PRELIMINARY EXPERIMENT ON BEAM TRAWL FISHING OPERATION

By

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Abstract

Experiment on Beam trawl fishing operation has been carried out by MV Plalung1 during 18 to 19 March 2003. Fishing ground was nearby the entrance buoy of Chao-praya River, Inner zone of Gulf of Thailand. The experiment was aimed to investigate fishing efficiency of commercial scale beam trawl.3 fishing operations had been conducted by 3 different towing speeds, i.e. 2, 3 and 4 knots. Catch composition has shown, Group of other species are dominant catch, followed by group of demersal species, crab, Shrimp and Cephalopod with 13.98 kg, 5.66 kg, 4.45 kg, 3.3 kg and 2.5 kg respectively.

The result has shown that the most appropriate towing speed of beam trawl is 4 knot with the maximum CPUE and minimum bottom sediment and garbage in the cod-end part. However the catching selectivity and the effects to sea bottom and benthic habitat by dragging characteristic of beam trawl must be further investigated.

Key word: Beam trawl, fishing efficiency, towing speeds, catch composition, Chao-praya River, Gulf of Thailand

Introduction

In the past decade, continental shelf and coastal zone have been heavily exploited and harvested by lots of fishing activities. Coastal states have confronted with the serious problem on the depletion of marine resources. Fisheries policies, fisheries management included the fisheries plans of action have been introduced and adopted to recover the present crisis fisheries situation.

One of the well-known destructive coastal fishing gears particularly around the mouth of rivers is push net. The dominant target species for push net fishing is coastal shrimp. Push net has effective performance to capture the aquatic animal from the sea bottom to sea surface due to be high opening characteristic of net design. The fisheries statistic, year 1988-1997, has shown that 55.5% of catches by push net is marketable and trash fishes, 44.5% is shrimp. In order to seek for the appropriate fisheries policy for reduce the destructive fishing activities, e.g. push net, dredge and bottom trawl, integrated coastal fisheries management have got to be urgently implemented, to decrease the heavy exploitation and established sustainable coastal fishing.

Fishing gear modification techniques for improving the selective characteristic of push net has been separate in two trends. One is the push net design modification, i.e. expansion of the standardization for mesh size and the invention of appropriate selective target species devices. The other is the fishing gear replacement program. The concept of the replacement program is the introducing of the lower destructive fishing gears which capture same target species. The replacement program for reducing number of push net fishing boat will be effected not, only the push net fishermen but also the shrimp consumer, if any fishing gears for push net replacing do not proper for shrimp capturing. Shrimp marketing may encounter the highest effect on marketing due to lack of the marketable product. In order to maintain the shrimp product especially the Banana shrimp and School prawn which majority products have been harvested by marine capture only, beam trawl net should be one of the appropriate fishing gear for replacing the push net by the fishing gear replacement program.

The preliminary experiment of beam trawl was a part of the project Study and Development of Selective Trawl net for sustainable Shrimp Fishery. The preliminary experiment was the first sea trial of the beam trawl net, after the trawl net design and construction had been accomplished. The result of the sea trail will be reference information for beam trawl net, hauling devices and deck arrangement improvement. Also to understand the others merit and demerit of beam trawl before the comparative experiment between beam trawl and push net which are the heart of the project will be conducted. The envisage outcome will be the reference for formulating the appropriate fisheries management policy especially the fishing gear replacement program to maintain and recover the resources of the marine coastal zone which regional has strengthen awareness in the present time.

Objective

1) To practice on the beam trawl fishing operation for the SEAFDEC researcher and crew of research vessel M/V Plalung1.

2) To seek for the appropriate fishing techniques and deck machinery modifications of beam trawl fishing operation.

3) To investigate the result of marine catches by beam trawl which are basic information for the study on the comparison of beam trawl and push net for shrimp fishery.

Material and method

1) Area of the sea trial

The sea trial of beam trawl fishing operations, were conducted nearby the entrance buoy of Chao-praya River, Inner zone of Gulf of Thailand. Depth of the fishing ground sounded by echo sounder was between 16m to 20 m. The majority of bottom sediment was muddy. The position is viewed by the chart.

