.

When not in use, the handline including the main line, branch lines, hooks and sinker, is coiled on a small roller made from bamboo, wood or a plastic float.

Fishing with handline is commonly done early in the morning in the waters with rocky bottom or around an island. Squid is the most widely used bait for handline some times about 10 cm long mackerels are used as live bait for catching Spanish mackerel. Most fishing boats have a live-bait tank on board, in which captured fish can also be kept.

8.2 Pole

This simple fishing gear consists of a rod, line, sinker, hook and sometimes a buoy. In spite of its simple operation, the gear is not very popular with Thai marine fishermen. It can, however, still be found in the fishing grounds In the Gulf, particularly in Rayong and Chantaburi province. Pole and line is used for catching bottom fish such as whiting along the shore, for sea-bass caught around the wing-fykes and bamboo stake traps, and most of all, for squid. The squid fishing pole is popular among the small-scale fishermen. The pole is a piece of bamboo, 2-3 meters long, with a 2 m long nylon monofilament line, 0.8 – 1.0 mm in diameter, attached to one end. Three to four hooks are tied together to make a multiple hook. These are attached to the line, together with a cone-shaped lead sinker. Another line with

dead or live bait fish (and with or without a sinker) is lowered in to the sea to attract squid. When the squid has bitten, it is pulled to the surface, and the pole gear with its multiple hooks is used to lift the catch into the boat. The fishing is carried out in the day-time

8.3 Trolling

Trolling is an old fishing technique, formerly quite popular in both the Gulf of Thailand and the Andaman Sea. At present, trolling still continues mainly on the Andaman side, where the open sea still ensures good fishing grounds. Fishing is done from 5-10 m long inboard-powered fishing boats. Two 5-6 m long bamboo, wooden or iron-pipe rods are fixed on the sides of the boat, with 3-4 trolling lines fastened at the tip and the middle of the rods. The fisherman, who controls the boat from the stern, holds another line. In all, four to five lines are operated simultaneously. One line consists of 30-100 m of steel wire (08.-1.0 mm) joined with a swivel to 3-6 m of nylon monofilament (1.1-1.2 mm), plus 80-100 cm of stainless steel wire, ending in first an ordinary hook and then a twisted hook. Fresh mackerel is used as bait. Fishing is conducted preferably as sunrise and sunset. The trolling speed is 3-5 knots. The best fishing grounds are around islands, rocky underwater hills, shoals and fish shelters. The most common catch is Spanish mackerel, but the giant queen-fish, dolphin-fish, bonito and barracuda are also caught. The gear can be found on the west coast of southern Thailand, in Khuraburi of Ranong, and Ban Pakbara of Satun province, and on the eastern seaboard in the Gulf, in Chantaburi and Trat province. Crews of trawler sometimes fish with trolling lines.

Squid trolling is more popular among small scale fishermen target on bigfin reef squid (*Sepiotheutis lessoniana*)

8.4 Longlines

The bottom longline is the most common type of hook-and-line gear in Thailand. It consists of a main line, branch lines (hook lines) and hooks. The construction of bottom longline gear used in Thailand is the most common and general type of bottom longline gear. The main line is usually made of vinylon, which is dyed with juice obtained from mangrove bark. When polyethylene is used for the main line, sinkers are attached to it directly or to the joints between the main line and branch lines, in order to increase the sinking force.

Polyethylene is the main material for the branch lines, but nylon monofilament is also used quite frequently. The interval between two adjacent branch lines is 2.0-2.5 m, when the target species are large-sized fish, such as red snapper, grouper and Spanish mackerel. The length of branch lines for this type of gear is 40-60 cm. When the target species are medium-sized fish, such as threadfin and marine cat-fish, the branch lines are spaced less widely, about 1.4-2.0 m apart, and the length of a branch line is about 50 cm.

The bottom longline for ray is somewhat different from an ordinary bottom longline described above. The branch lines in this gear are fastened close together, with intervals of only about 27-33 cm. The branch lines are slightly shorter than the interval, 25-30 cm. The catching mechanism of a bottom longline for ray is different from that of an ordinary longline gear. In the latter case the fish to be caught is attracted by bait, where as the bottom longline for ray entangles and hooks the fish without bait.

The hooks for ordinary bottom longline are all of nearly the same shape, but vary in size. This type of hook has a long shank and a rounded bend. The length of shank ranges from 2.0 cm to 5.5 cm. All the hooks are barbed. The hooks for the bottom longline for ray are shaped differently from the hooks used for the ordinary bottom longline. They are long and angular, with a very sharp point but with no barb on it. Hooks are dipped in soya bean oil after operation to protect them from rusting coconut oil is not used, because of strong smell.

Hooks are arranged on a wooden or bamboo "hanger" which is called *tap* in Thai, meaning "a set". The length of a hanger for an ordinary bottom longline is 50-80 cm, which is sufficient to accommodate about 120-200 hooks. The hanger for a longline for ray is about 120-135 cm long, and about 300 hooks are arranged on it.

Bottom longline are usually operated early in the morning. Shooting is done while removing hooks from the hanger which is stood up-right and attaching bait on one hook after another. The number of hooks used for one operation depends on the size of the boat and the construction of gear, but an ordinary bottom longline has between 600 and 1500 hooks. In the case of the bottom longline for ray bait is not used. Therefore shooting is done as the hooks are removed from the hanger. As the interval between two adjacent branch lines is very short, 3-5,000 hooks are used in an operation.

Bait for an ordinary bottom longline is sardine or mackerel, whose body size is about 10 cm. Fish are cut into halves, head and tail part, and used for baiting snapper, grouper, Spanish mackerel and other fish. Squid is also good bait for longline, but it is not used widely, because the price of squid is sometimes quite high. In some cases, for example when fishing for the fourfinger threadfin, live bait is used. This is usually small mullet, about 7-8 cm long.

With an ordinary bottom longline, hauling of line the gear starts immediately after the shooting is finished. The bottom longline for ray is kept on the bottom for two hours or more before hauling. There is no facility for hauling line aboard ship. Hauling is done entirely by hand.