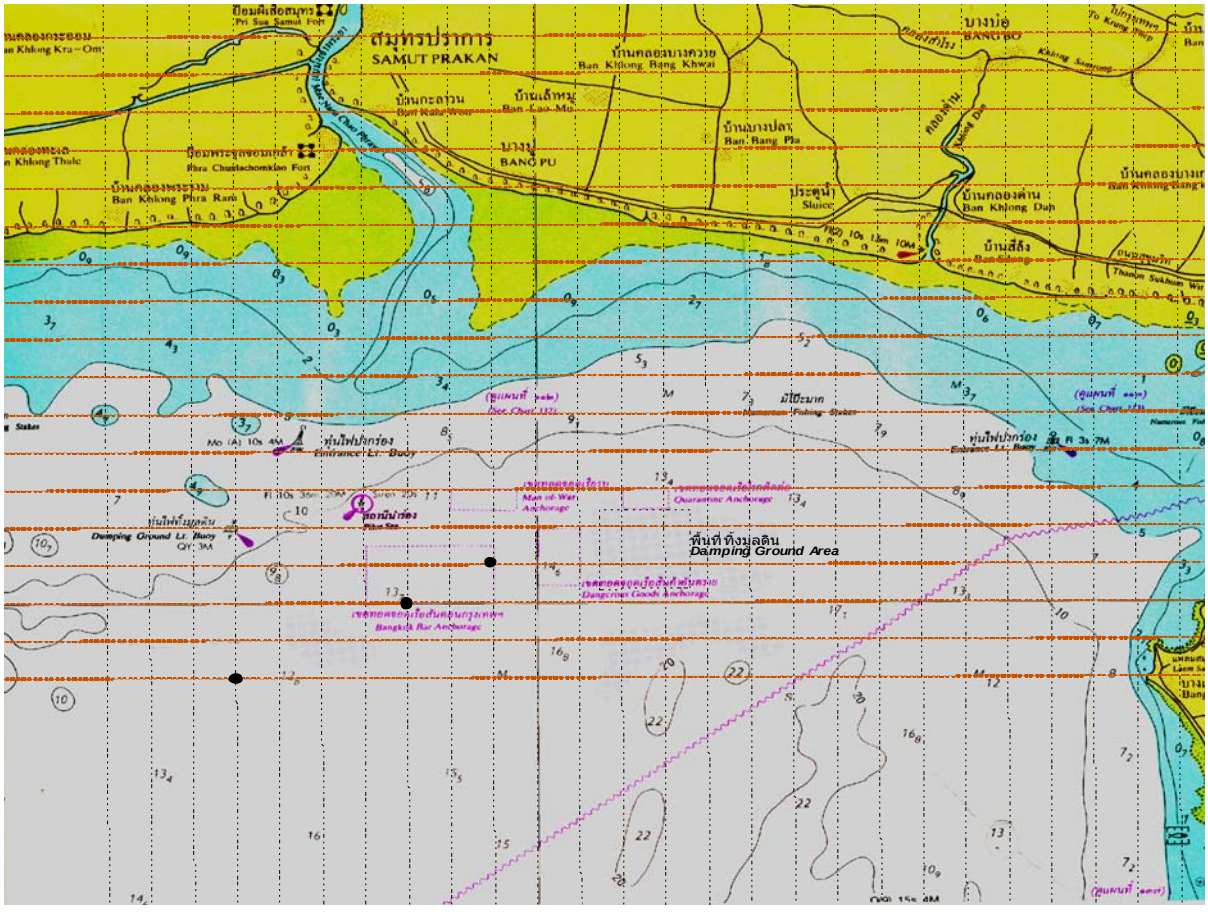


Figure 1 Area of sea trial operation

2) Fishing vessel and Beam trawl net

The preliminary experiment on beam trawl had been conducted by the modification of M.V. Plalung1. M.V. Plalung1 is a training ship, wooden stern trawler, belongs to Southeast

Asian Fisheries Development Center/Training department (SEAFDEC/TD) Samutprakarn, Thailand. She is designed for the operating of otter board bottom trawl, Bottom and drifting gillnet. During this sea trial, the auxiliary boom was installed at stern deck for heaving up the net. The ordinary beam trawlers are always install 2 fishing booms at the both sides, starboard and port side of ship. Due to the sea trial for trawl net testing and seeking for the appropriate technique of beam trawl fishing operation the 2 sides, starboard and port side booms did not prepare. Platform at the stern deck was not constructed either. The details of fishing vessel are described by the Annex 1.

Beam trawl net is a type of bottom trawl net. The target catches of beam trawl is coastal shrimp. The beam trawl fishing has been recorded of the operation in Thailand since 1957. It is the prototype of other bottom trawls in the Thailand. Thai fishermen always spread operated the small beam trawl along the coastal fishing ground of Thailand. The fishing boat is 6-8 m. length equipped with 7-8 horse power outboard engines in the few decades. Now a day, fishermen in the inner and central part of the Gulf of Thailand, Samutsakorn and Chumporn provinces, have enlarged their fishing boat to be 14-18 m. with 200-300 horse power inboard engines. Only fishermen in the southern part of the Gulf of Thailand still have operated the conventional small scale of beam trawl.

The beam trawl net designs are not significant developed compare with the previous decade. Only the weight of net are increased, it make beam trawl heavier than the past, due to enlarge the size of fishing boat so beam trawl can operate in the higher towing speed, 4-5 knot. Because the size of net is limited by the operation mechanism, the opening of beam trawl net is shallower than the other trawl net type.

The principle of beam trawl is simple, consisted of an iron beam which was 8 m. length. The purpose of the iron beam is, to spread the wing of trawl net into the certain opening width. The dredging characteristic of beam trawl net is performed by 2 pieces of 45 kilograms weight. Each cement weight is attached close to the end of wing net.

Design of Beam trawl net, which was constructed in the sea trial experiment, was duplicated from the local fisherman in the inner and central part of the Gulf of Thailand. The design is suitable for M.V.Plalung1 modification. Float rope and ground ropes are made from Z-twist Polypropylene rope, diameter 8 mm. Length of float rope is 8 m. and ground rope length is 9.0 m. The wing parts and square part are made from polyethylene net, twine size 380d/18 and mesh size is 2.0 inch. Belly part is composed from polyethylene net, twine size 380d/18 and mesh size is 1.75 inch and 1.5 inch respectively. The cod end piece is made from polyethylene net, twine size 700d/15 with mesh size 3.00 cm. There are not any lacing lines on the both side of net. 183 pieces of 150 grams lead sinkers are attached at the ground rope. Float line is attached with 5 pressure resistant floats.

Towing warp is Polypropylene material rope diameter 22 mm, 120 m length. Details of the net construction and arrangement are in the Annex 2.

Experiment and Data collection

3 fishing operations had conducted during this sea trial during 18 to 19 March 2003. In order to prevent any accidents because crew member is lack of experience of beam trawl fishing, beam trawl sea trials were conducted only in the daytime. Also shrimp species always bury themselves under the muddy in the daytime. So that daytime operations are the most appropriate period for fishing trial. Towing time of every operation was 1 hour. The first, second and third operation were different towing speed as 2, 3 and 4 knot respectively. The performance of fishing gear, fishing operation and hauling devices were took into the consideration by researchers in order to modify the fishing gear, fishing boat and their accessories with highest performance. Information is shown in the conclusion item.

Catch from the operation was sorted and classified in the group i.e. fish, squid, shrimp and crab. Weight of catch data was recorded by the total weight in gram. Length is different recording by the kind of catch. Species which less amount of catch were individual length measured and the large amount of catch were sampling for length measured.
Due to lack of the species classification skill, species of fish are classified into the level of Genus. Fish's weight is record in kilogram of total weight and total length is record in centimeter.

Shrimp species are classified into the genus level, Shrimp's weight is recorded in kilogram of total weight and shrimp's total length measures from the space between eyes to end of the uropod, is recorded in centimeter.

Squid species are classified into the genus. Weight of squid is recorded in kilogram of total weight and mantle length is record in centimeter.

Crab species are classified into the genus. Weight of crab is recorded in kilogram of total weight and carapace width is recorded in centimeter.

Figure 2: Researchers are collecting biological data, length and weight

Result of the experiment

According to the sea trial objectives of result of the operation can be separate into 2 main items, i.e. 1) fishing technique and 2) Catch composition.

1) Fishing technique

The preliminary experiment has an objective for sea trial the beam trawl net and their accessories has been well function during the operation. Because the towing speed is recognized as one the important technique to perform the efficiency of beam trawl fishing operation, so that different towing speeds, i.e. 2, 3 and 4 knots were investigated during the sea trail. The results of catches, which different towing speeds, were found different by catch quantities. The largest amount of total catches, 24.68 kg, were collected from the third operation with the ship's engine capacity was 1400 rpm, towing speed 4-5 knot. The fewer amounts of catches, 1.96 kg, were collected from the operation with the ship's engine capacity was 1200 rpm, towing speed about 2 knot (Table 1)

Date	Towing time	Position Latitude / Longitude	Catch (kg)	Remark
18/04/03	1544-1644	Latitude 13°18′.9N Longitude 100°33′.4E	1.84	Towing speed 2 knot.
	1741-1841	Latitude 13°20′.1N Longitude 100°38′.4E	5.69	Towing speed 3 knot.
19/04/03	0549-0650	Latitude 13°20′.8N Longitude 100°37′.4E	22.73	Towing speed 4 knot

Table 1 Sea trial positions and speed with the total catch (kg.)