HOOK and LINE

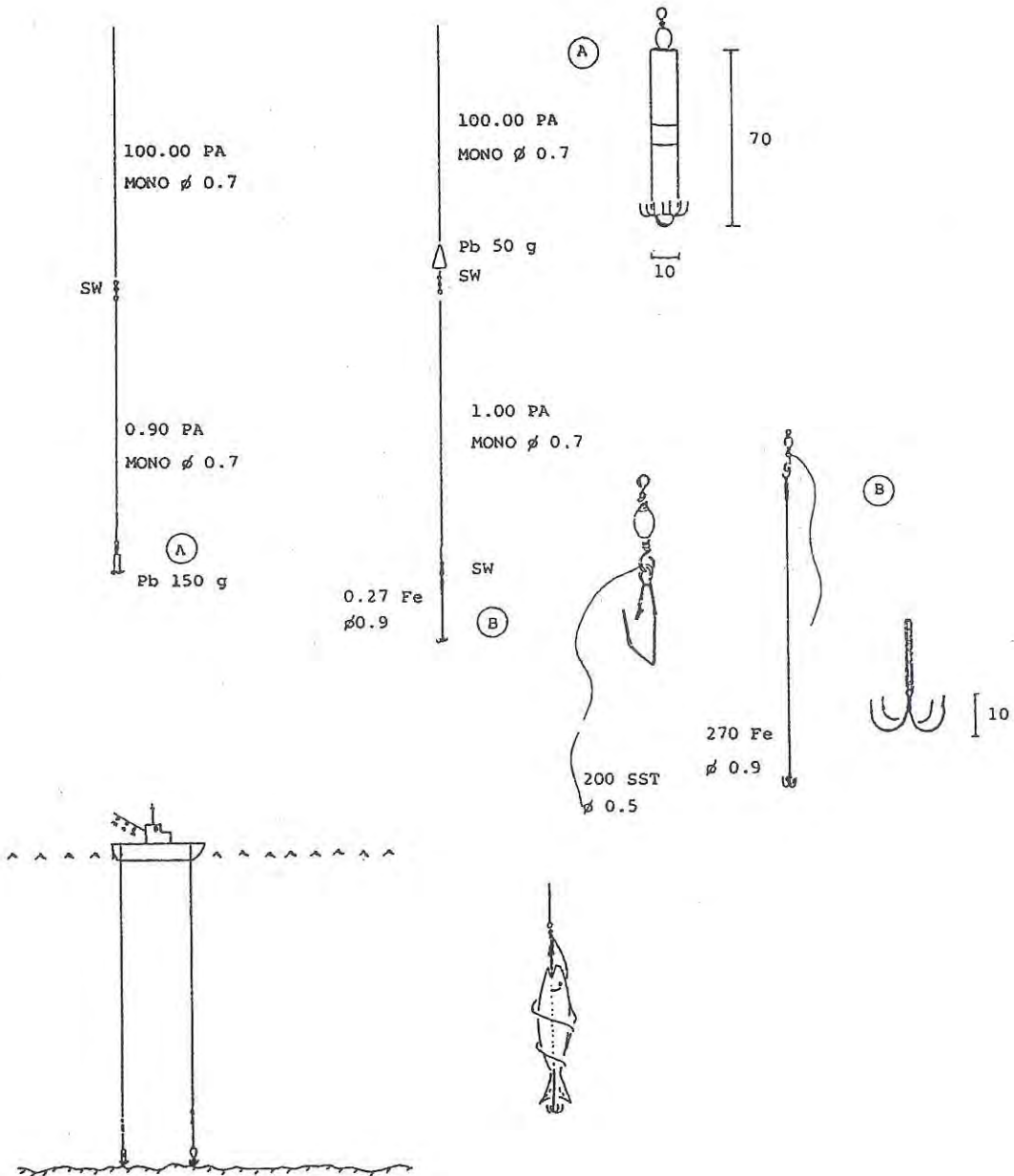
Hand
(Nighttime)
Squid

VESSEL

Loa 10 m
hp 10

LOCATION

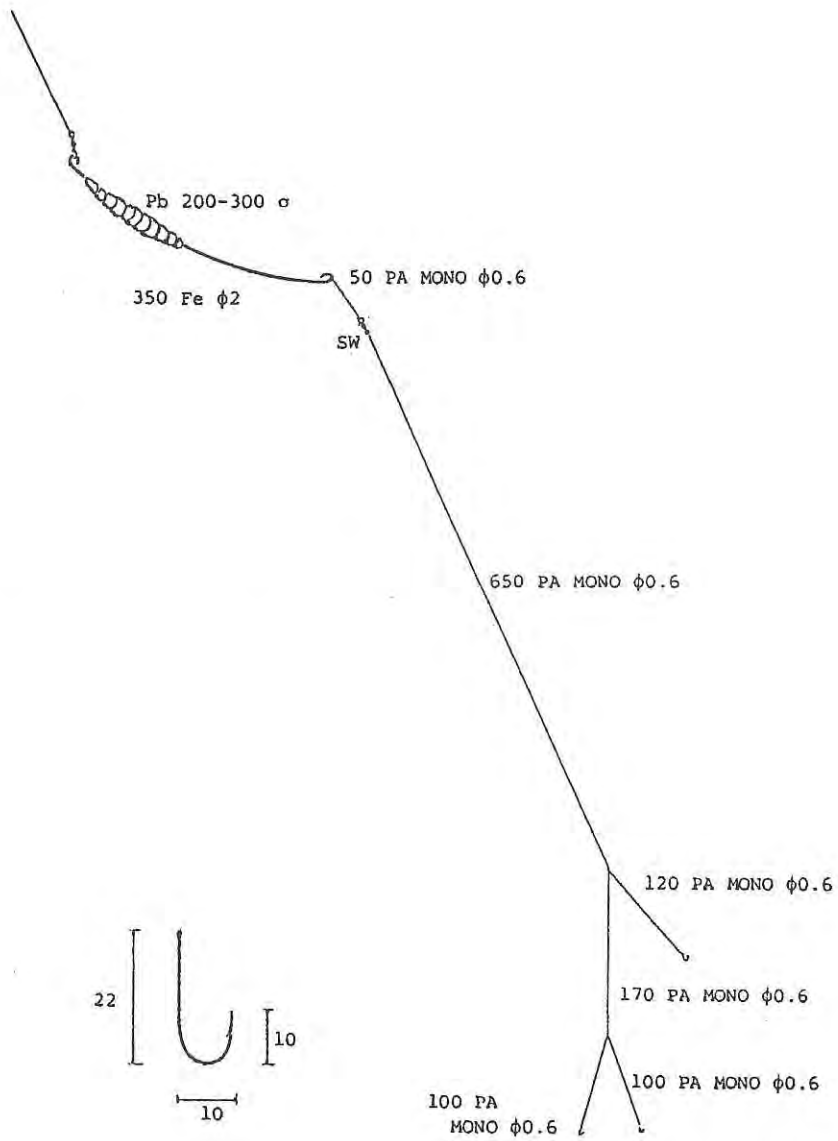
Ban Phe
Rayong



HOOK and LINE
Hand
Threadfin bream
Whiting

VESSEL
Loa 5 m
hp 4

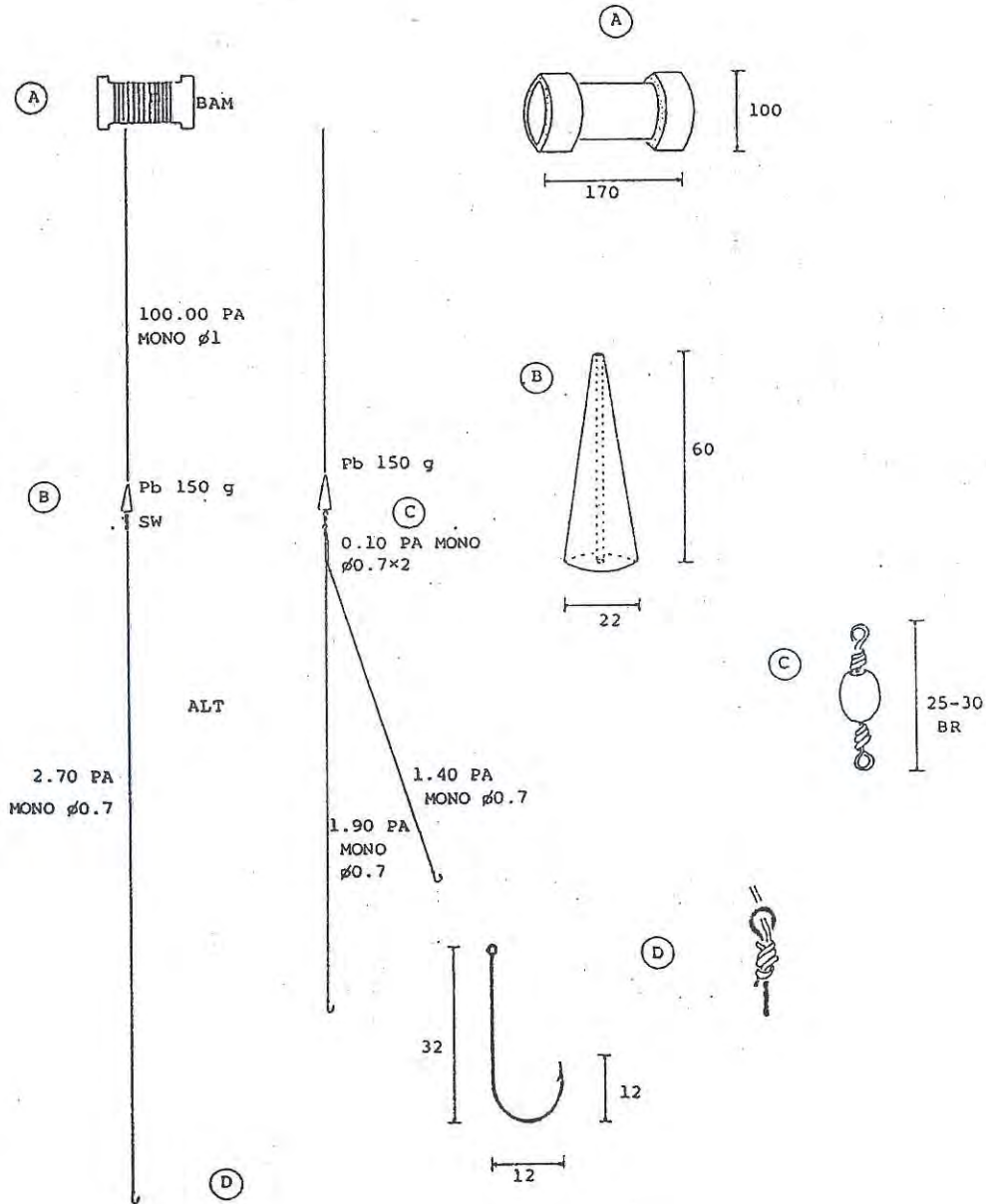
LOCATION
Ban Hin Khao Hin Daum
Rayong



HOOK and LINE
Hand
Trevally

VESSEL
Loa 10 m
hp 10

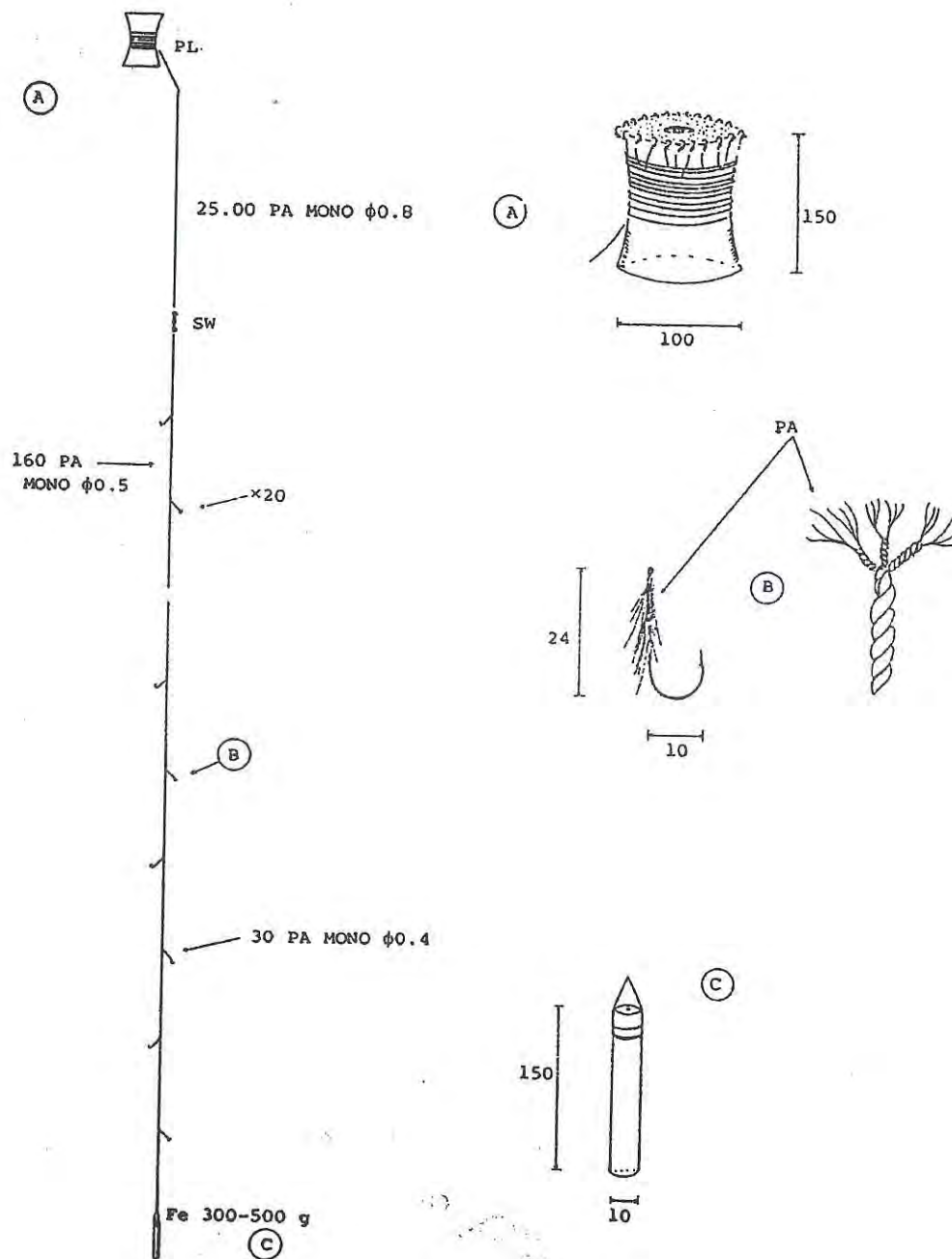
LOCATION
Ban Phe
Rayong



HOOK and LINE
Hand
Mackerel

VESSEL
Loa 5 m
hp 4

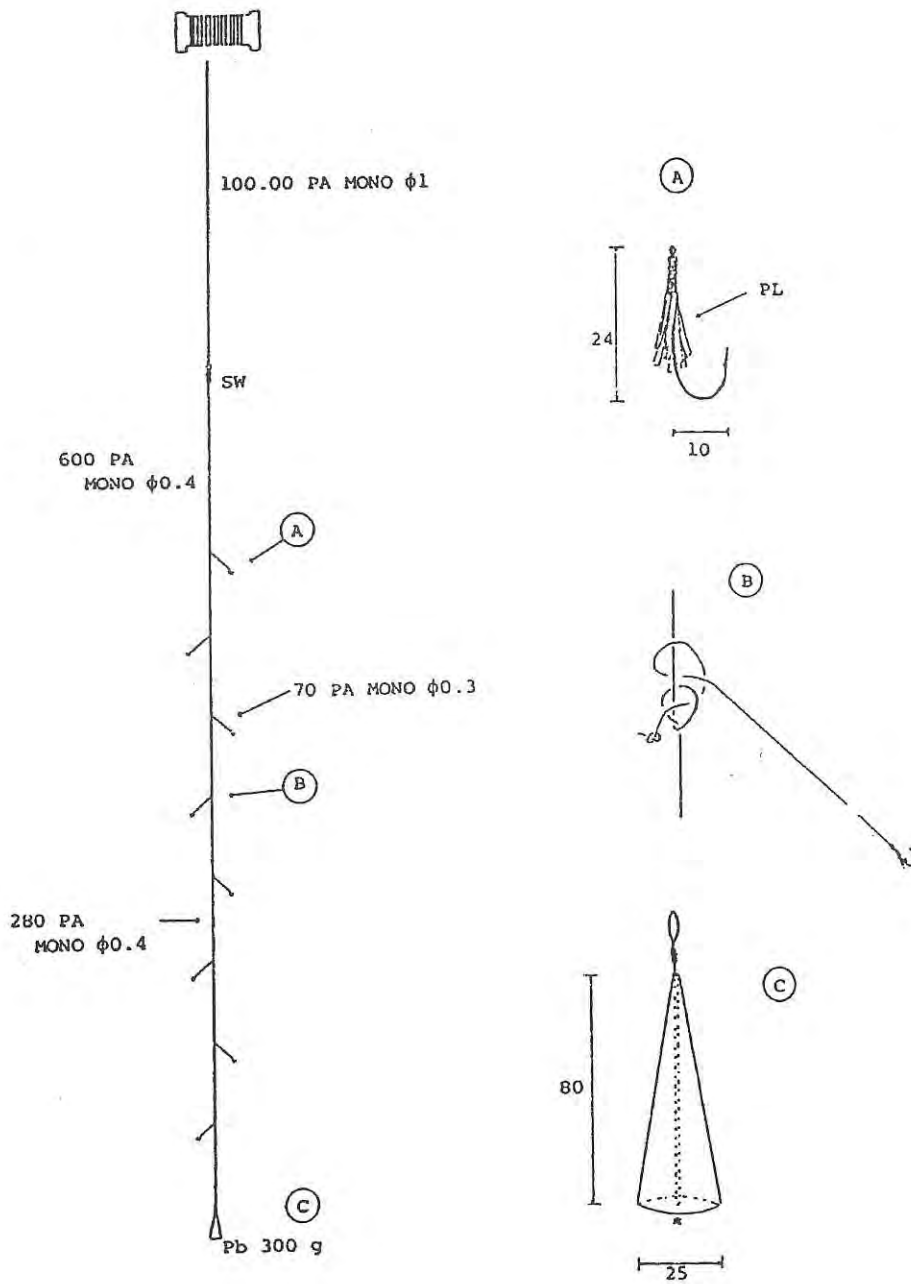
LOCATION
Ban Tapong
Rayong



HOOK and LINE
Hand
Mackerel
Sardine

VESSEL
Loa 5 m
hp 4

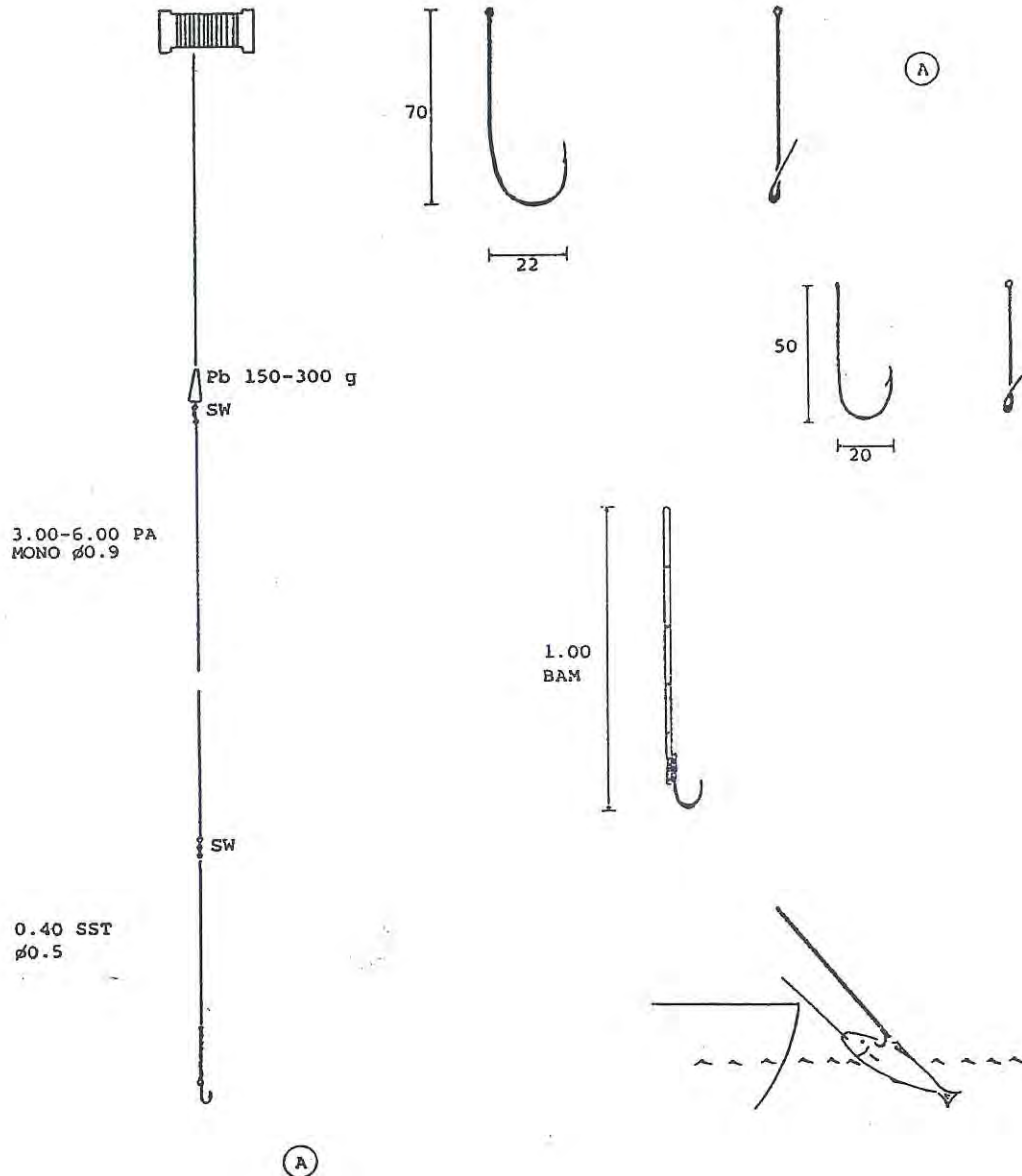
LOCATION
Ban Hin Khao Hin Daum
Rayong



HOOK and LINE
Hand
Spanish mackerel
Barracuda

VESSEL
Loa 10 m
hp 10

LOCATION
Ban Phe
Rayong



HOOK & LINE

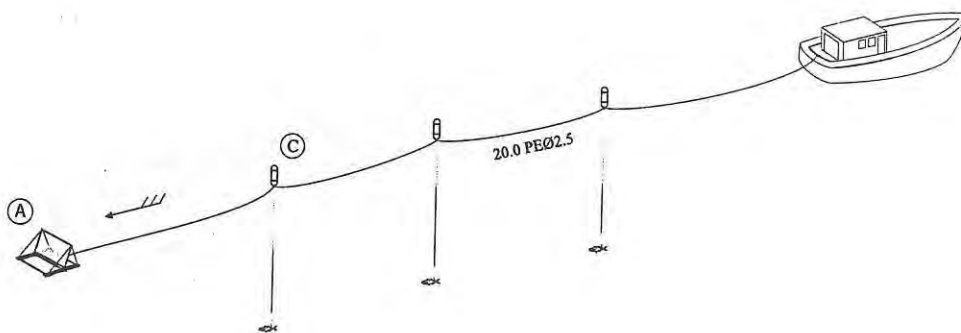
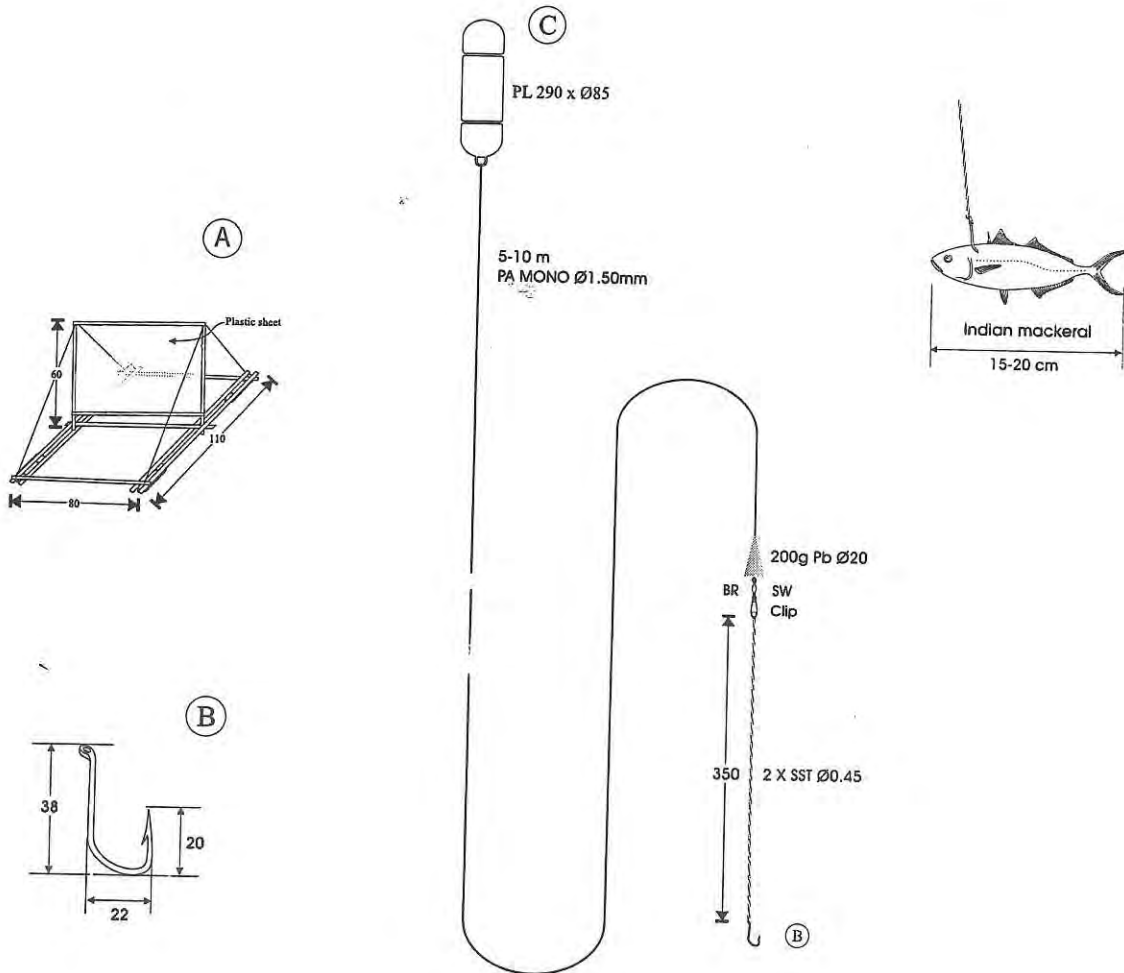
Drift Longline
Spanish mackerel

VESSEL

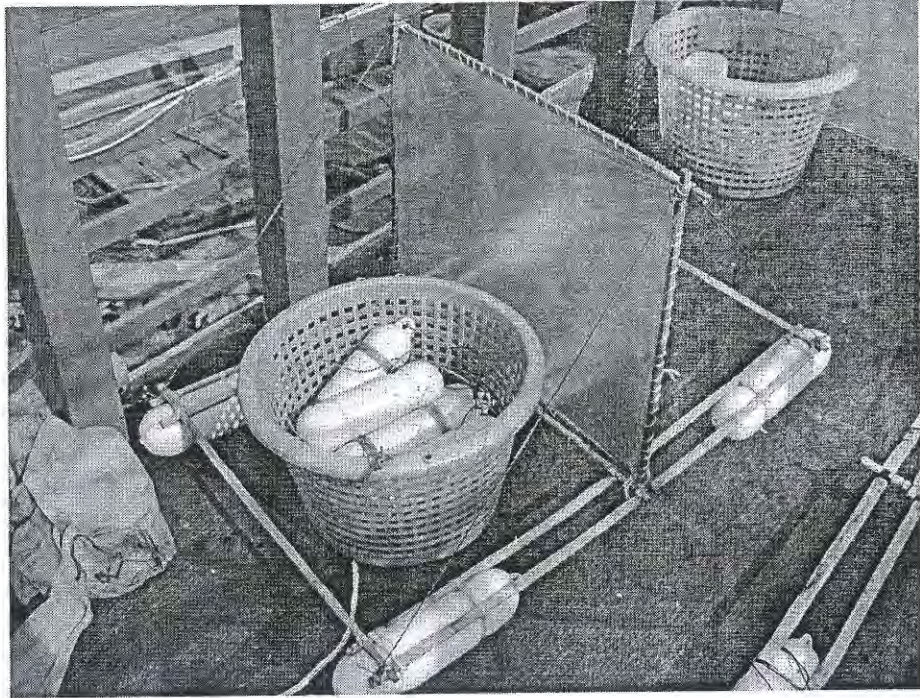
Loa 16 m
hp 273

LOCATION

Ban Phe
Rayong



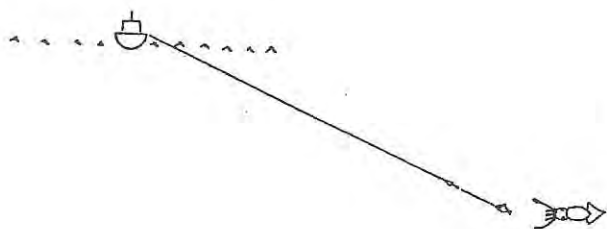
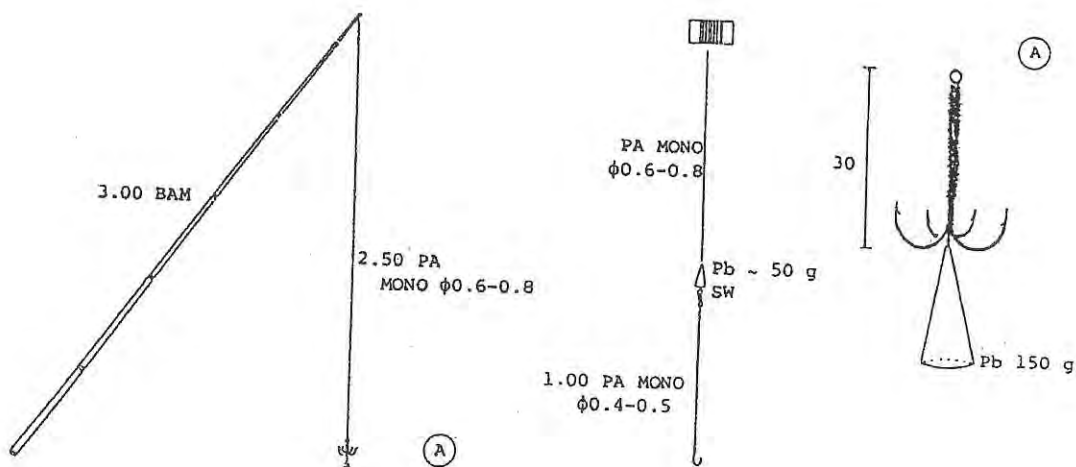
Rv. 2002