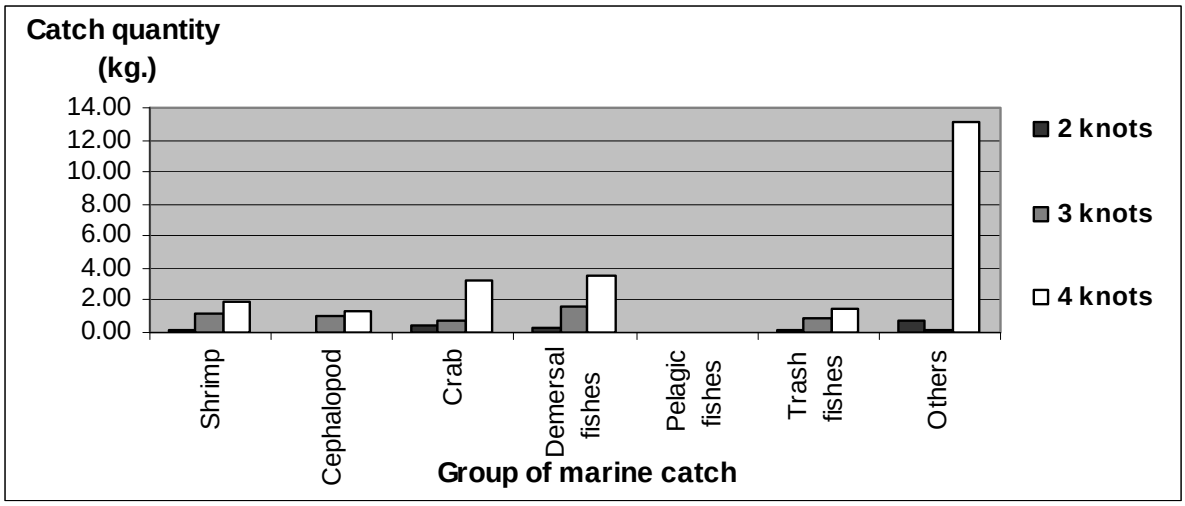


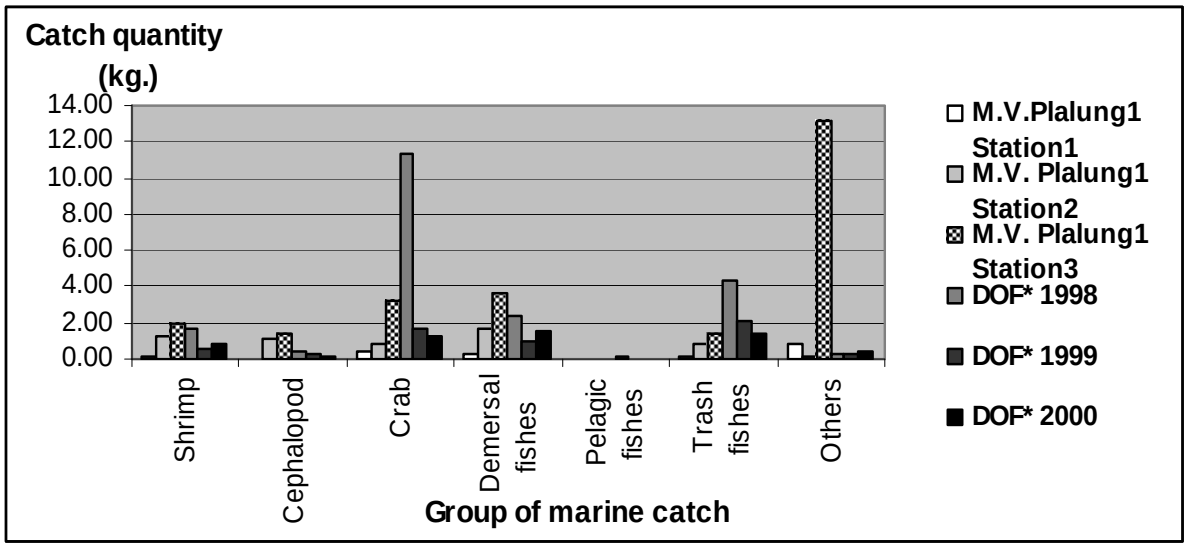
Figure 3 Catch composition by group (by weight: kilogram) related to the towing speed

Referred to the Catch per Unit Effort (CPUE) record during year 1998-2000 by the DOF* research vessel, R.V. Pramong 2 and R.V. Pramong 4, average catch result during years 1998-2000 was 10.6 kg/hr. Data recorded from sea trial by M.V.Plalung1, the catch results of first and the second operation, 1.84 kg/hr and 5.69 kg/hr respectively, were much less than the average catches and the catch result by the third operation, 22.73 kg/hr, was much more than the average catch by DOF research vessel in year 1998-2000 (Table 2).

Figure 4 Catches composition by beam trawl fishing

Group of Catches	Weight (kg) of Operation No.			Weight (Kg) during year 1998-2000			Average in
	Station 1	Station 2	Station 3	1998	1999	2000	1998-2000
Shrimp	0.15	1.20	1.95	1.65	0.57	0.78	1.00
Cephalopod	0.00	1.10	1.40	0.37	0.22	0.14	0.24
Crab	0.45	0.80	3.20	11.30	1.67	1.21	4.73
Demersal fishes	0.35	1.62	3.60	2.32	0.96	1.59	1.62
Pelagic fishes	0.00	0.00	0.02	0.14	0.01	0.03	0.06
Trash fishes	0.11	0.87	1.41	4.30	2.12	1.37	2.60
Others	0.78	0.10	13.10	0.29	0.35	0.41	0.35
Total	1.84	5.69	22.73	20.37	5.90	5.53	10.60

Table 2 Catch composition by group (by weight: kilogram) compare with the total catch by R.V. Pramong 2 and R.V. Pramong 4 in year 1998-2000



*DOF: Department of Fisheries

Figure 5 Catch comparison (By weight: kilogram) of beam trawl between M.V. Plalung1 (Year 2003) and Department of fisheries research vessels (Year 1998-2000)

2) Catch composition

The catch composition is classified by 7 groups of marine species. Catch by 3 operations, the dominant group was categorized by the G*roup of others* which comprised of the bloody calm, flat-head lobster, mantis shrimp and horse shoe crab, 13.98 kg (42.22%). The minority catches was G*roup of pelagic*, i.e. Yellow-strip trevally, 0.02 kg (less than 0.01%). Bloody calm was the highest catch quantity, 12.7 kg (38.36%) The detail of catch composition is described, as below.