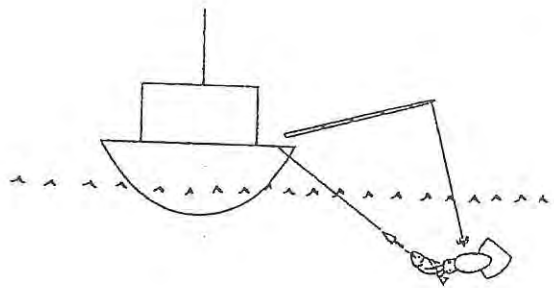
HOOK and LINE
 Pole
 (Daytime)
 Squid

VESSEL
 Loa 10 m
 hp 10

LOCATION
 Ban Tapong
 Rayong



①

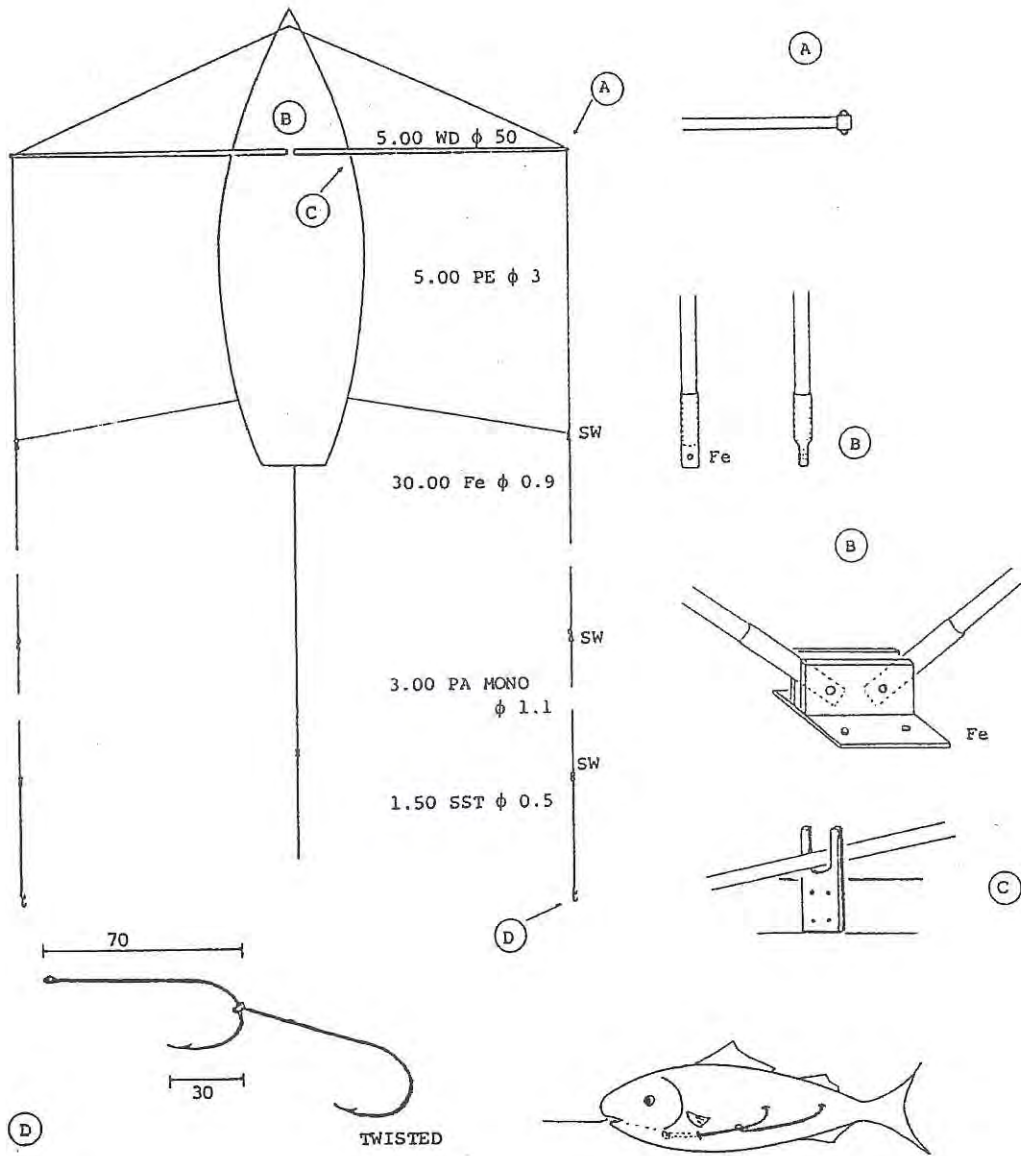


②

HOOK and LINE
Trolling
Spanish mackerel

VESSEL
Loa 10 m

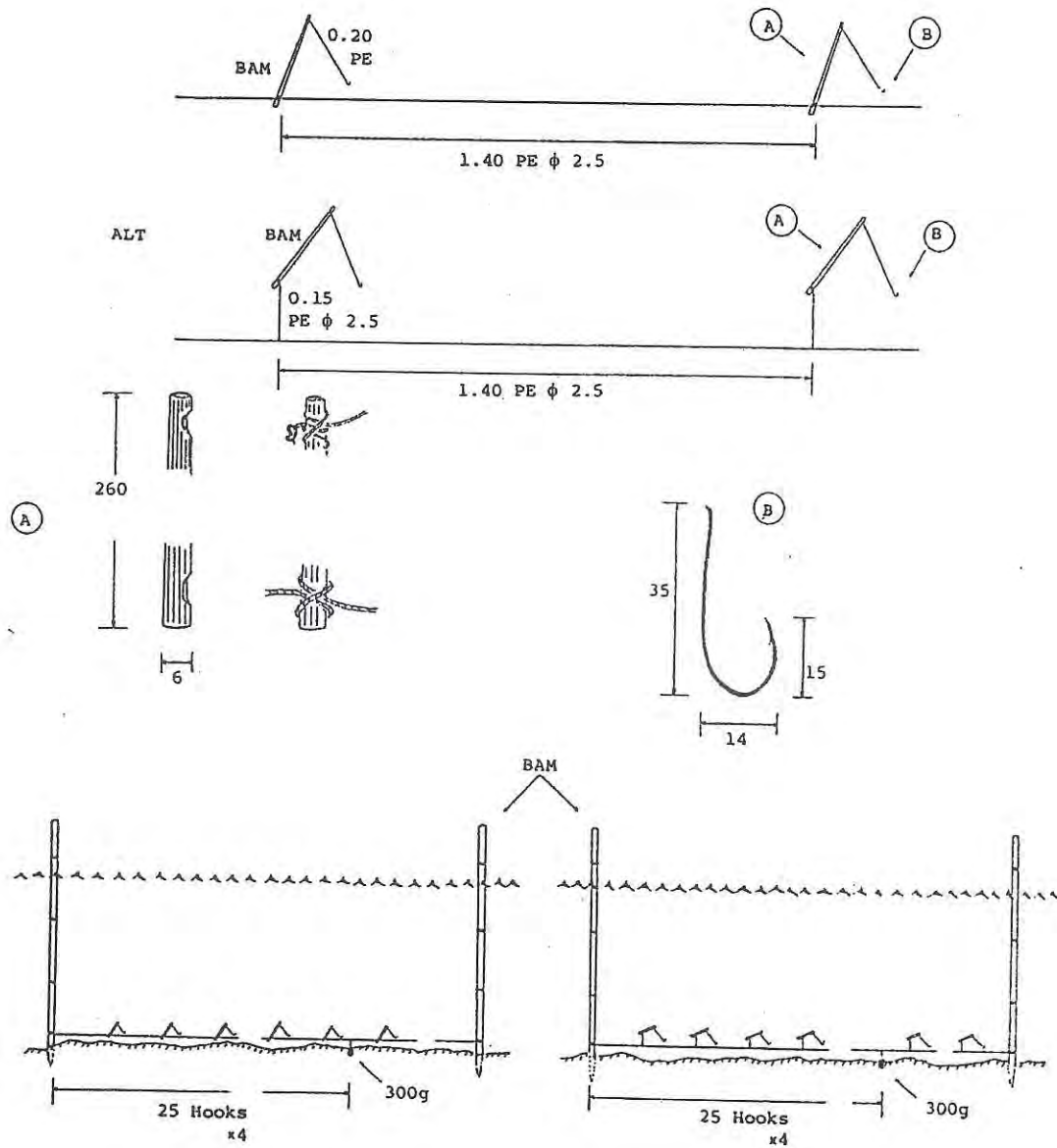
LOCATION
Pakbara
Satun



HOOK and LINE
Bottom longline
Marine catfish

VESSEL
Loa 6 m
hp -

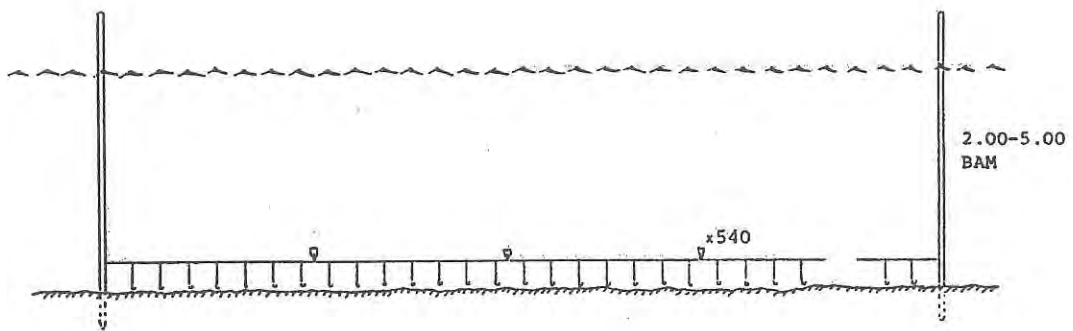
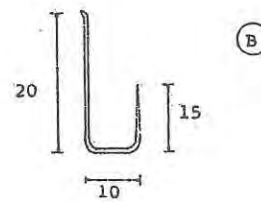
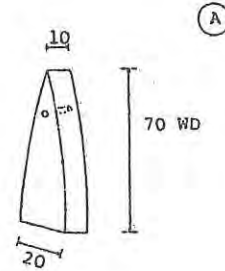
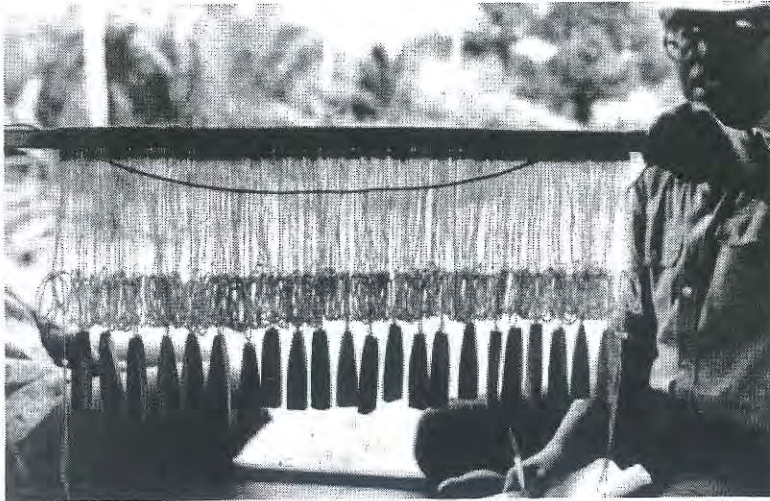
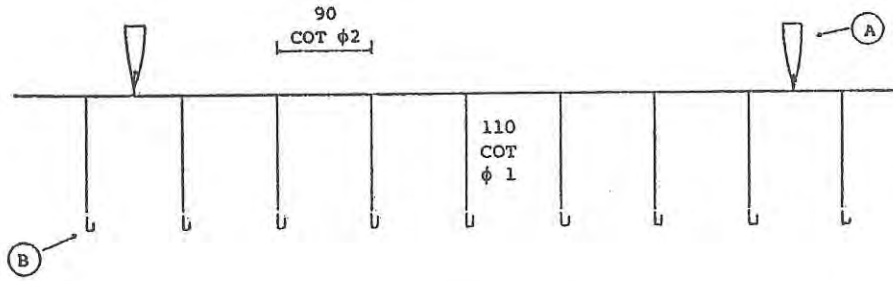
LOCATION
Bang Ya Prak
Samut Sakhon



HOOK and LINE
 Bottom longline
 Marine catfish

VESSEL
 Loa 5 m
 hp -

LOCATION
 Ban Tachang
 Surat-Thani



HOOK & LINE

VESSEL

LOCATION

Longline

Loa

6.5 m

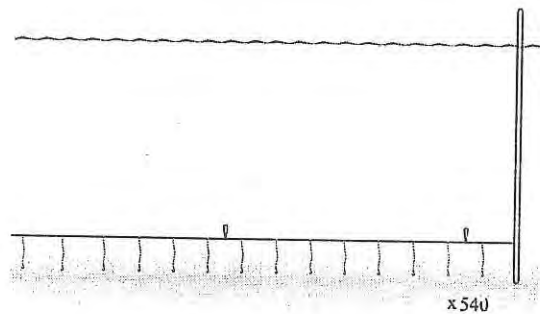
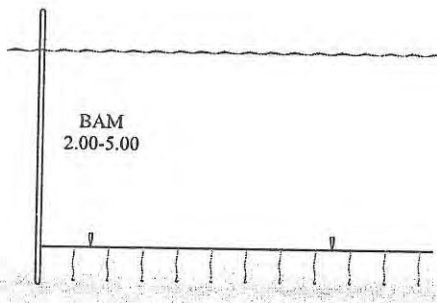
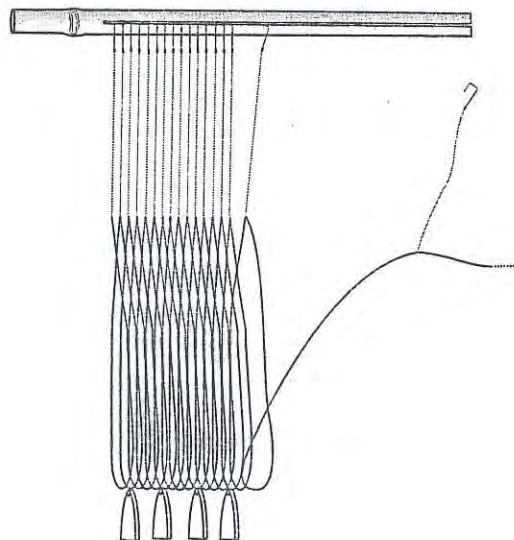
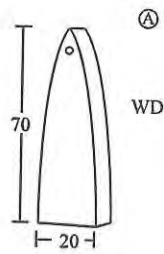
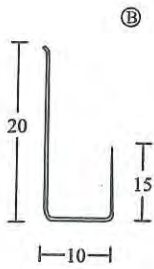
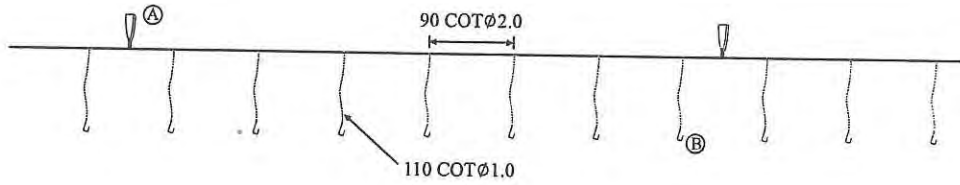
Ta Chang

Catfish

hp

8

Surat Thanee

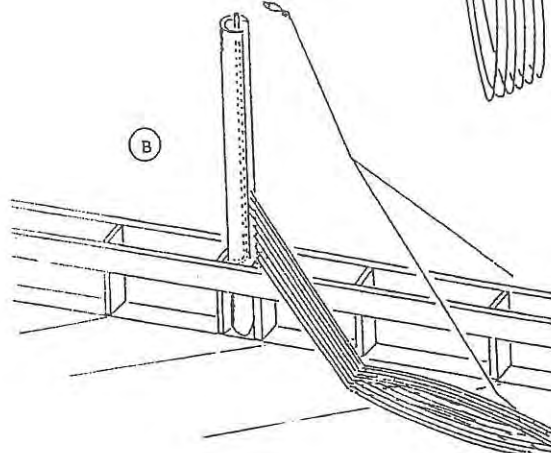
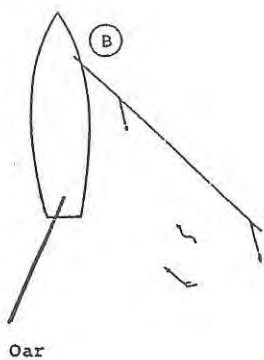
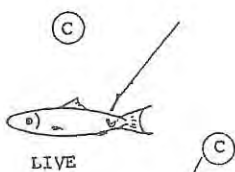
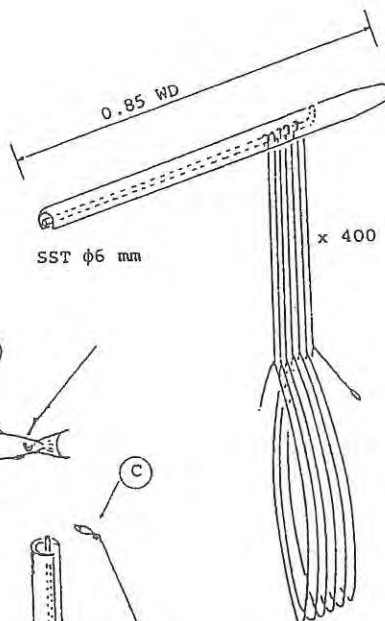
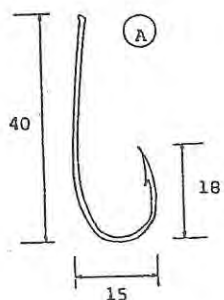
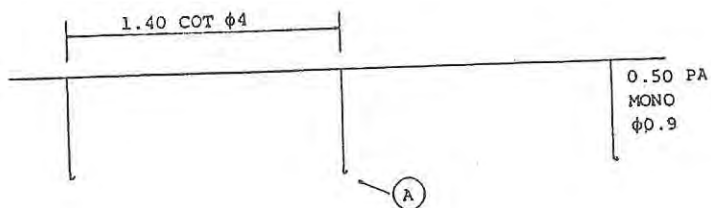


Rv. 2002

HOOK and LINE
Bottom longline
Fourfinger threadline

VESSEL
Loa 5 m
hp

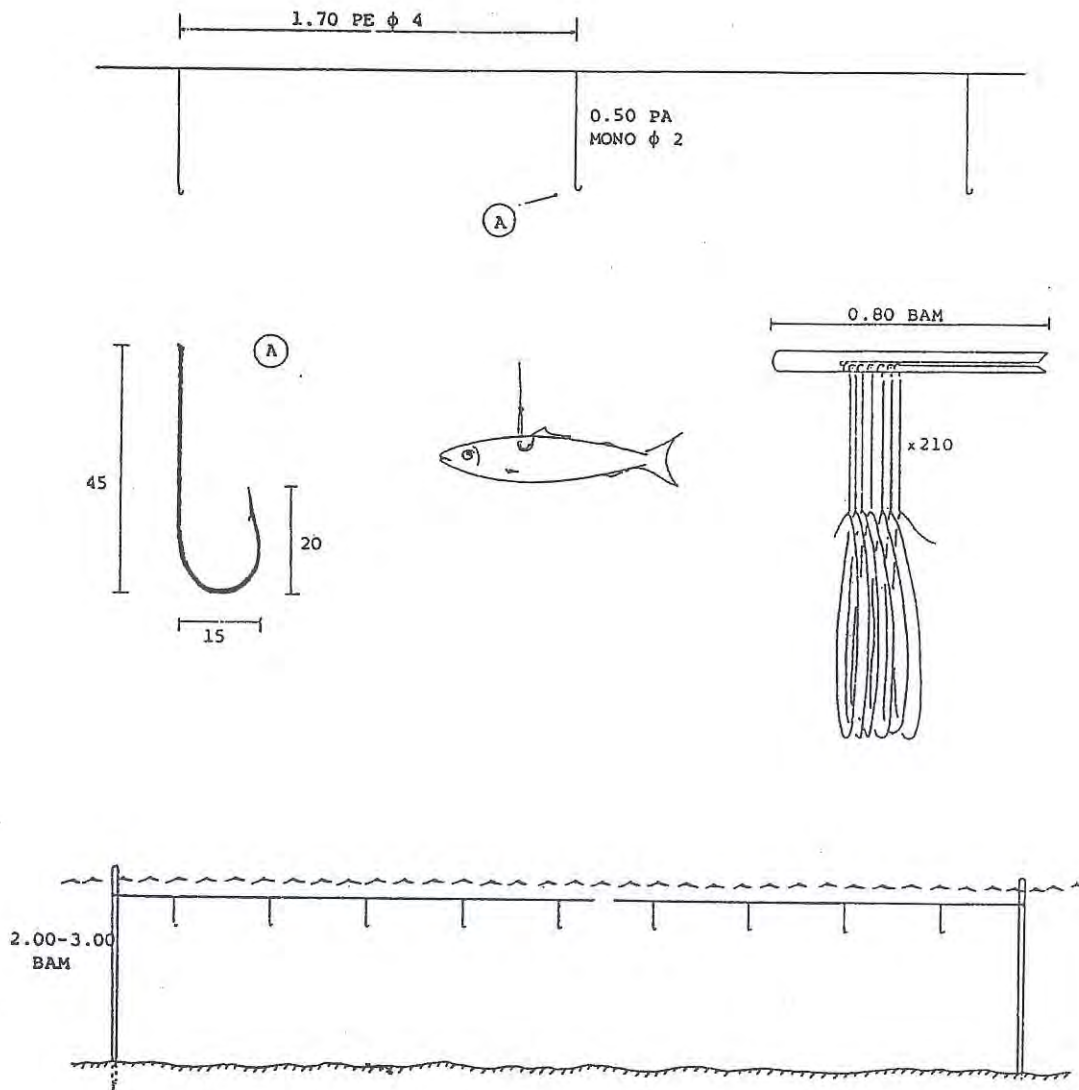
LOCATION
Bang Bo
Samut Prakarn



HOOK and LINE
Longline
Fourfinger threadfin

VESSEL
Loa 7 m
hp 6

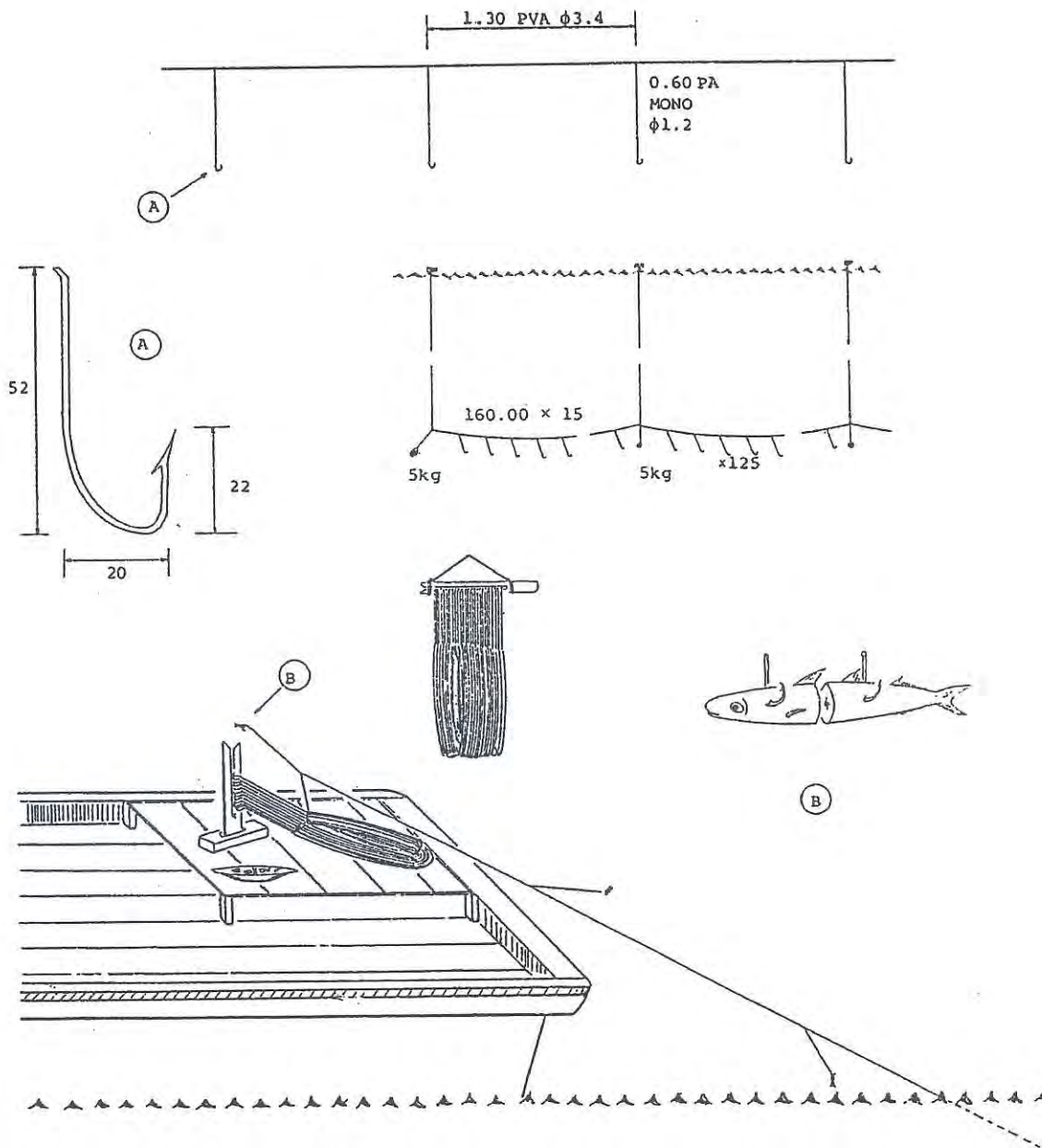
LOCATION
Angsila
Chon Buri



HOOK and LINE
Bottom longline
Snapper, Grouper

VESSEL
Loa 18 m

LOCATION
Phuket
Phuket



HOOK & LINE

VESSEL

LOCATION

Longline

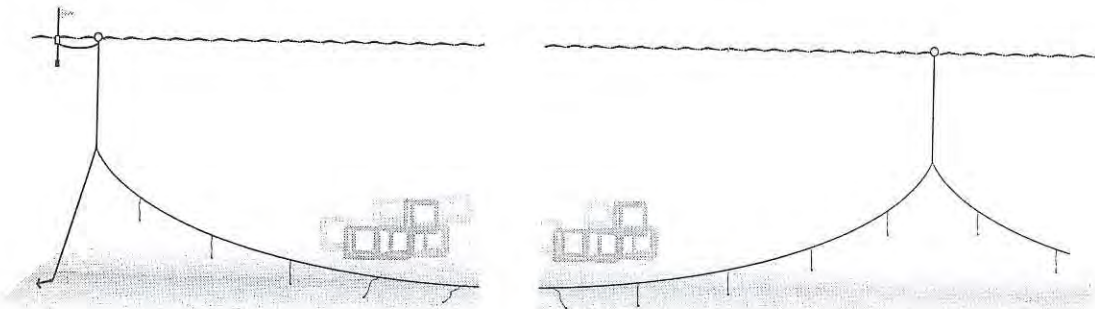
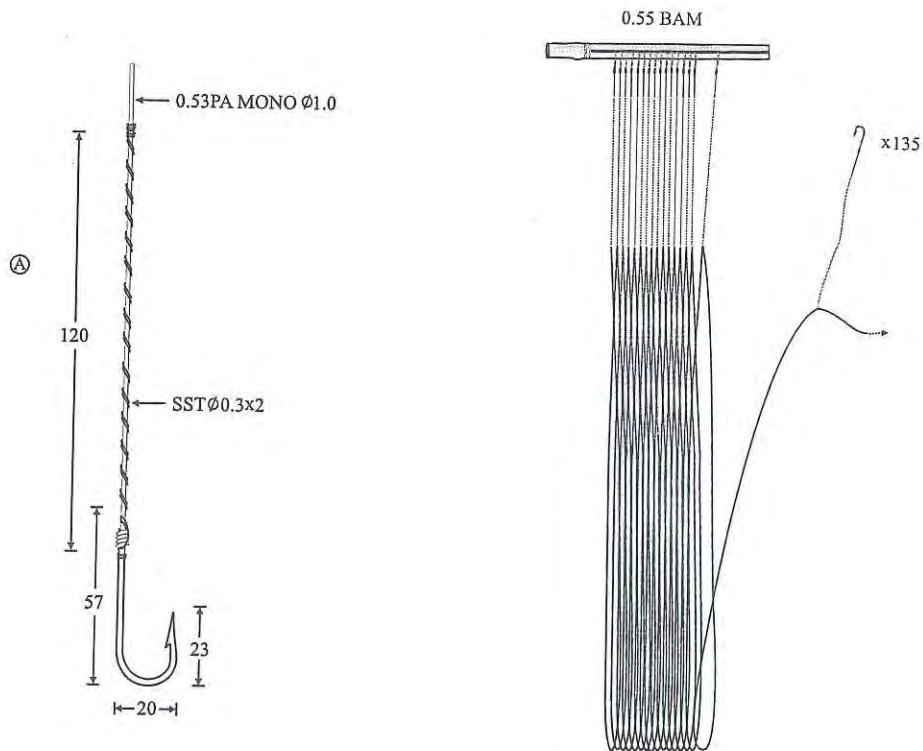
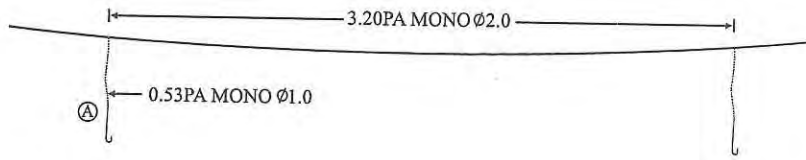
Loa 6.5 m