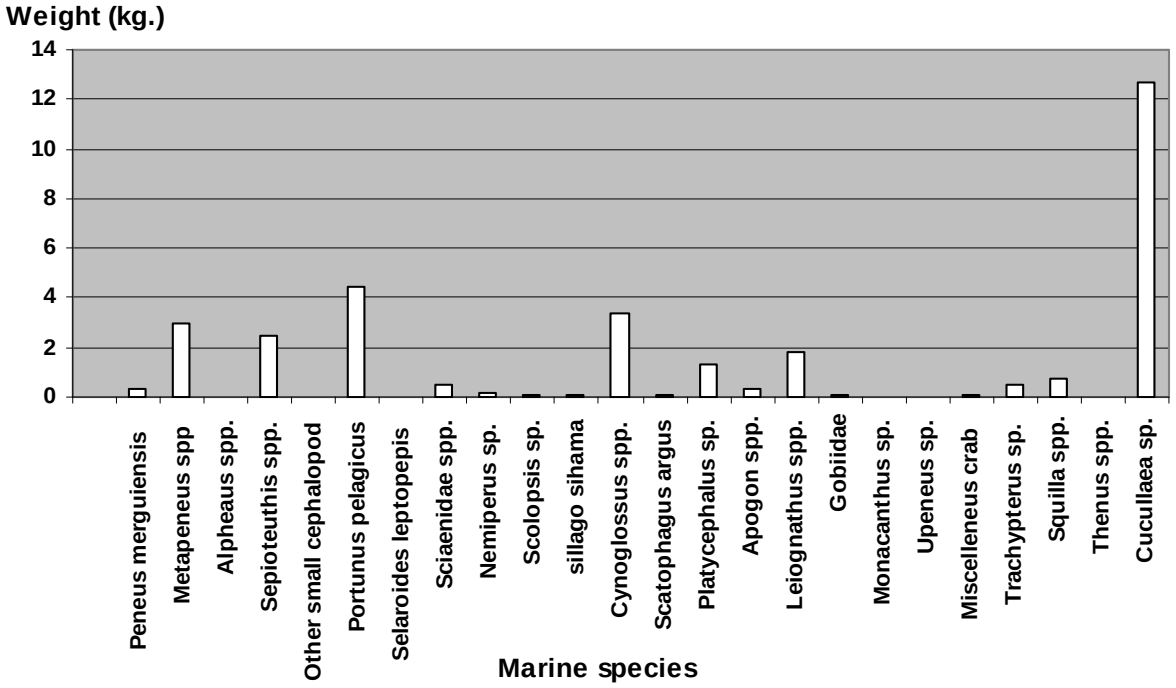


Figure 6 Total catch by weights of marine species caught by beam trawl

1. Shrimps Total catch of shrimps was 3.3 kg with 62 specimens. The average CPUE was 1.1 kg/hour. Station No.3 has shown the highest catches followed by station No.2 and No.1 respectively. The shrimp group accounted for 10.25% of the grand total catch. Average CPUE from the sea trails by M.V. Plalung1 were found closely to the experiments conducted by Department of Fisheries during year 1998 to 2000 that CPUE was 1.00 kg/hour.

Shrimps were classifies into 3 dominant groups.

1.1 Banana Shrimp (*Penaeus merguiensis*) Total catch by 3 operations of banana shrimp was 0.35 kg, with 10 specimens. The average CPUE was 0.12 kg/hour. Banana shrimp accounted for 10.6% of total shrimp catched and 1.06% of the grand total catch.

Total length distribution of Banana shrimp was varied from 13.5 to 19.5 cm with the average length as 15.65 cm. The dominant of total length was found as 14.0-14.9 cm.

1.2 School Prawn (*Metapeneus spp*.) School prawn was dominant shrimp species caught during 3 fishing operations. School Prawn could be classified into 2 main species, i.e. *Metapeneous ensis* and *Metapeneous affinis*. Total catch of School Prawn were 2.95 kg, with 52 specimens. The average CPUE was 0.98 kg/hour. School prawn accounted for 89.3% of total shrimp caught and 8.91% of the grand total catch.

Total length distribution of School Prawn is varied from 6.5 to 13.0 cm with the average total length as 10.66 cm. The range of total length between 10.0-10.9 cm was highest number with 27 School Prawn specimens.

1.3 Other Shrimps less quantities of common snapping shrimp (*Alpheaus sp*.) are caught during the sea trails. Total weight by the 3 operations was less than 0.001 kg. This group of shrimp had not shown any significant in quantities for the catch record of this beam trawl sea trials. Catching percentage of them shared 0.1% of total shrimp total catch.

Figure 7 Shrimps caught by bream trawl

Marine species	Total Weight (kg)			Total	*Percentage1	*Percentage2	Average
	Station 1	Station 2	Station 3	(kg)	(%)	(%)	(kg/Station)
Peneus merguiensis	0.00	0.10	0.25	0.35	10.6	1.06	0.12
Metapeneus spp	0.15	1.10	1.70	2.95	89.3	8.91	0.98
Other small shrimp	0.001	0.00	0.00	0.004	0.1	0.01	0.001
Total	0.15	1.20	1.95	3.304	100	9.98	1.10

* Percentage1: Catching percentage compare with the total catch of the shrimp group.
Percentage2: Catching percentage compare with the grand total catch.