Singha Nakon

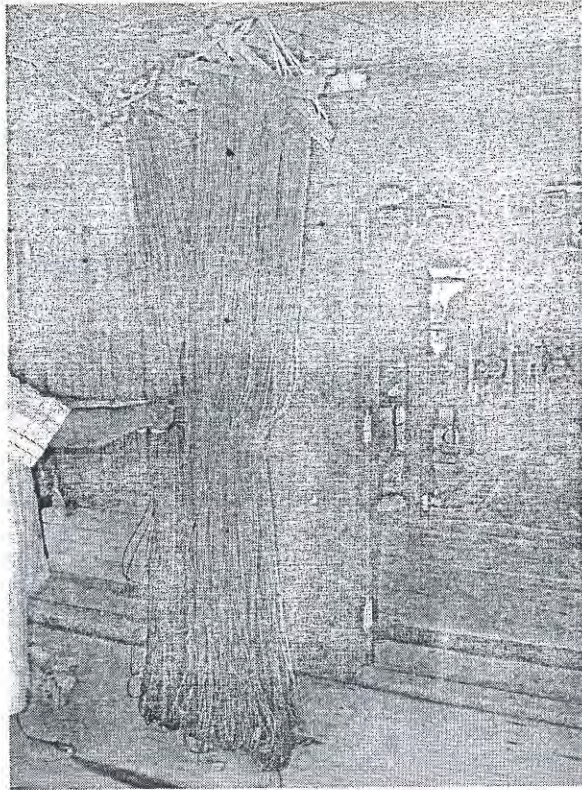
Spanish mackerel,
Grouper, Ray

hp 8

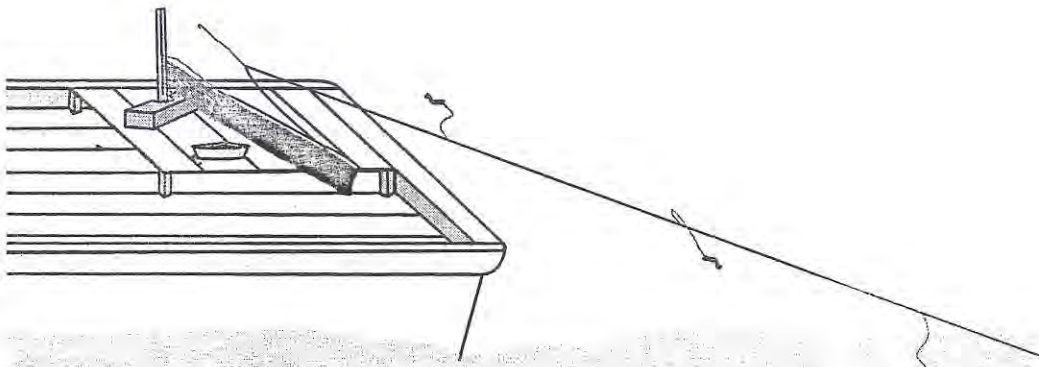
Songkia



Rv. 2002



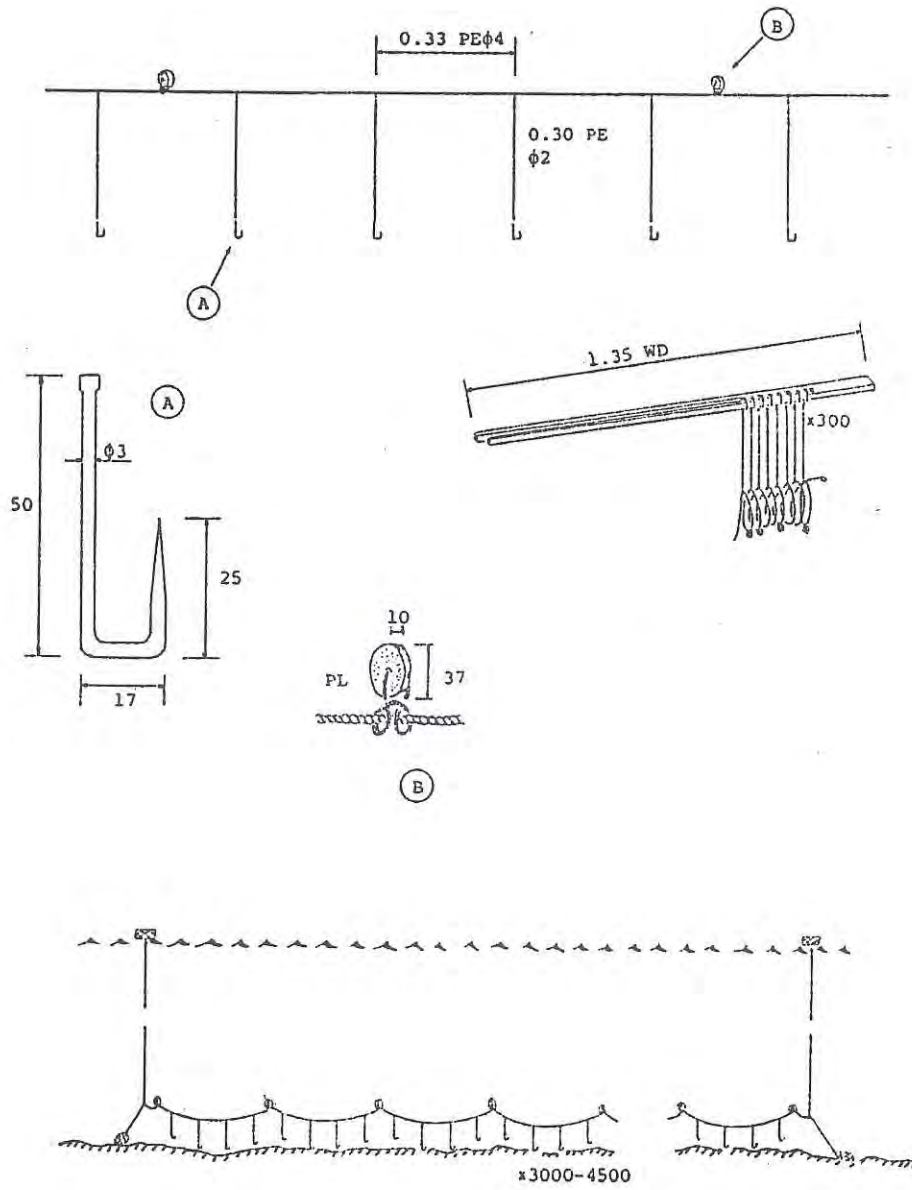
Shooting of longline



HOOK and LINE
Bottom longline
Ray

VESSEL
Loa 8 m

LOCATION
Ravai
Phuket



9. SCOOP NETS

Bundit Chokesanguan

**Revised by
Nopporn Manajit**

CONTENTS

	Page
Scoop net fishing.....	367
Fishing gear and methods	368
9.1 Scoop net	
9.2 Push net	
Designs and specifications	370
<u>Scoop net</u>	370
<input type="checkbox"/> Planktonic shrimp	
<u>Push net</u>	373
<input type="checkbox"/> Planktonic shrimp	
<input type="checkbox"/> Shrimp	
<input type="checkbox"/> Demersal fish	

SCOOP NET FISHING

Scoop net is operated widely in Thai coastal waters. Fishing gear is simple, consisting of a net and two poles to keep the net open. A small version of such a net is hand operated by a fisherman (scoop net), while larger nets are pushed by an engine-driven boat which can be any size between a long-tail boat and a trawler. The latter type of scoop net is better known as push net.

According to the fishery statistics from 1990 to 1997 the annual catch from scoop net has been increasing, particularly and highest in 1996 (41,730 mt). This increase of catch is due to the catch from push net fishing (Table 9.1). The catch from push net is increased gradually from 1990-1998 and highest in 1996 (29,790 mt). As can be seen from the table 9.1 that the catch from push net fishing in 1997 (28,648 mt) become more than twice of the catch in 1990 (14,176 mt) while the number of push net fishing boats in 1998 (901 units) less than in 1990 (970 units) (Table 9.2)

Table 9.1 Annual catch by scoop net and push net fishing.

	1990	1991	1992	1993	1994	1995	1996	1997
Scoop net	9,730	9,737	12,572	11,645	13,166	13,635	11,940	9,889
Push net	14,176	22,094	20,974	21,146	24,821	26,298	29,790	28,684
Total	23,906	31,831	33,546	32,791	37,987	39,933	41,730	38,573

Source: Fishery statistical bulletin for the South China Sea area. 1990-1997

Table 9.2 Number of push net fishing boats in Thailand, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Push net	970	990	818	808	651	634	722	901

Source: Fishery statistical bulletin for the South China Sea area, 1990-1997

For the push net fishing, the proportion of trash-fish is very high about 42 per cent while the major species caught by scoop net are non-penaeid prawns about 99 per cent in 1997.

The main species of fish caught by scoop net and push net fishing in 1997 were as follows:

<u>Scoop net</u>	<u>Catch/year (mt)</u>
Non-penaeid prawns	9,803
Penaeid prawns	3
Others	83
<hr/>	
Total	9,889

<u>Push net</u>	<u>Catch/year (mt)</u>
Trash fish	12,085
Non penaeid prawns	12,511
Penaeid prawns	58
Blue swimming crab	689
Squid	232
Cuttlefish	529
Others	2,580
<hr/>	
Total	28,684

Source: Fishery statistical bulletin for the South China Sea area 1997

FISHING GEAR AND METHOD

9.1 Scoop net

Scoop net is a small-scale gear; it resembles a large spoon and can be operated by one fisherman. The skis at the end of the two poles are made of wood or coconut husk. The fishing is carried out in the day-time, in waters 0.10-1.50 m deep. The fisherman brings his equipment to the fishing ground in a rowing-boat, attaches the net to the poles, gets into the water and starts wading, pushing the net in front of him and pulling his small boat behind. From time to time he raises the net and picks up small shrimps, planktonic shrimp or any other catch. Fishing can be done throughout the year, but the best time is from June to August.

9.2 Push net

The net of this gear has three distinct parts: the upper and the lower part, and the cod-end. There is a ground-rope, which is either a chain or some rope weighted with sinkers, so that it touches the sea bottom during fishing operation. The ends of the ground rope are fastened to the poles, which hold the net. The head rope hangs along the length of the poles.

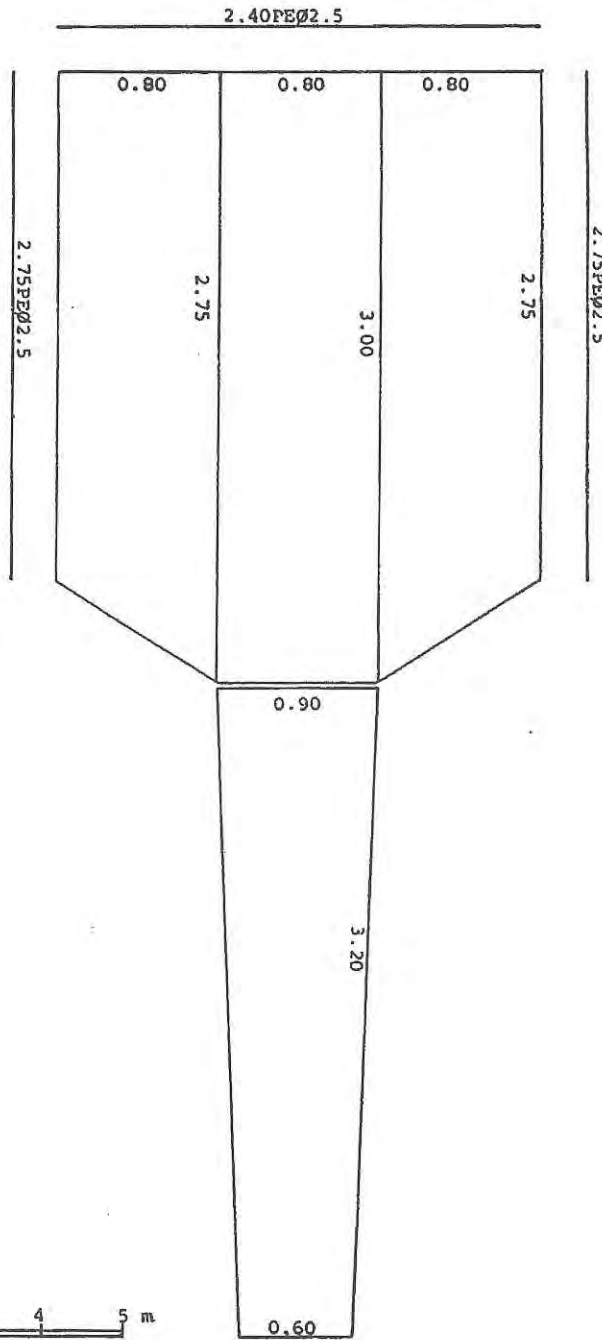
The poles are either bamboo or trunks of pine trees or iron pipe, 6-40 meters long, depending on the size of gear and the scale of fishing. Two poles are tied so as to form an inverted V-shape, ending in wooden or iron skis or stainless steel which slide along the sea bed. Floats are also attached near the skis to prevent them from getting stuck in the mud. On large-sized gears, the floats are adjustable by means of a rope and a ring fixed to the pole. Very long poles are often not tied to each other but are fastened directly to an outrigger or a boom on the foredeck of the fishing boat.

Push-net fishing is operated from an engine-driven boat, either in the daytime or at night. When the boat arrives at the fishing ground, the net is tied to the poles, with the ground-rope and head-rope in position. The gear is lowered in the water and floats adjusted until the skis touch the bottom. At the end of a fishing operation, the cod-end is hauled by means of a rope attached to it, emptied, and lowered for the next round of fishing. The gear is operated widely in coastal areas of Thailand. In 1982 there were 1,899 registered push-net boats, mostly in Surat Thani, Satun, Nakhon Sri Thammarat and Samut Prakarn provinces.

SCOOP NET
Scoop net
Planktonic shrimp

VESSEL
Loa -
hp -

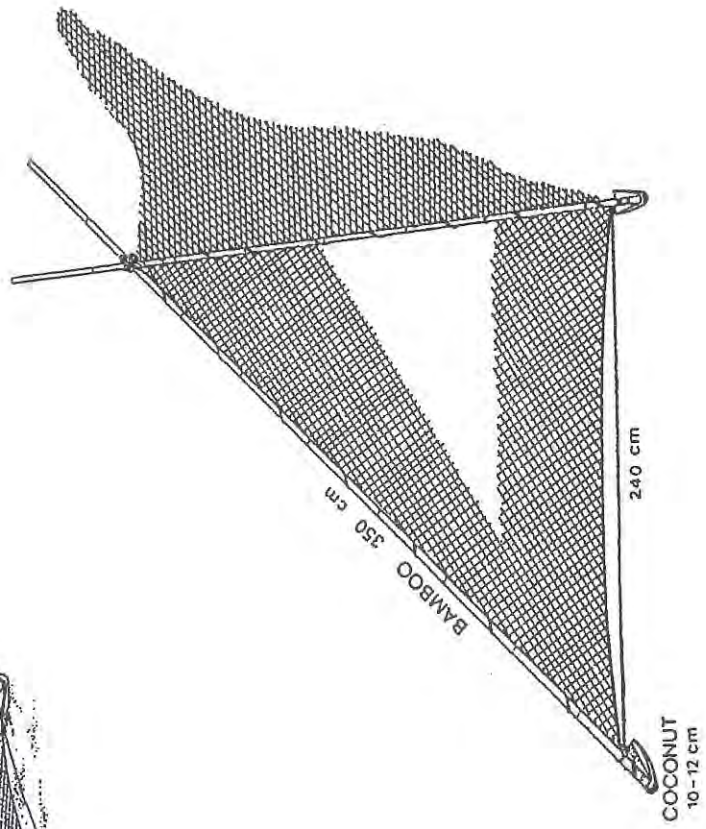
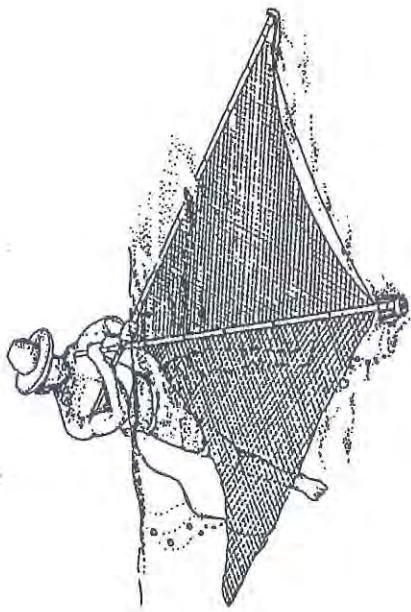
LOCATION
Khokkhai
Phangnga



MAT

PA
minow
blue
2x2mm

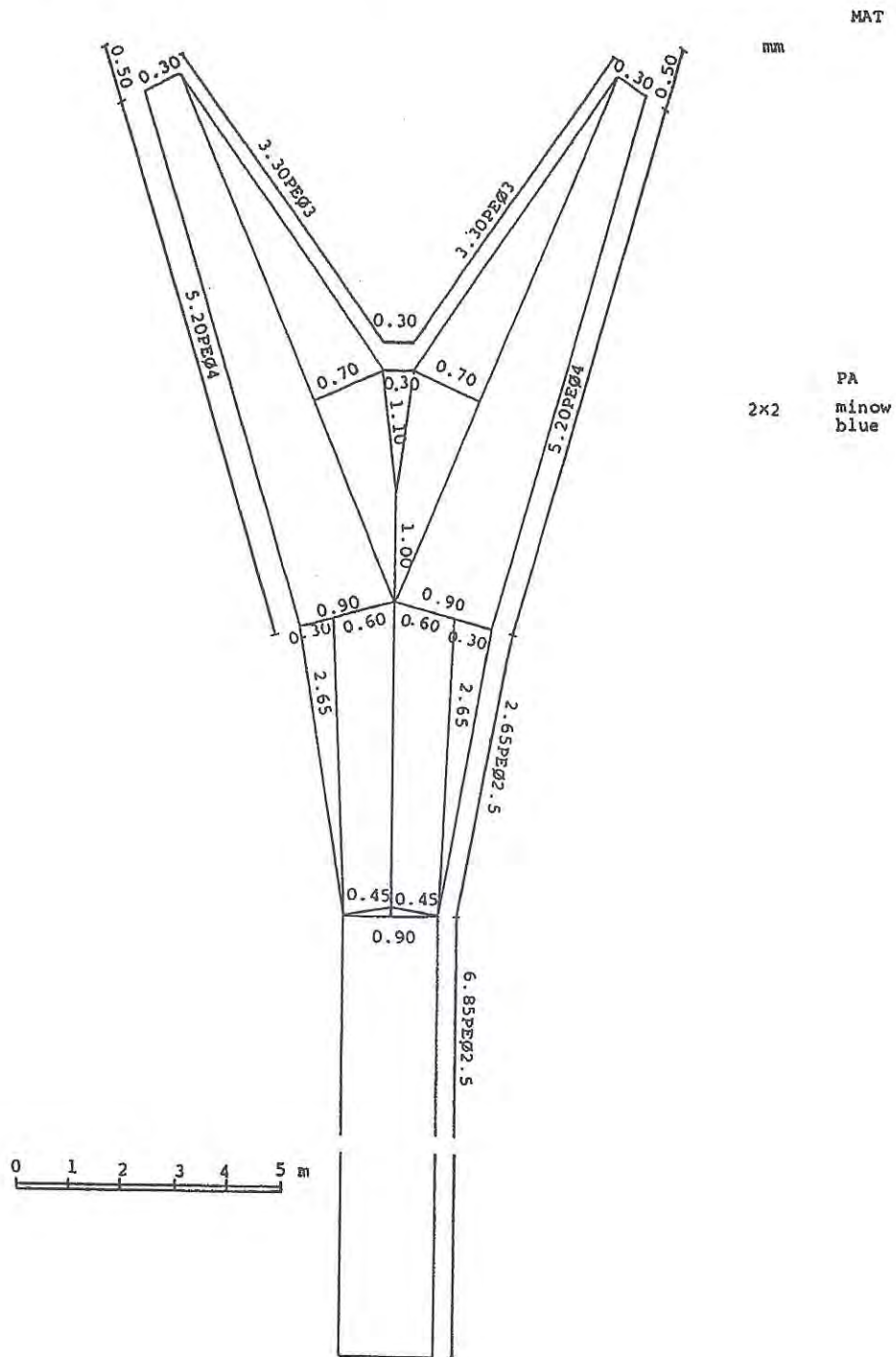




SCOOP NET
Scoop net
Planktonic shrimp

VESSEL
Loa 5 m
hp -

LOCATION
Chebilang
Satun



SCOOP NET

Push Net

Acetes, Shrimp

VESSEL

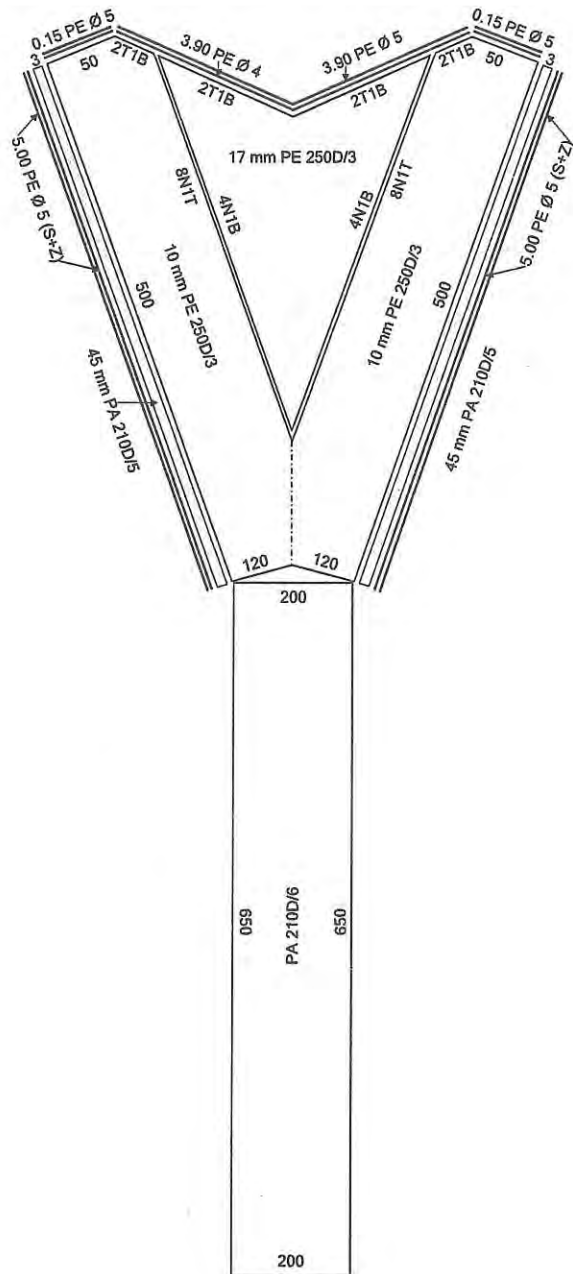
Loa 8 m

hp 10

LOCATION

Kanchanadit

Surat Thani

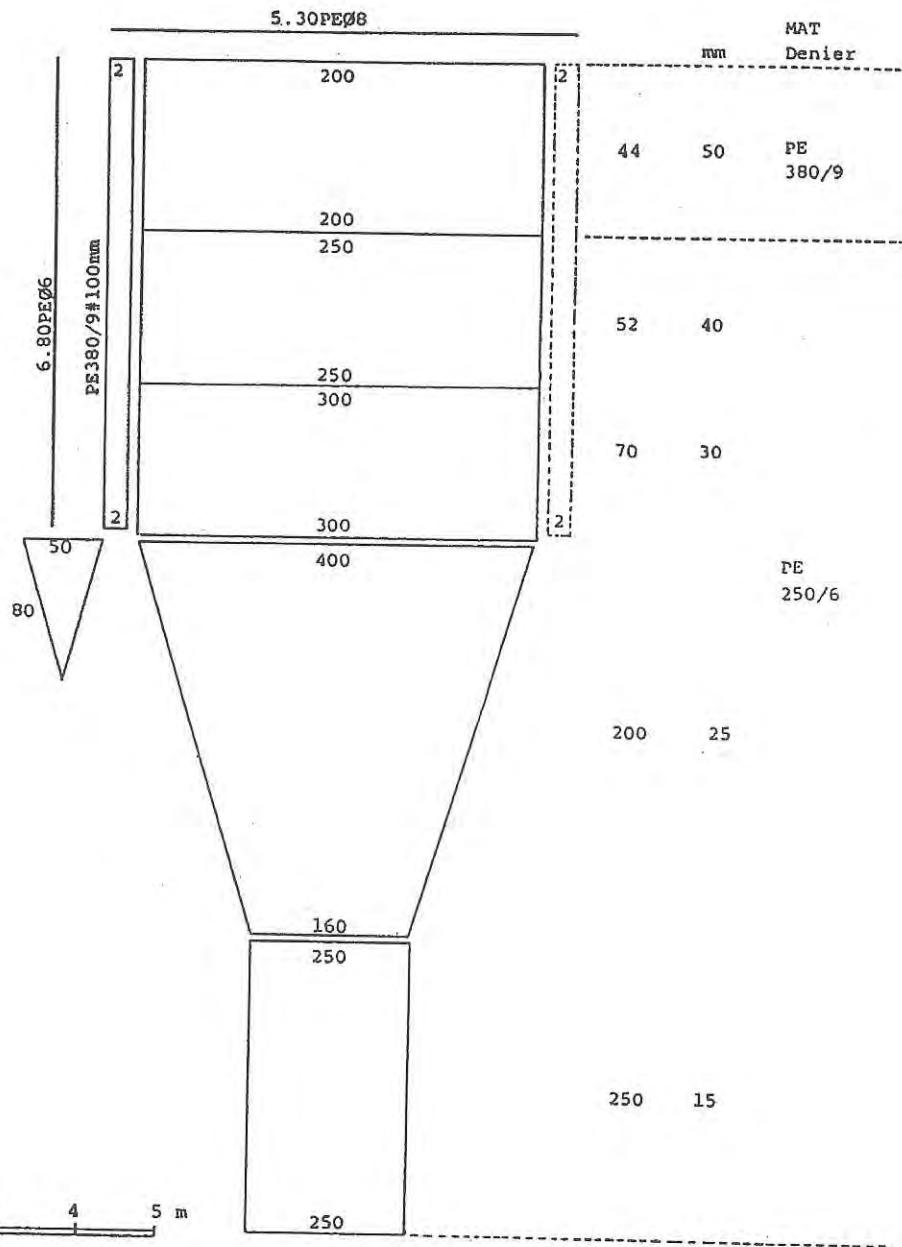


Rv. 2002

SCOOP NET
Bamboo push net
Shrimp

VESSEL
Loa 9 m
hp 5

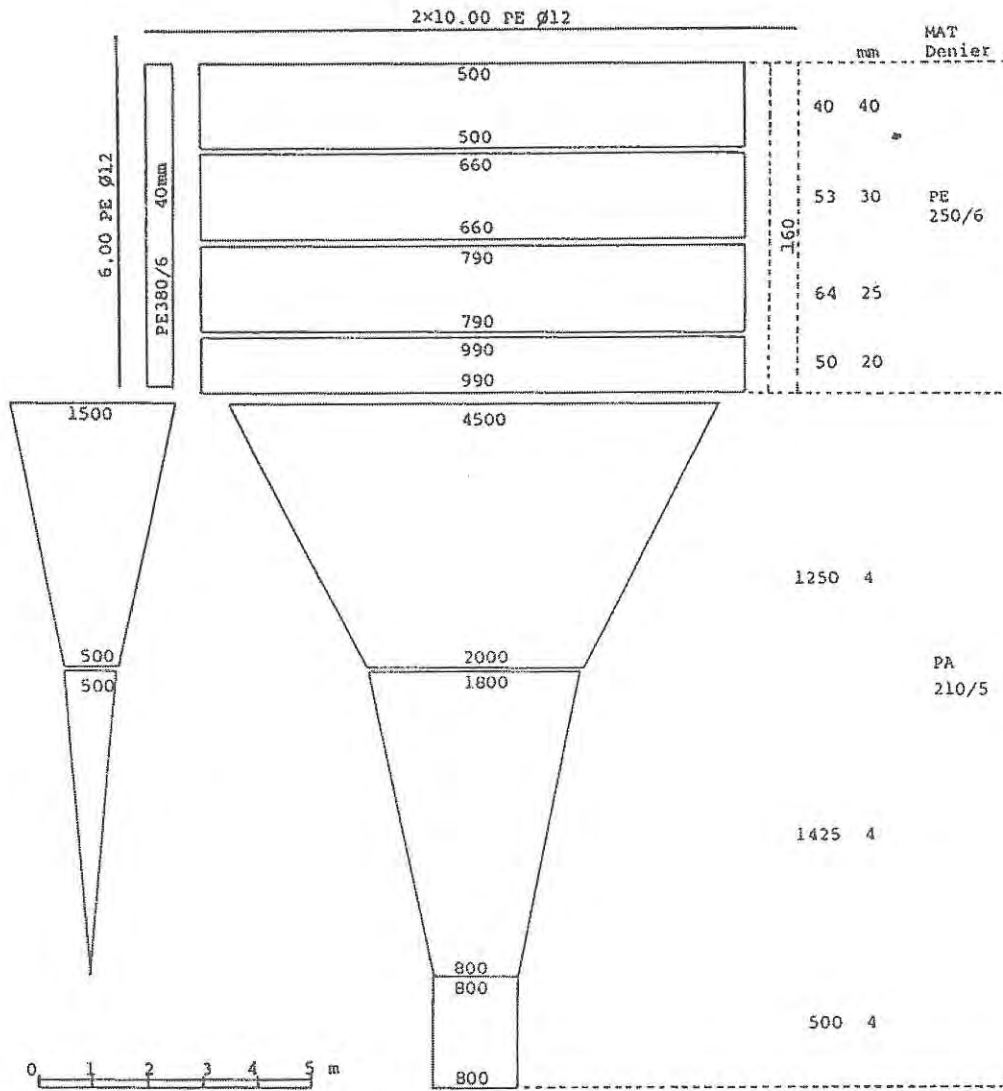
LOCATION
Khao-niwes
Ranong



SCOOP NET
Push net
Shrimp

VESSEL
hp 150

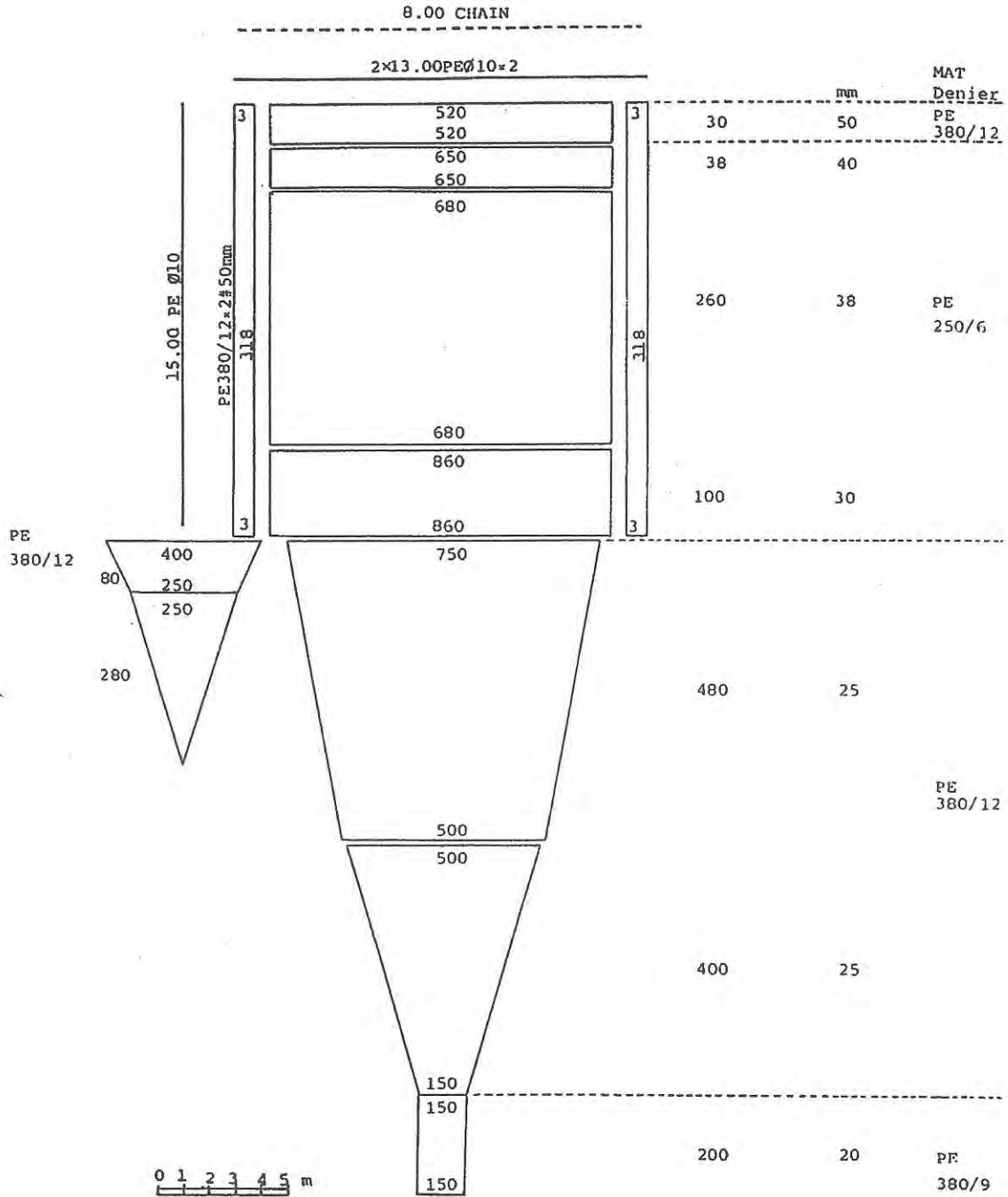
LOCATION
Ban Thungmaha
Prachuap Khiri Khan



SCOOP NET
Push net
Shrimp

VESSEL
hp 260

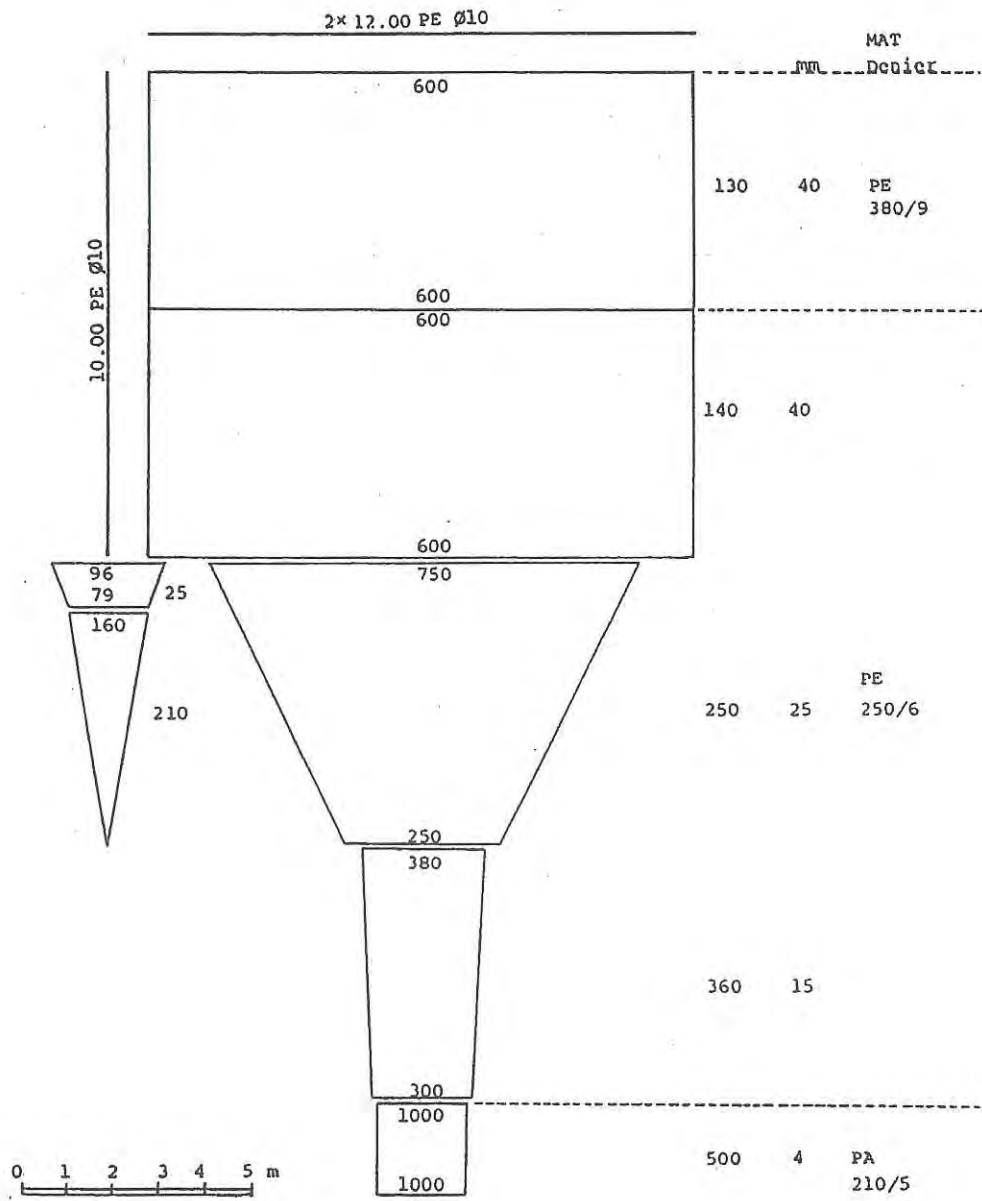
LOCATION
Samut Songkhram
Samut Songkhram