Table 3 Result of Shrimp caught by beam trawl

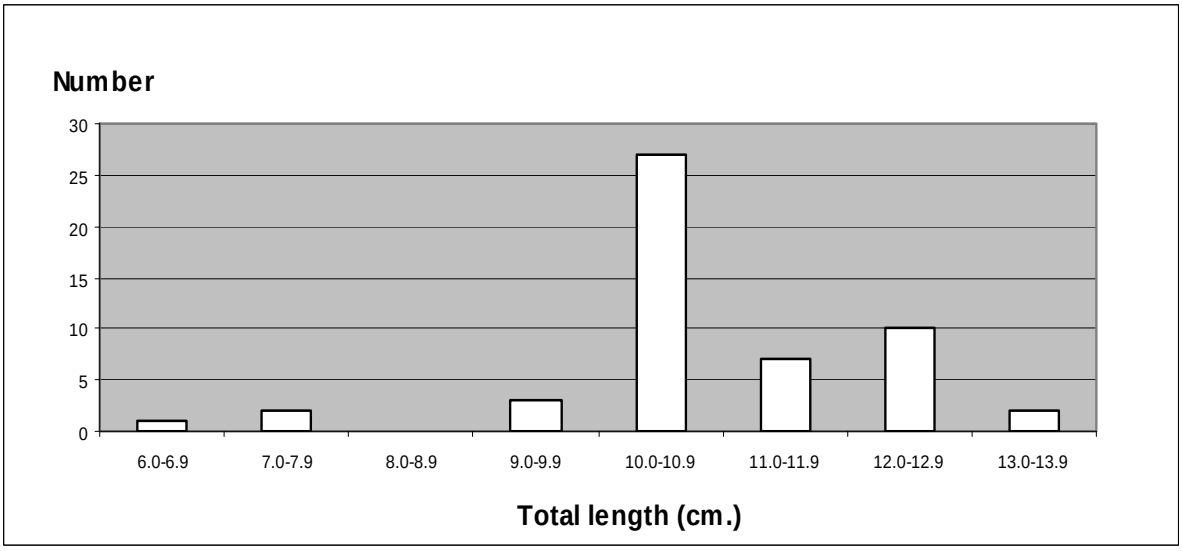


Figure 8 Total length distribution of School prawn caught by beam trawl

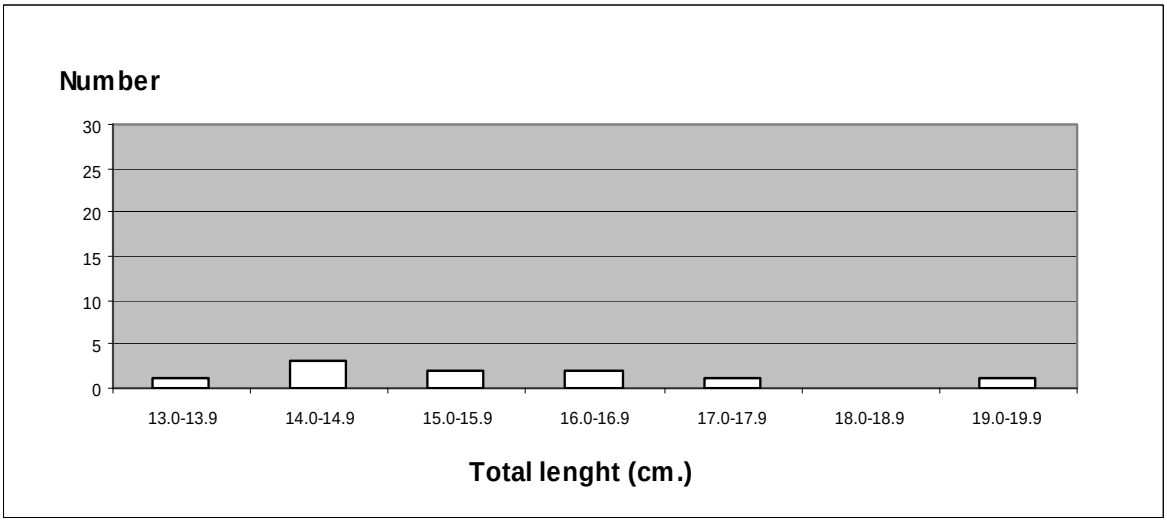


Figure 9 Total length distribution of Banana shrimp caught by beam trawl

2. Cephalopods Cuttlefish (*Sepia* spp.) was dominant cephalopod caught by beam trawl. The total catch by 3 fishing operations was 2.5 kg, with 52 specimens. The average CPUE was 0.83 kg/hour. Station No.3 has shown the highest catches followed by station No.2 and No.1 respectively. Cuttlefish accounted for 99.9 of total cephalopod caught and 7.55% of the grand total catch.