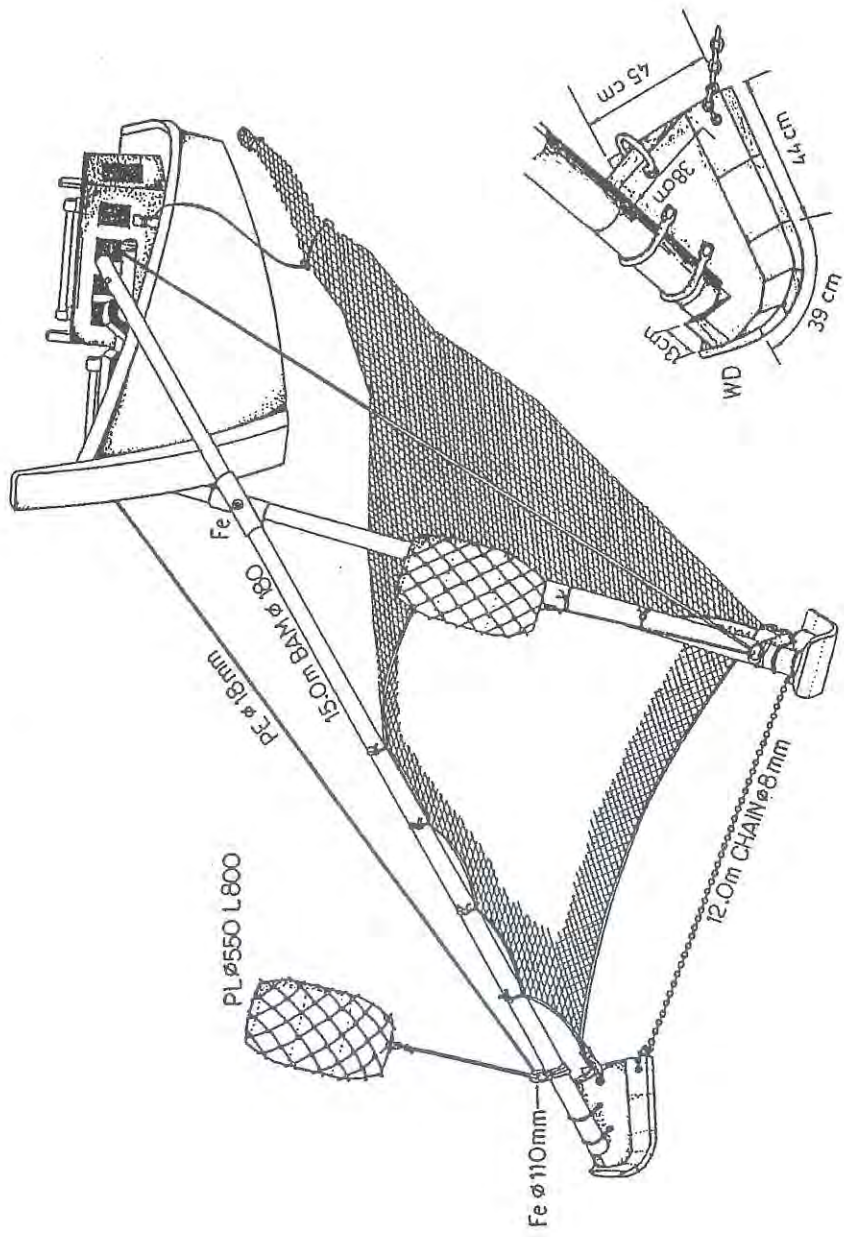


SCOOP NET
Push net
Shrimp

VESSEL
Loa 10 m
hp 260

LOCATION
Lamphapa
Samut Prakarn





SCOOP NET

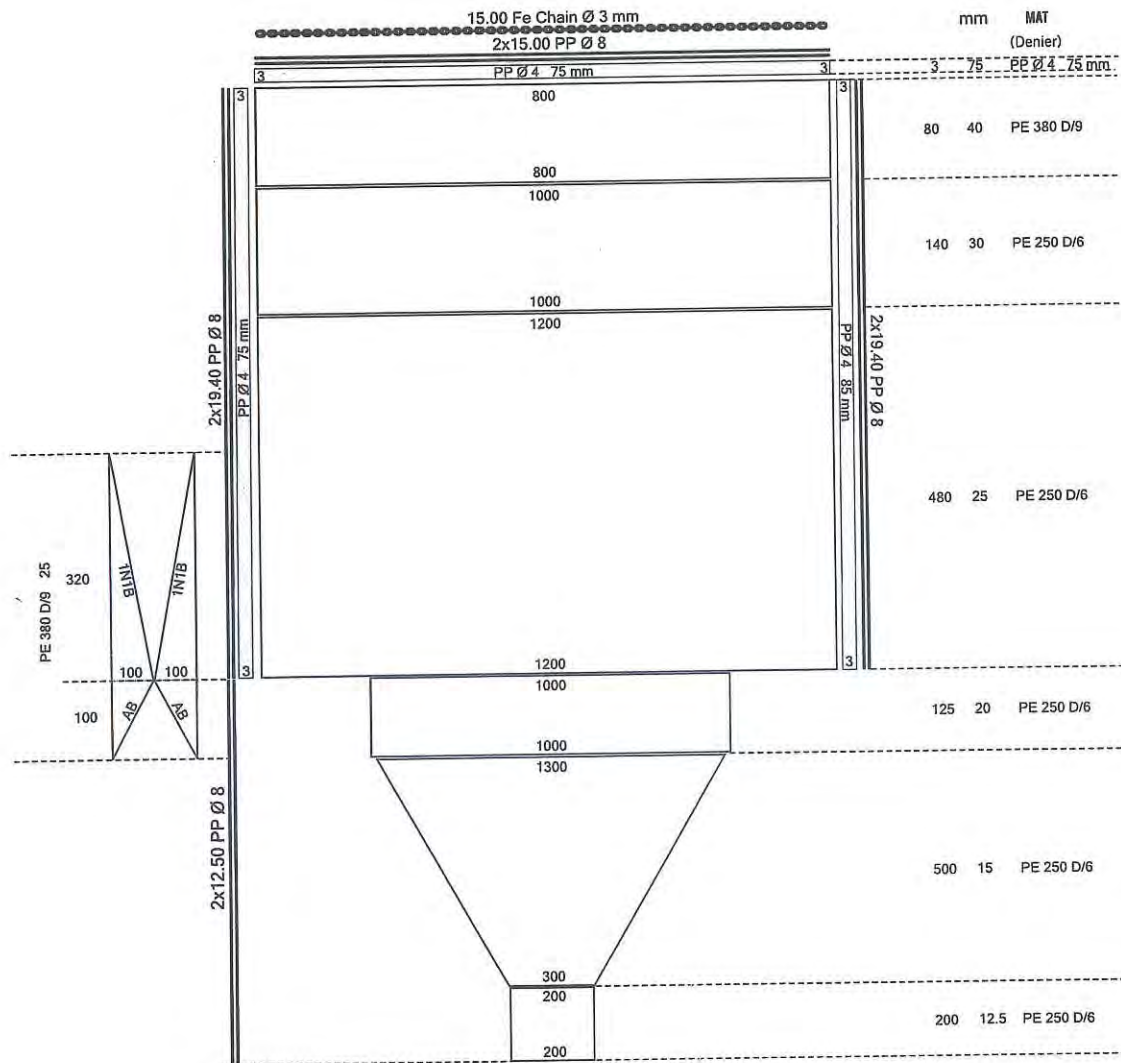
Push Net
Shrimp, Demersal fish

VESSEL

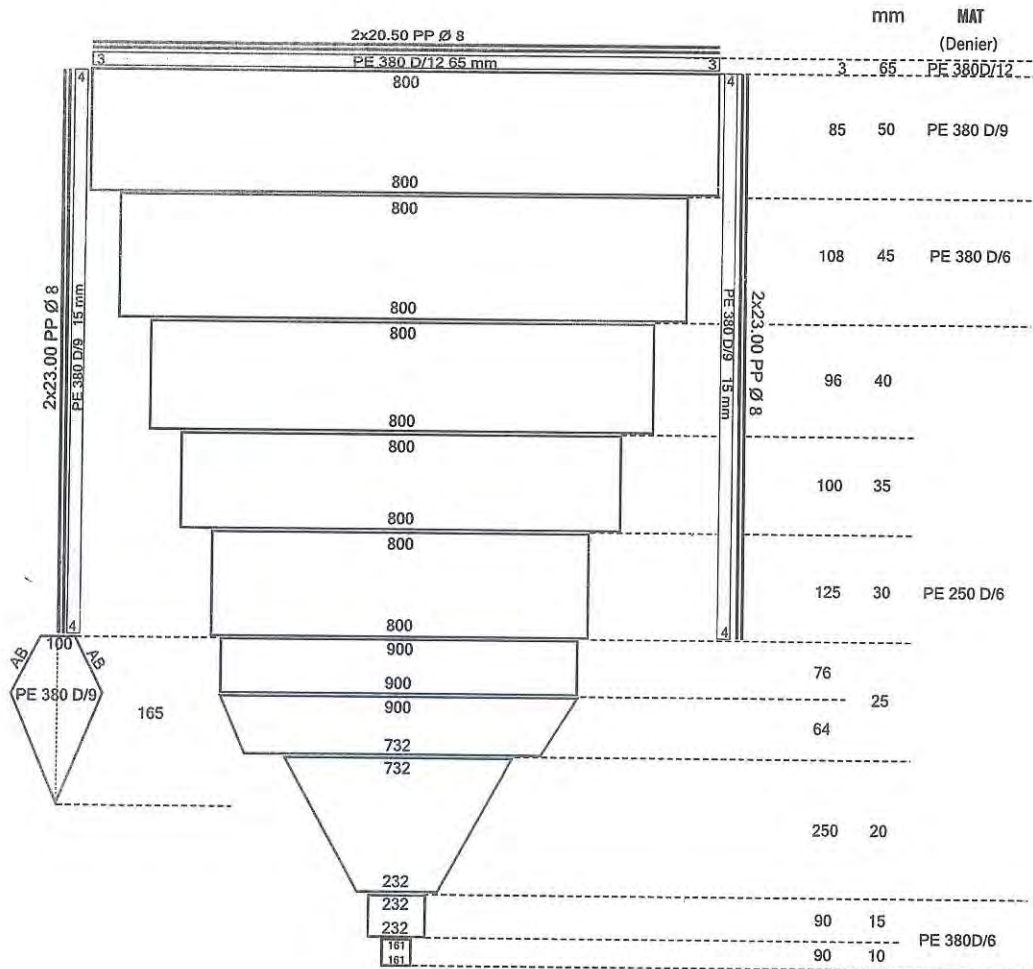
Loa 12 m
hp 120

LOCATION

Muang
Nakhon Sri Thammarat



SCOOP NET	VESSEL		LOCATION
Push Net	Loa	10 m	Muang
Shrimp, Demersal Fish	hp	150	<u>Trad</u>



Rv. 2002

SCOOP NET

VESSEL

LOCATION

Push Net

Loa

18.5 m

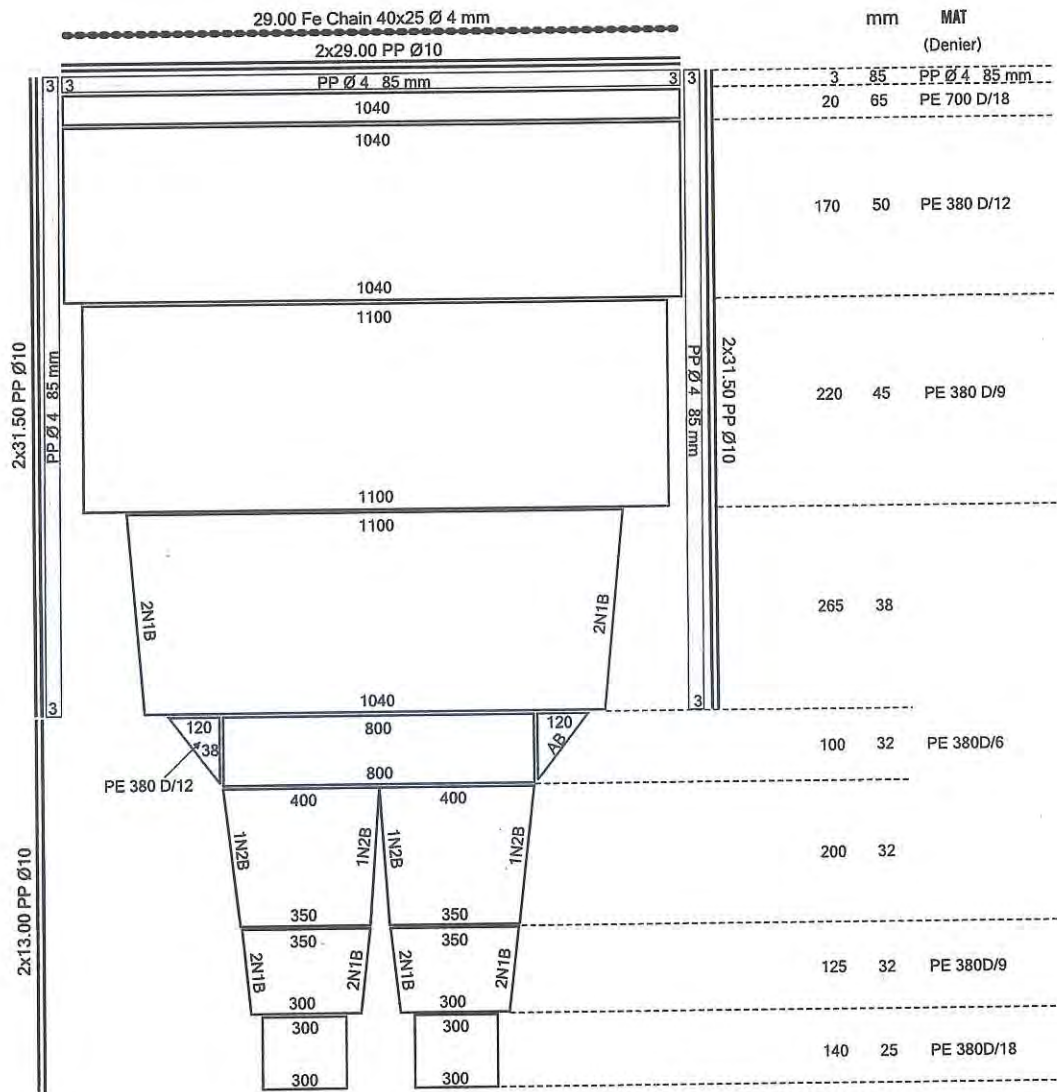
Paknam Lungsuan

Shrimp, Demersal Fish

hp

420

Chumpom



Rv. 2002

10. DRIVE-IN NET

Aussanee Munprasit

CONTENTS

	Page
Drive in net	387
Fishing gear and methods	387
10.1 Muro ami	
Drive-in net	388
□ Yellowtail fusilier	

DRIVE IN NET

It was originally a tradition gear from Okinawa where it is called muro-ami. In 1951, some Thai fishermen learnt the technique from their Japanese colleagues operating in Southeast Asian waters, and began using the gear by fishermen in Samut Prakarn, Chonburi and Phuket. The results, however, were disappointing, particularly in the Gulf. Eventually, only one set of drive in net has remained in operation, at Ravai fishing village at Phuket. The gear is still known as "Japanese net" (Uan Yee Poon). It is used for catching yellowtail fusiliers which the Thais call "Japanese fishes" (Pla Yee Poon)

FISHING GEAR AND METHODS

Drive-in net

The gear consists of a bag-net and two wings. The bag-net is 26.5 m long and has an opening of 18.2 x 6.8 m. The materials are nylon, and polyethylene at the cod-end and the front flap. The wings are 140 m long rectangular polyethylene nets, 50 mm mesh-size.

The fishing operation is carried out by 20-25 men, using one mother boat and four long-tail boats. The net is set at the sea bottom, the mouth of the bag-net facing the current. The fish are driven into the net by 8-10 fishermen who swim around and shake a rope to which iron rings and palm leaves are attached at 1.5 m intervals, and another six men who dive to the bottom and hit iron rings against rocks. The divers breathe through pipes connected to a compressor on board the fishing boat.

This method of fishing is suitable for rocky bottom areas around islands, in water depth from 5 to 20 meters. Fishing can be done outside the monsoon season, when the sea is calm. In the Andaman Sea this happens between November and April. The best fishing time of the month is during neap tide.

SEINE NET

Drive in net, Muro ami,
Oikomi ami
Uan Yeepoon

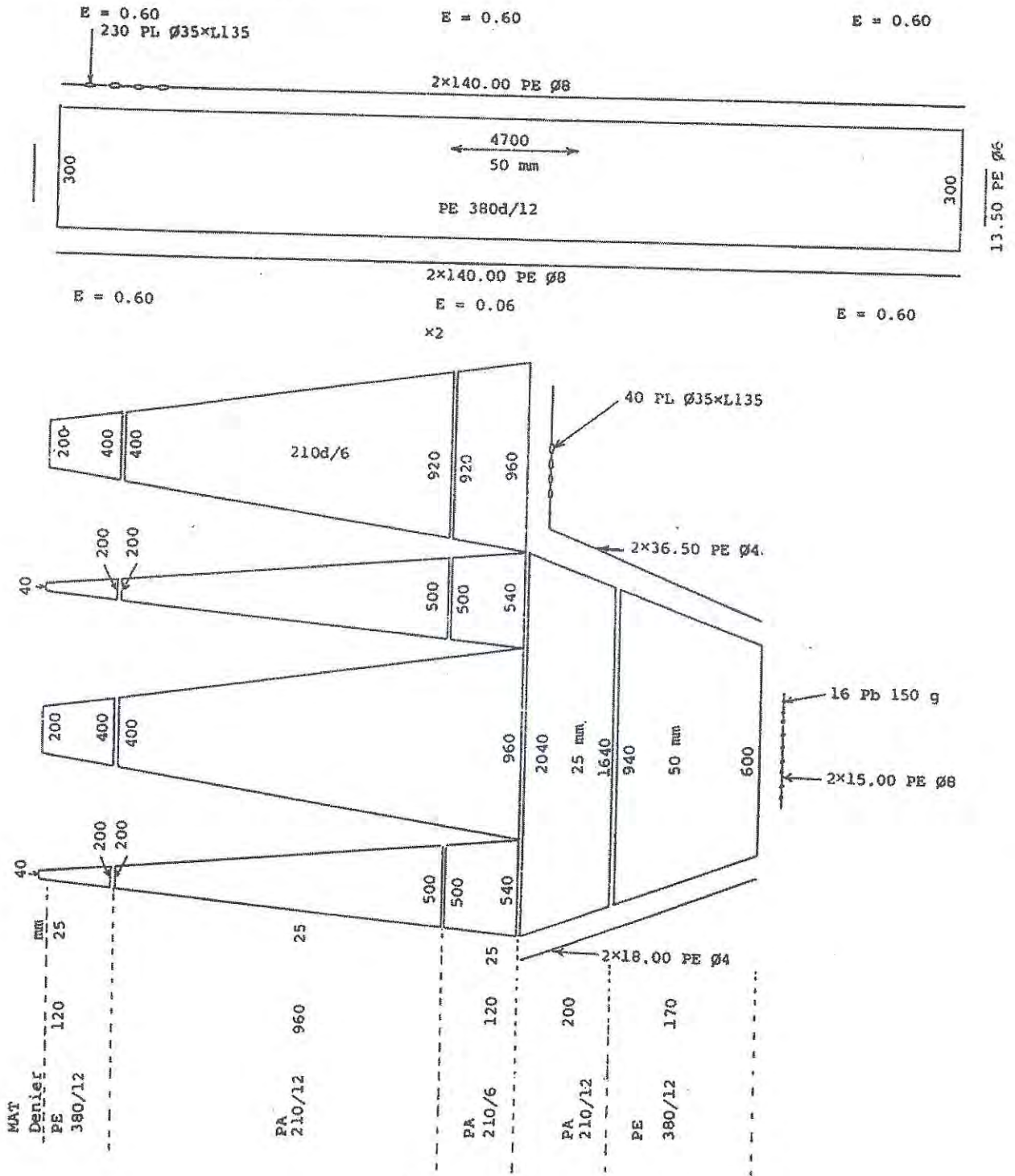
VESSEL

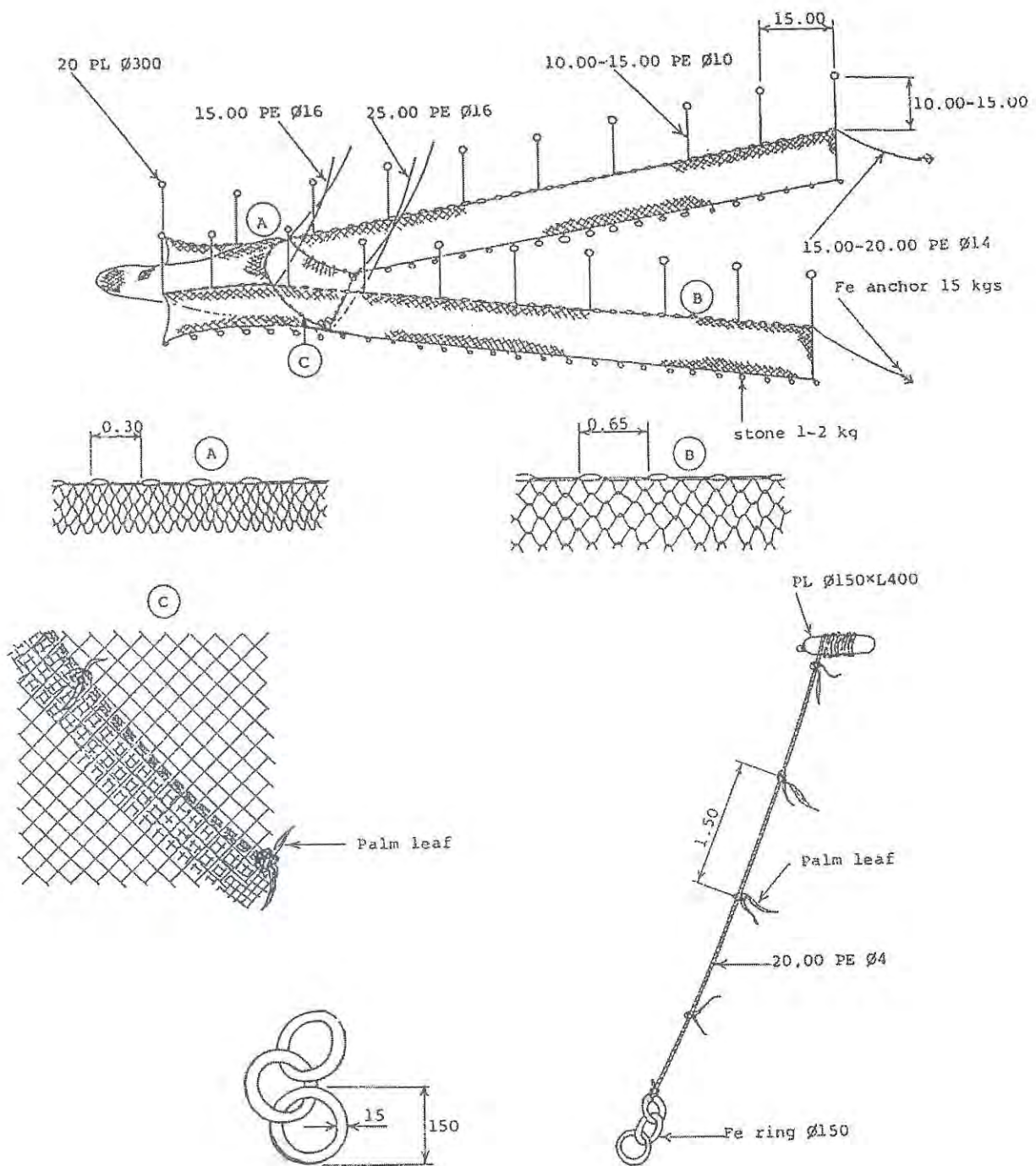
Loa 18 m + 4 x 10 m
hp 260 4 x 10

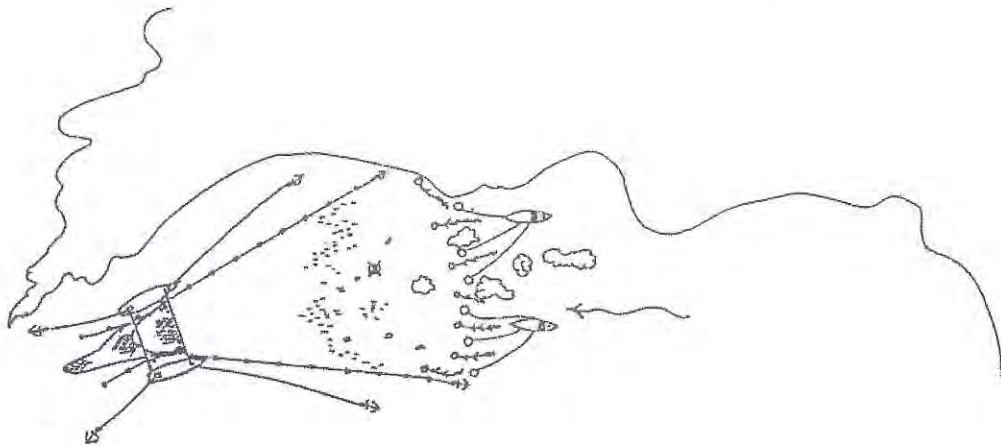
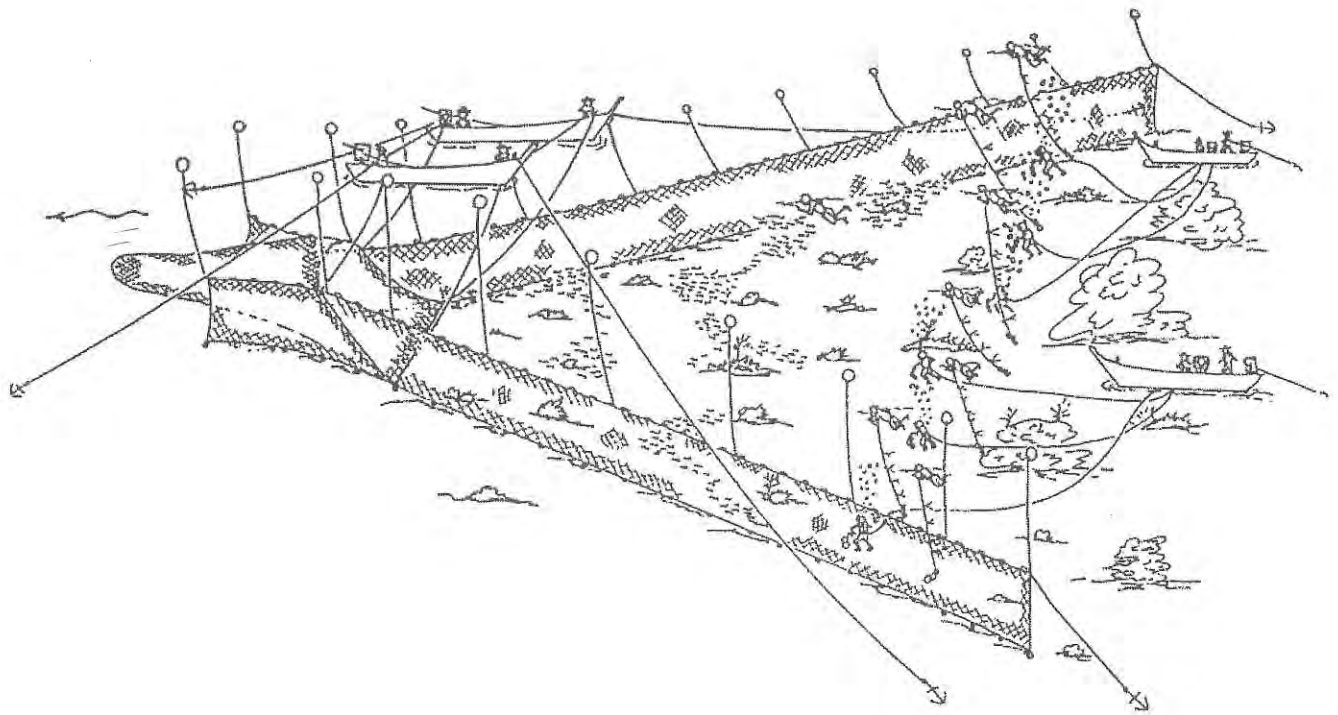
LOCATION

Banravai
Phuket

Yellow tail fusilier, Rabbit fish,







11. DREDGES

**Aussanee Munprasit
Yuttana Theparoonrat**

CONTENTS

	Page
Dredge fishing	395
Fishing gear and method	395
11.1 Clam dredge	
Designs and specifications	396
<u>Clam dredge</u>	
□ Venus shell	
□ Blood cockle	
□ Short-necked clam	

DREDGES FISHING

Various shapes and sizes of dredges are used to collect edible clams. Most of the dredges, such as bamboo basket rake and iron wire basket rake, are small, and are operated near shore on a small-scale. However, some iron-frame dredges for collecting blood-cockles (ark-shells) or short-necked clams (undulated surf-clams) are operated by fishing boats on a comparatively large scale.

According to the fishery statistics from 1993 to 1997, the annual catch of blood-cockles and short-necked clams showed a tendency of decrease, but in 1996 short-necked clams was sudden jump, it may due to many trawlers changed to be dredges in that year. The annual catch of marine shells is shown in the table below.

Table 10.0 Annual production of some marine shell fish, 1993-1997

	1993	1994	1995	1996	1997
Blood-cockle (ark-shell)	20,600	11,300	14,400	15,800	8,300
Short-necked clam (Undulated surf-clam)	42,600	33,300	30,900	52,900	35,800
Other shellfish	70,900	92,900	99,100	84,600	76,600

FISHING GEAR AND METHODS

11.1 Clam dredge

The most common types of dredges are the simplest ones; any implement in the fishing household which can serve to dig a hole in the sand or mud on the beach is also a fishing tool. A piece of wood, a nail, an iron bar, a bamboo stick, a length of wire or a grass-rake, becomes a dredge on a sand-bar and in the shallow water in the tidal zone. No boat is required for this method of clam-collecting, and most commonly sought specials are Venus-clam and hard clam.

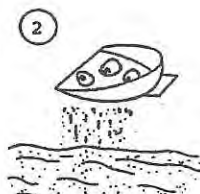
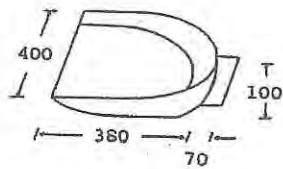
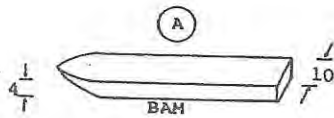
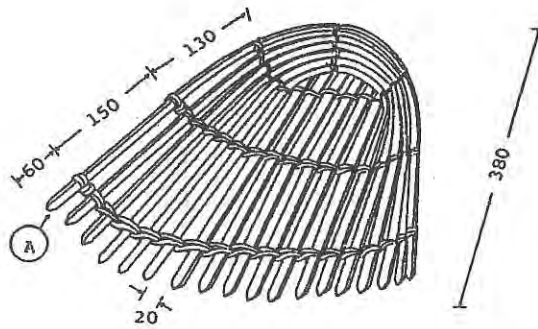
Larger dredges are operated from a boat, to collect clams that live in water up to 5 meters deep, such as blood-cockles (ark-shell). The dredge in this case is an iron basket (60 x 80 x 40 cm) with a bamboo holder (6-7 m long). Fishing is done in the day-time, near a river-mouth or anywhere with muddy sea bottom. It is quite popular in Nakhon Si Thammarat and Pattani provinces.

Large-scale dredge-fishing operations are carried out from inboard-powered boats with 6-120 h.p. engine. A boat usually pulls one or two dredges. These are shaped like a box, with the sieve size from 10 to 20 mm. The dimensions are : 40 x 60 x 50 cm for blood-cockle dredge, and 130 x 200 x 20 cm for short-necked clam. Fishing grounds are in muddy sea bed areas and around the river mouth. Dredges are operated in the day-time, all the year round, with the peak period from September to November. Most dredge-fishing boats are registered in Trat, Samut Prakan and Surat Thani province.

DREDGE
 Clam dredge
 Venus shell

VESSEL
 Loa -
 hp -

LOCATION
 Khokkhai
 Phananga



DREDGE

Clam dredge

Venus shell

VESSEL

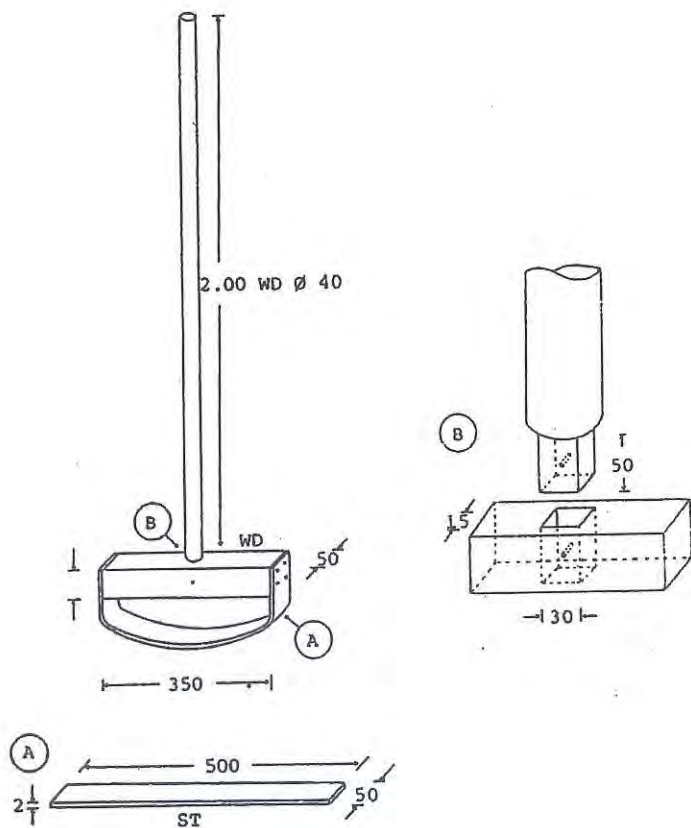
Loa -

hp -

LOCATION

Ban Prasae

Rayong



DREDGE

Clam dredge

Venus shell

VESSEL

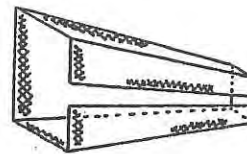
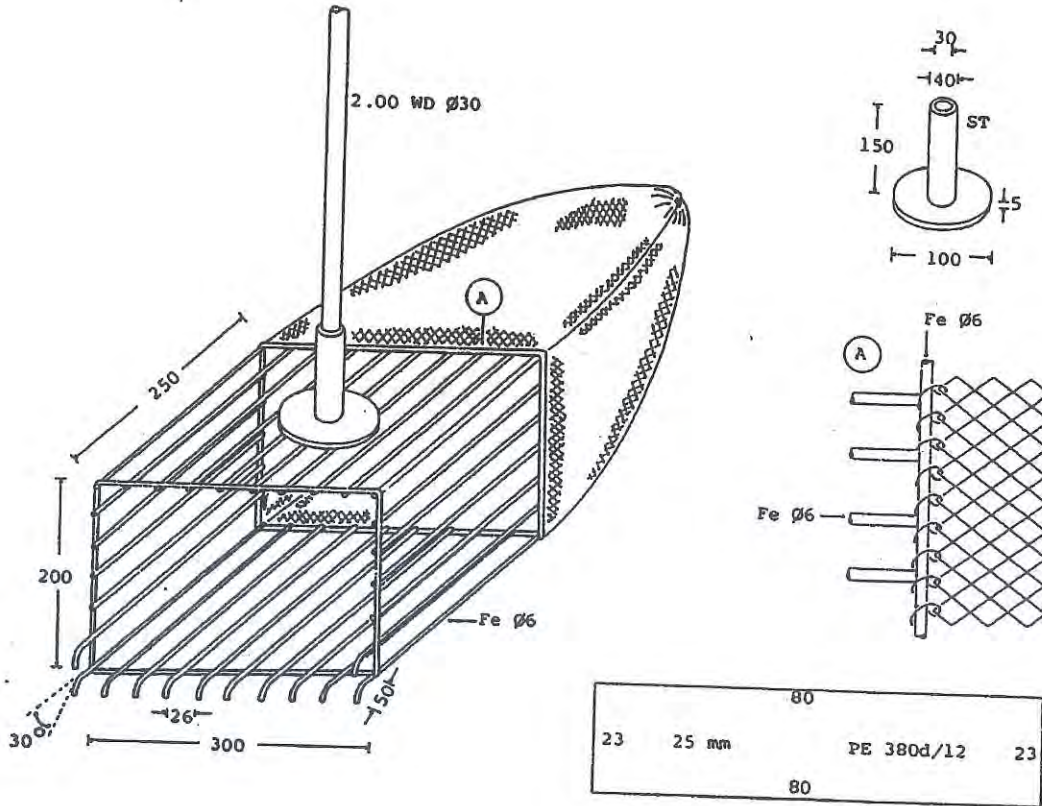
Loa: -