Mantle length distribution of cuttlefish varied between 4.0 to 12.0 cm. with the average length as 6.6 cm. The range of mantle length between 5.0-5.9 cm. was highest number of frequency as 17 Cuttlefish specimens.

The others were few squids without any significant in quantities. Catching percentage of them shared 0.1% of total cephalopod caught.

Average CPUE from the sea trails of M.V.Plalung1 were found more than the experiments conducted by Department of Fisheries during year 1998-2000, which were 0.24 kg/hour

Marine species	Total Weight (kg)			Total	*Percentage1	*Percentage2	Average
	Station 1	Station 2	Station 3	(kg)	(%)	(%)	(kg/Station)
Cephalopod							
Sepioteuthis spp.	0.00	1.10	1.40	2.50	99.9	7.55	0.83
Other small cephalopod	0.00	0.001	0.00	0.001	0.1	0.003	0.0003
Total	0.00	1.10	1.40	2.501	100	7.55	0.8303

* Percentage1: Catching percentage compare with the total catch of the shrimp group.
Percentage2: Catching percentage compare with the grand total catch.

Table 4 Result of Cephalopod caught by beam trawl

3. Crabs Blue swimming crab (*Portunus pelagicus*) was only species caught by beam trawl. Total catch of Blue swimming crab was 4.45 kg with 47 specimens. The average CPUE was 1.48 kg/hour. Station No.3 has shown the highest catches followed by station No.2 and No.1 respectively. Blue swimming crab accounted for 13.44% of the grand total catch.

The carapace width distribution of Blue swimming crab varied between 3.5 to 12 cm. with the average carapace width as 6.9 cm. The range of carapace width between 5.0-5.9 cm. was highest number of frequency as 20 Blue swimming crab specimens.

Catches from the beam trawl fishing operations by M.V. Plalung1 were found less than the experiments conducted by Department of Fisheries during year 1998-2000, which caught 4.7 kg/operation/hour.

Marine species	Total Weight (kg)			Total	*Percentage1	*Percentage2	Average
	Station 1	Station 2	Station 3	(kg)	(%)	(%)	(kg/Station)
Portunus pelagicus	0.45	0.80	3.20	4.45	100	13.44	1.48
Total	0.45	0.80	3.20	4.45	100	13.44	1.48

* Percentage1: Catching percentage compare with the total catch of the shrimp group.
Percentage2: Catching percentage compare with the grand total catch.

Table 5 Result of crab caught by beam trawl

Figure 10 Blue swimming crab caught by bream trawl

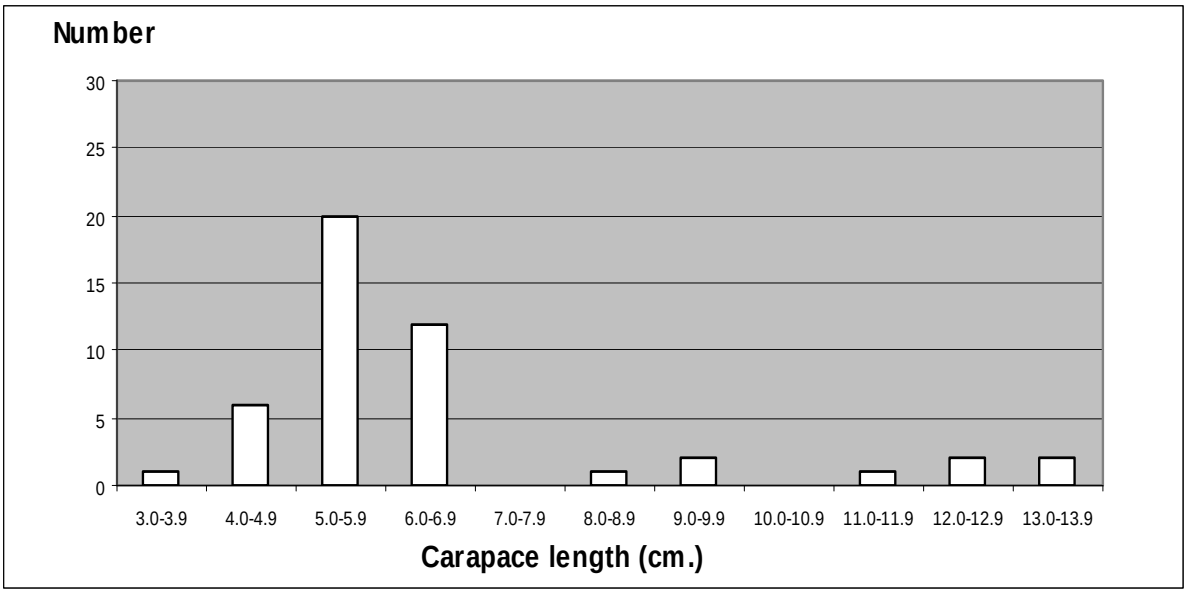


Figure 11 Carapace width distribution of swimming crab caught by beam trawl

4. Others Group of other catches were consisted of 2 main species i.e. bloody calm (*Cucullaea labiata*), Mantis shrimp (*Squilla* spp.) The other 2 species, i.e. Flatted-head lobster (*Thenus* spp.) and a Horse shoe crab (*Trachtpleus gigas*), were less significant in the quantities of catch. Group of other catches were found as dominant catch by weight of beam trawl with 13.98 kg. The average CPUE was 4.66 kg/hour. Station No.3 has shown the highest catches, 13.1 kg. They accounted 43.40% of the grand total catch.