hp -

LOCATION

Khokkhai

Phangnga



DREDGE

Small clam dredge

Small clam

VESSEL

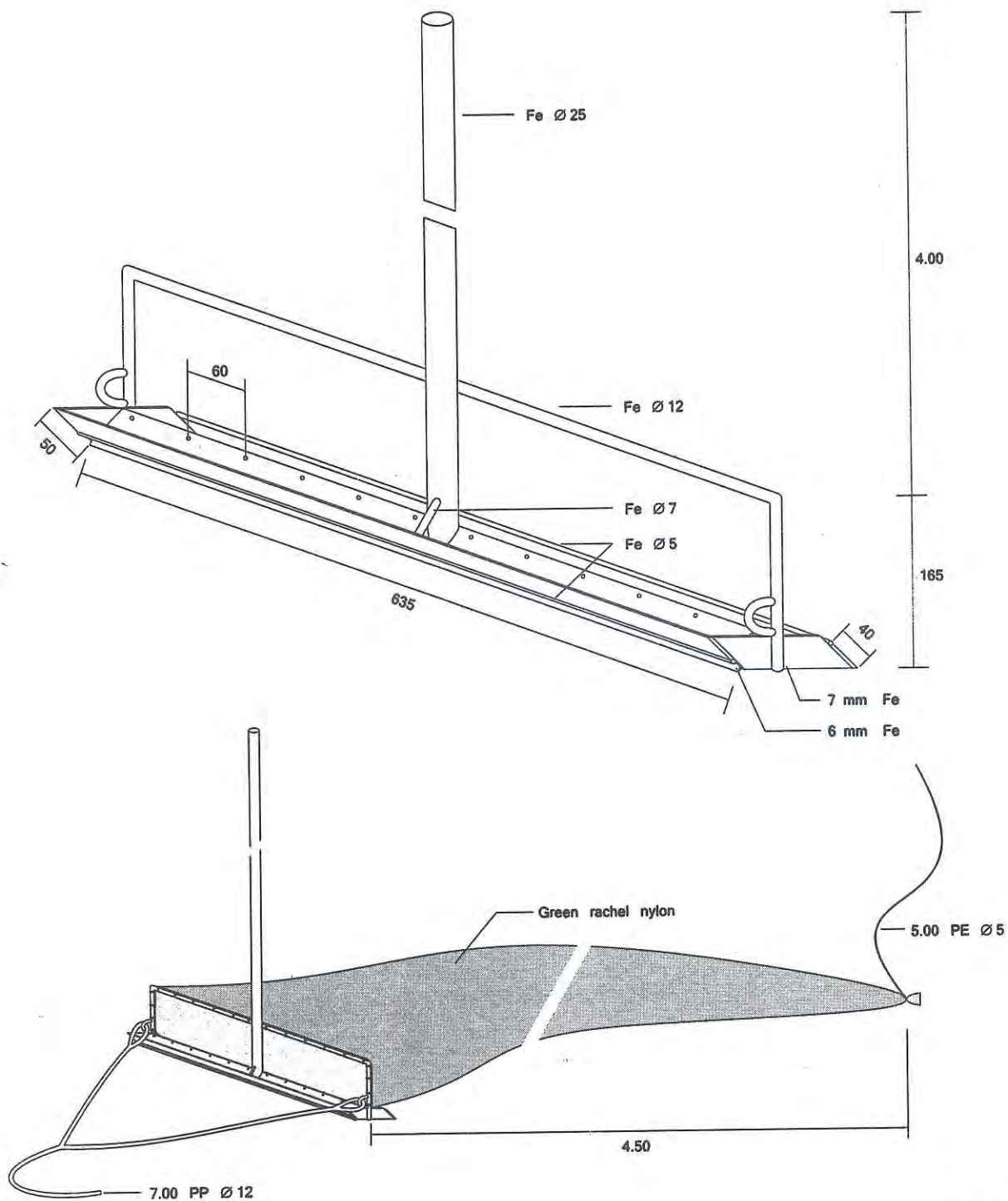
Loa 10 m

hp 10 LT

LOCATION

Kanchanadit

Surat Thani



Rv. 2002

DREDGE

Clam dredge

Ark shell

VESSEL

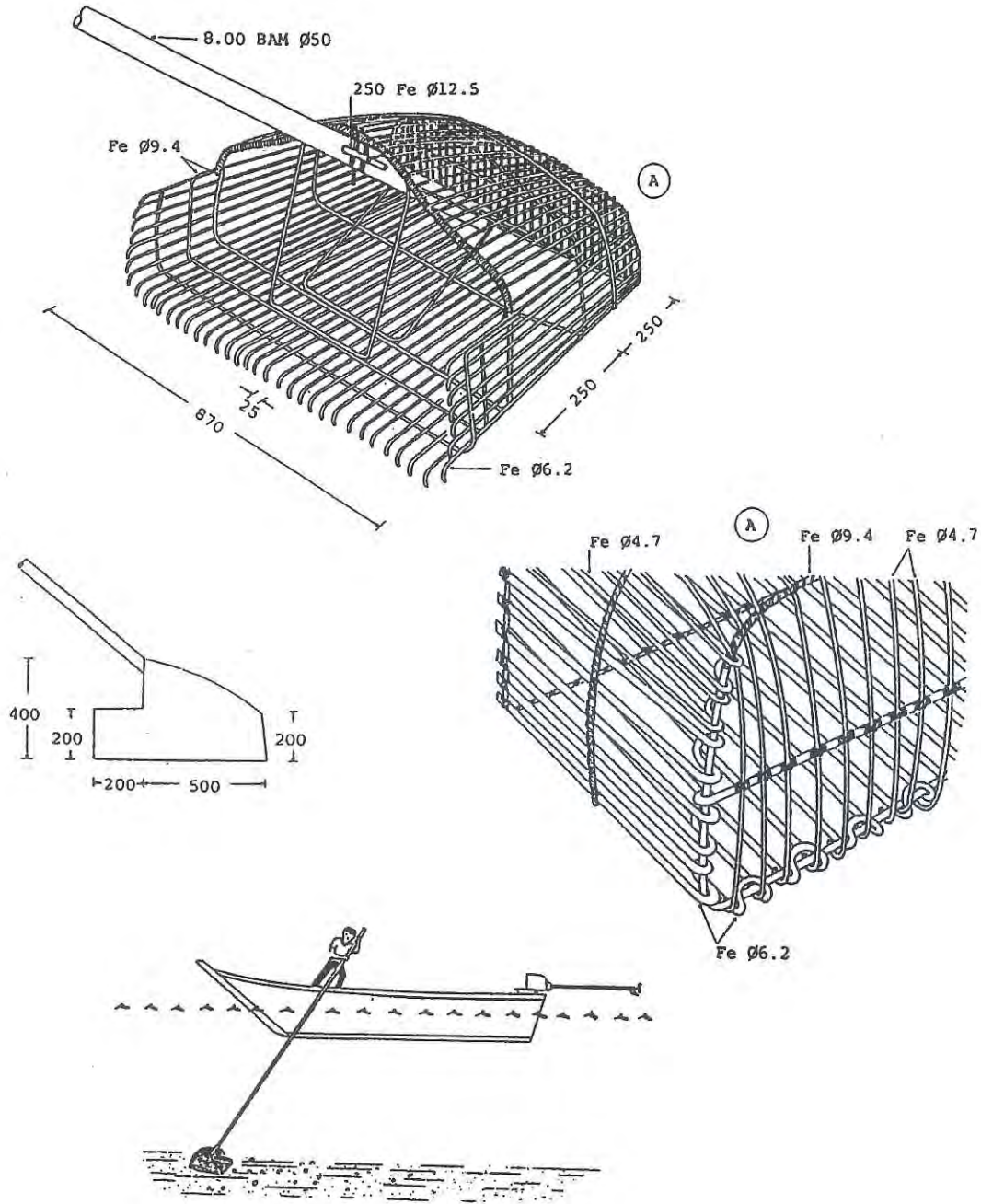
Loa 12 m

hp 4-6 LT

LOCATION

Ban Rusamilae

Pattani



DREDGE

Clam dredge
Kard Hoy Klang

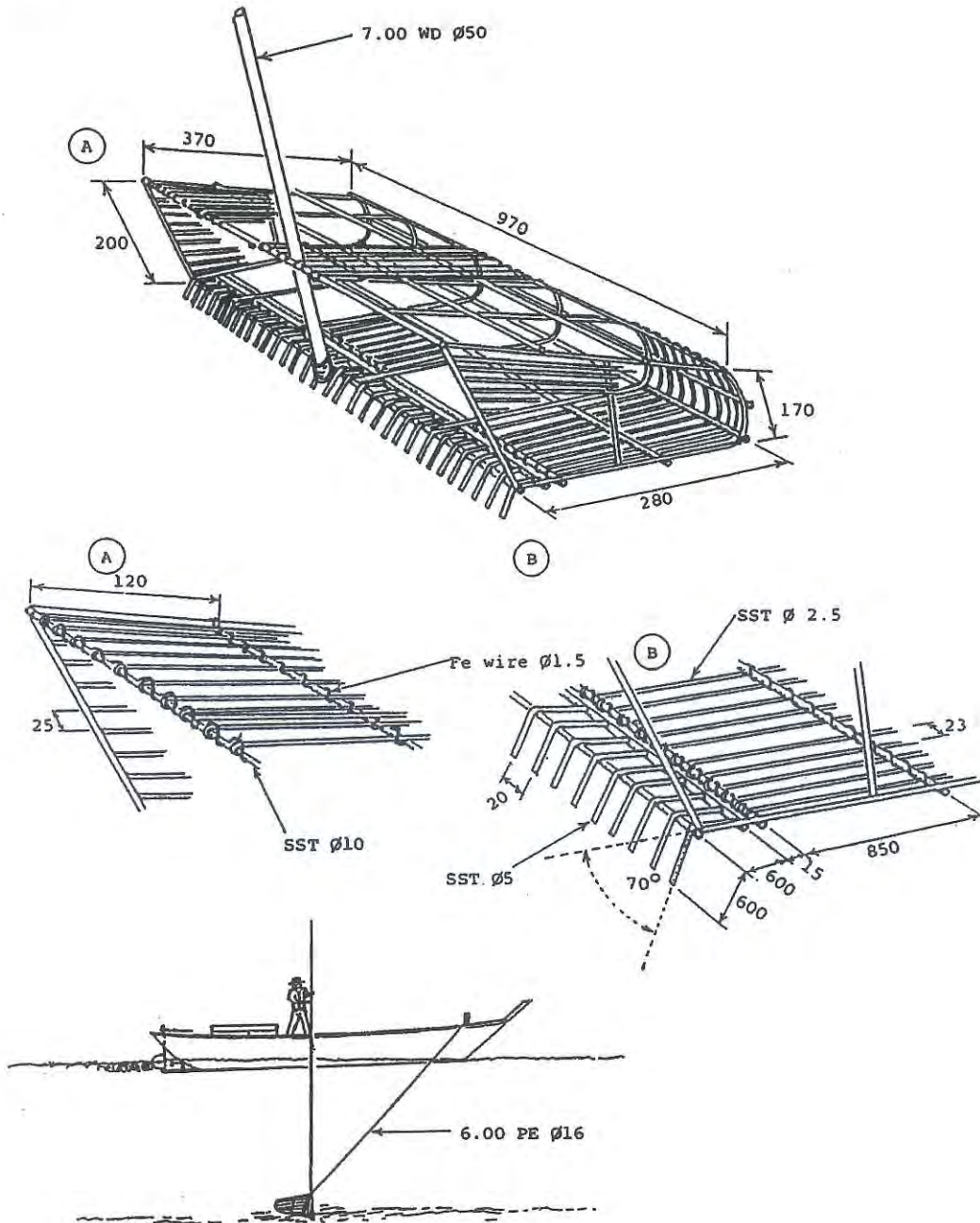
Bloody cockle

VESSEL

Loa 9 m
hp 10

LOCATION

Pak Nakhon
Nakhon Si Thammarat



DREDGE

Clam dredge

Undulated surf clam

VESSEL

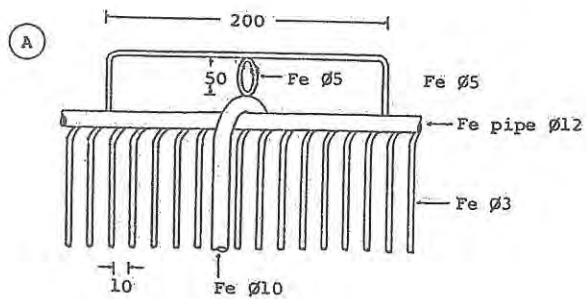
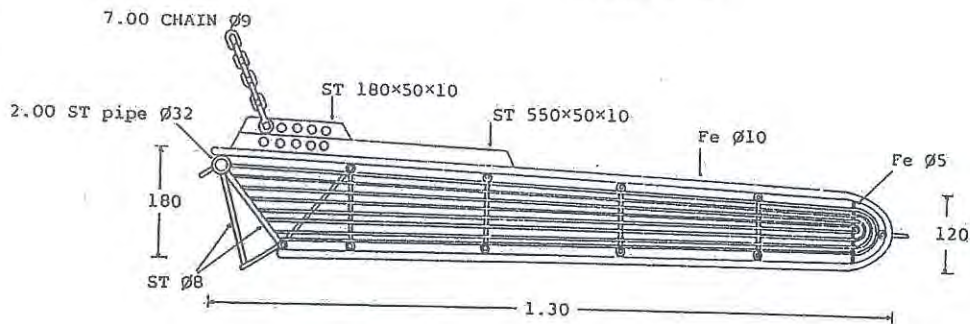
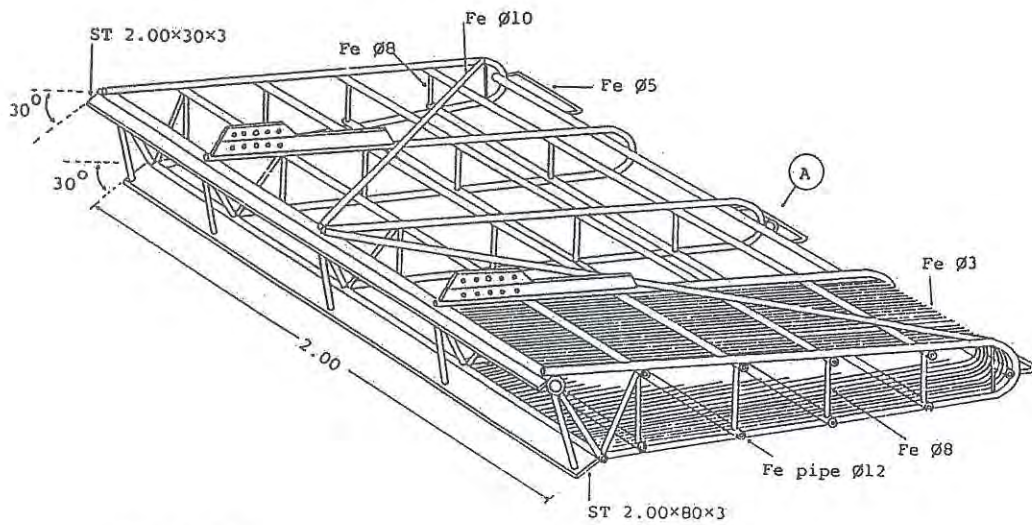
Loa 14 m

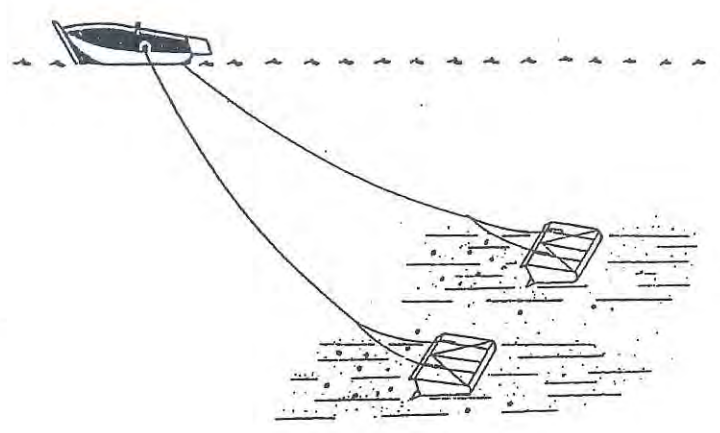
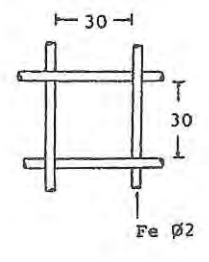
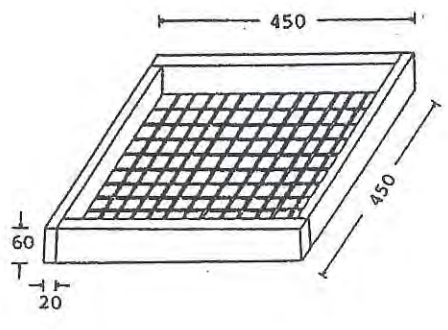
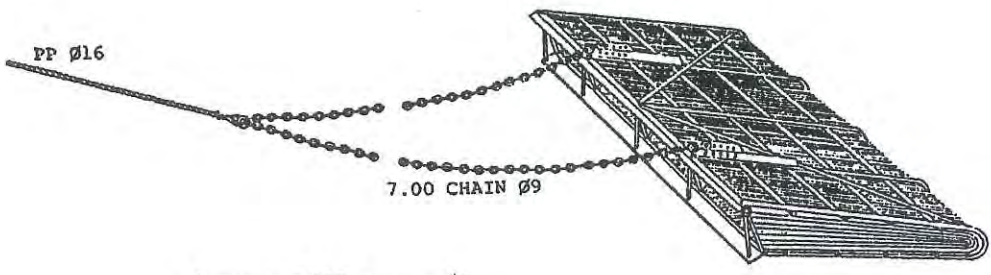
hp 120

LOCATION

Surat Thani

Surat Thani





12. MISCELLANEOUS

Raya Petchkham

CONTENTS

	Page
Miscellaneous.....	409
Fishing gear and method.....	409
- Oyster hammer	
- Spade	
- Hook or Gaff hook	
- Spear, Harpoon	
- Mud ski	
Design and specifications.....	410

MISCELLANEOUS

There are many miscellaneous types of gear used by fishermen. Although their existence is unrecorded, most of them are considered accessories parts of major gear for catching a particular species. It covers a variety of gear with mixed methods and techniques of operation. It is however, use by hand during operations. Others are dug in mud to make a hole near the shore or in tidal flats.

Fishing Gear and Methods

1 Oyster Hammer

This is a hand instrument used to drive the oyster out of the rocky substrate. The hammer is made of iron bar 1-1.50 cm. diameter. It consist of pointed head and like "T" sharp 25-30 cm. long. The end of hammer is flat for pick the oyster flesh. This gear is operated at rocky shore.

2 Spade

This gear consist of wood bar handle 60-80 cm long, 3-5 cm. diameter and spade body made of iron plate size 0.1-0.2 cm. thick, 30-40 cm. long and 10-15 cm wide. The iron plate is bended like curve. This gear is used to drive the green mussel out of stick from stake trap, set bag or wing set bag

3 Hook or Gaff hook

The hook is inserted into hole to catch the mudcrab in mangrove forest. It consist of flat wood handle 4-5 cm. wide, 1.5 cm. thick and 60-90 cm. long. The handle made of wire or iron bar.

4 Spear and Gaff hook

Gaff hook is similar to a mud crab gaff hook but it more sharpen than mud crab gaff hook and the end of handle join with whole wood bar and vertical direction. A spear consist of iron fork about 4-5 ribs and whole wood handle like gaff hook. This gear is used to catch eel.

5 Mud ski

Mud ski is a wooden board. The fishermen will sit on board and use their one leg push on mud to move the board. The ski is used to help the fishermen for catch the cockle, mud crab, catfish, etc. This instrument is operated with scoop net or others for catching and collecting mud living organism.

MISCELLANEOUS

VESSEL

LOCATION

Oyster hammer

Loa

-

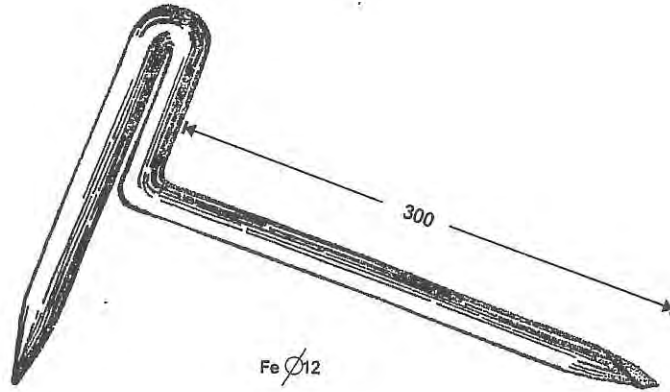
Ang Sila

Oyster

hp

-

Chonburi



Rv. 2002

MISCELLANEOUS

Spade, Mussel spade

Green mussel

VESSEL

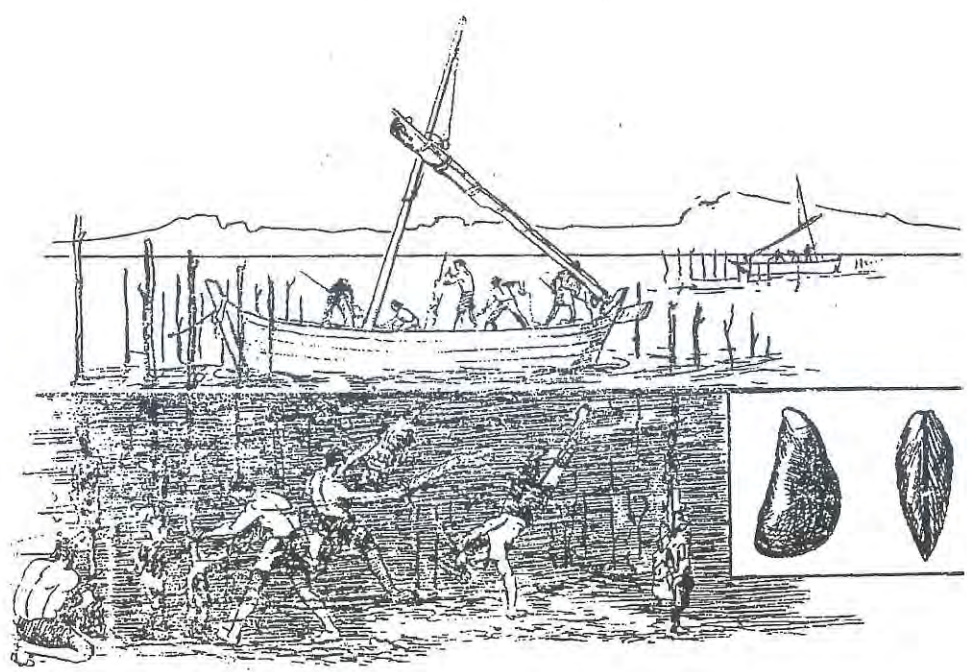
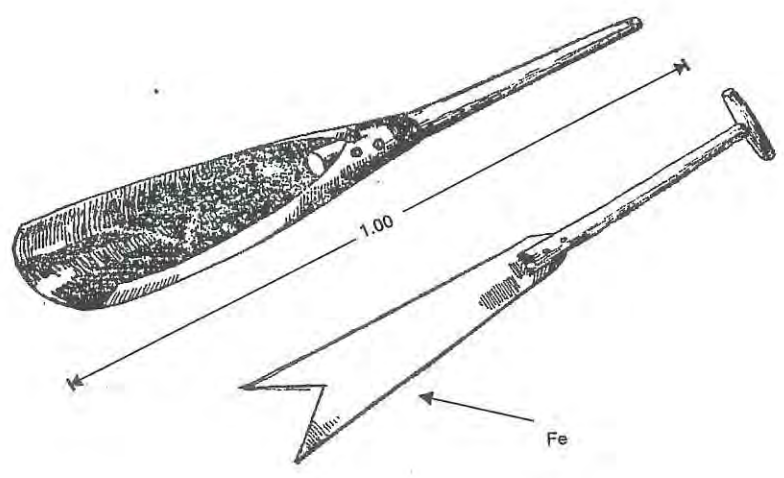
Loa 8 m

hp 70 LT

LOCATION

Phrasamut Chedi

Samut Prakan



MISCELLANEOUS

Hook or Gaff hook

Mud crab

VESSEL

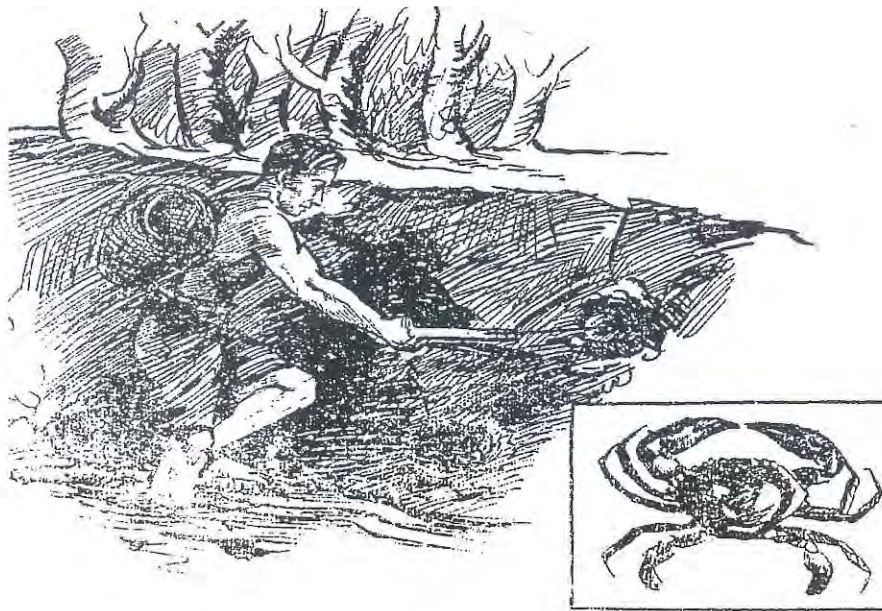
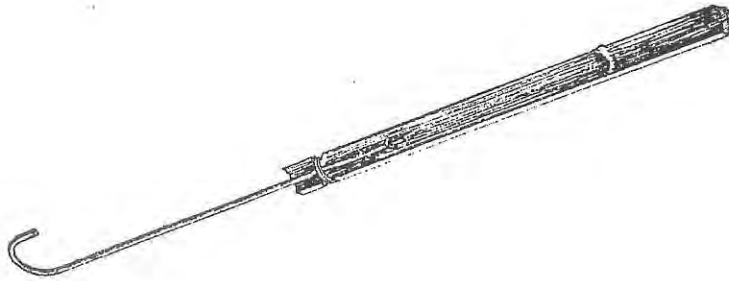
Loa

hp

LOCATION

Phrasamut Chedi

Samut Prakan



MISCELLANEOUS

VESSEL

LOCATION

Spear and Gaff hook

Loa

-

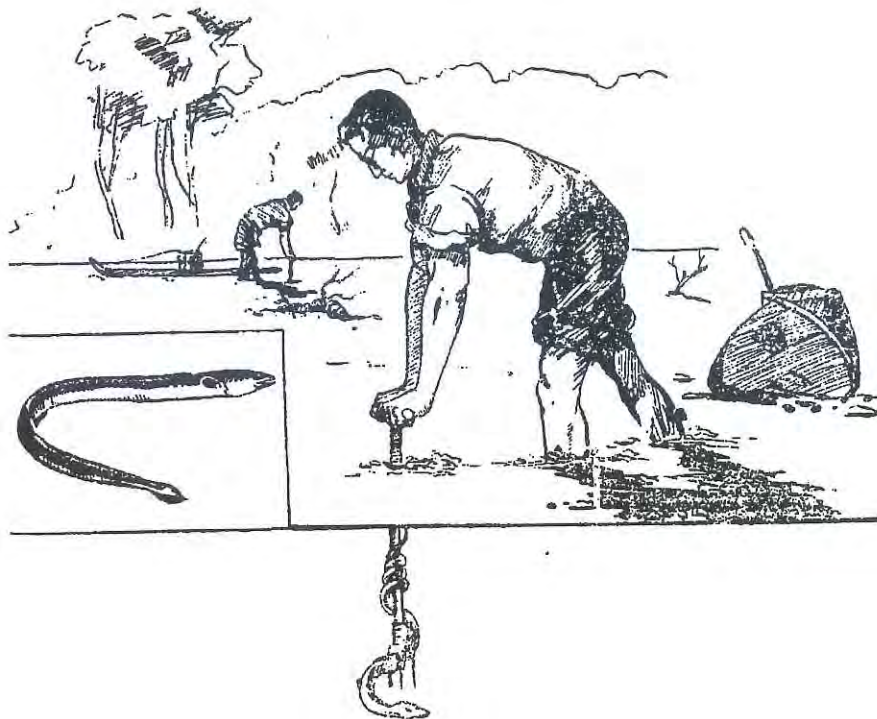
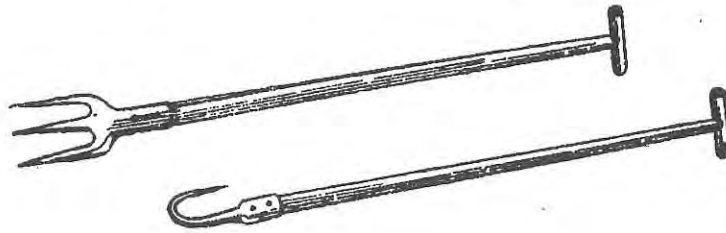
Phrasamut Chedi

Eel

hp

-

Samut Prakan



MISCELLANEOUS

Mud ski

Mud crab, cockle, catfish, etc.

VESSEL

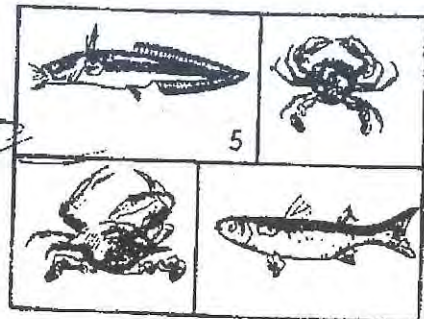
Loa

hp

LOCATION

Bangtaboon

Petchaburi



REFERENCES

- Department of Fisheries (1969). Thai Fishing Gear. [ปทานุกรมเครื่องมือทำการประมงของประเทศไทย]. Exploratory Fishing Unit, Department of Fisheries, Ministry of Agriculture, Bangkok. 319 pp. (in Thai)
- Department of Fisheries (1969). Marine Fishing Gear of Thailand. [เครื่องมือทำการประมงประเภทน้ำเค็มของประเทศไทย]. Exploratory Fishing Unit, Department of Fisheries, Ministry of Agriculture, Bangkok. 779 pp. (in Thai)
- Department of Fisheries (1985). Fisheries Record of Thailand, 1983. [สถิติการประมงแห่งประเทศไทย 2526]. Department of Fisheries, Ministry of Agriculture and Cooperatives, Bangkok. 139 pp.
- Department of Fisheries (1997). Thai Fishing Vessel Statistic, 1997 [สถิติเรือประมงไทย ปี 2540]. Department of Fisheries, Ministry of Agriculture and Cooperatives, Bangkok. 100 pp.
- FAO (1975). FAO Catalogue of SMALL SCALE FISHING GEAR. Fishery Industries Division FAO. 191 pp.
- HJUL, P. (1972). The Stern Trawler. Fishing News (Books), London. 221 pp.
- NOMURA, M. (1981). Fishing Techniques (2). Japan International Cooperation Agency, Tokyo. 183 pp.
- NOMURA, M., and T. YAMAZAKI, (1977). Fishing Techniques (1). Japan International Cooperation Agency, Tokyo. 206 pp.
- SAINSBURY, J.C. (1971). Commercial Fishing Methods. Fishing News (Books), London. 119 pp.
- SAKURAI, T. (1979). Fisheries of Thailand [Thai no gyogyo, Kaigai Suisan Sosho, 18]. World Fisheries Ser., Tokyo. 77 pp. (in Japanese).
- Southeast Asian Fisheries Development Center (1980). Fishery Statistical Bullentin for The South China Sea Area, 1978. SEAFDEC Secretariat, Bangkok. 200 pp.
- Southeast Asian Fisheries Development Center (1981). Fishery Statistical Bullentin for The South China Sea Area, 1979. SEAFDEC Secretariat, Bangkok. 201 pp.

- Southeast Asian Fisheries Development Center (1982). Fishery Statistical Bullentin for The South China Sea Area, 1980. SEAFDEC Secretariat, Bangkok. 227 pp.
- Southeast Asian Fisheries Development Center (1983). Fishery Statistical Bullentin for The South China Sea Area, 1981. SEAFDEC Secretariat, Bangkok. 227 pp.
- Southeast Asian Fisheries Development Center (1984). Fishery Statistical Bullentin for The South China Sea Area, 1982. SEAFDEC Secretariat, Bangkok. 268 pp.
- Southeast Asian Fisheries Development Center (2000). Fishery Statistical Bullentin for The South China Sea Area, 2001. SEAFDEC Secretariat, Bangkok. 155 pp.
- Southeast Asian Fisheries Development Center (2001). Fishery Statistical Bullentin for The South China Sea Area, 2001. SEAFDEC Secretariat, Bangkok. 155 pp.