4.1 The Bloody calm (*Cucullaea labiata*) was dominant caught by beam trawl. The total catch was 12.7 kg, accounted for 90.84% of others group and 38.36% of total catch. The average catch was 4.2 kg/hour. The bloody calm had not been recorded by the experiments of Department of Fisheries during year 1998-2000 so that the comparison of CPUE can not be calculated.

4.2 Mantis shrimp (*Squilla* spp.) Total catch of Mantis shrimp by 3 operation of beam trawl was 0.77 kg, with 60 specimens. The average catch was 0.26 kg/hour. Mantis shrimp accounted for 5.51% of others total catch and 2.33% of the grand total catch.

Total length distribution of Mantis shrimp is varied from 13.5 to 19.5 cm with the average length as 15.65 cm. The range of total length between 7.0-7.9 cm. was found the highest number as 27 Mantis shrimp specimens.

CPUE from the sea trails by M.V. Plalung1 was found close the experiments conducted by Department of Fisheries during year 1998-2000, which caught 0.33 kg/hour.

Few Flatted-head lobsters (*Thenus* spp.) and a Giant king crab (*Trachypleus gigas*) was caught by the fishing operations. Their quantities were too less significant to record.

Marine species	Total Weight (kg)			Total	*Percentage1	*Percentage2	Average
	Station 1	Station 2	Station 3	(kg)	(%)	(%)	(kg/Station)
Trachtpleus gigas	0.00	0.00	0.50	0.50	3.58	1.51	0.17
Squilla spp.	0.07	0.10	0.60	0.77	5.51	2.33	0.26

* Percentage1: Catching percentage compare with the total catch of the shrimp group.
Percentage2: Catching percentage compare with the grand total catch.

Table 6 The result of others group caught by beam trawl

Marine species	Total Weight (kg)			Total	*Percentage1	*Percentage2	Average
	Station 1	Station 2	Station 3	(kg)	(%)	(%)	(kg/Station)
Thenus spp.	0.01	0.00	0.00	0.01	0.07	0.03	0.00
Cucullaea labiata	0.70	0.00	12.00	12.70	90.84	38.36	4.230
Total	0.780	0.100	13.100	13.980	100	42.223	4.660

* Percentage1: Catching percentage compare with the total catch of the shrimp group.
Percentage2: Catching percentage compare with the grand total catch.

Table 6 (Cont.) Result of Group of Others caught by beam trawl

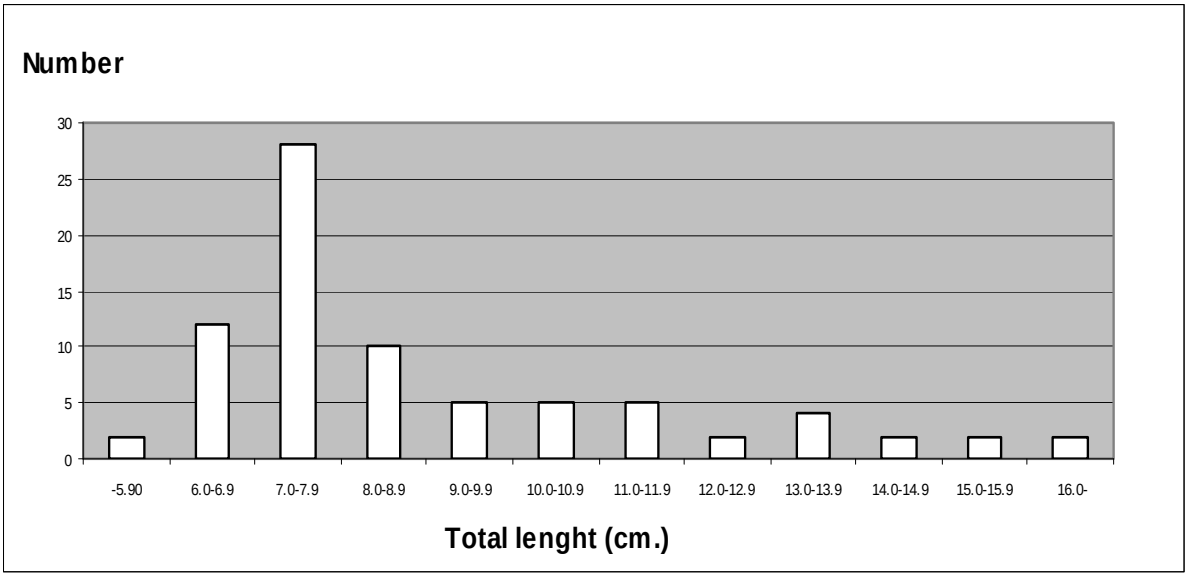


Figure 12 Total length distribution of Banana shrimp caught by beam trawl

5. Pelagic fishes 2 specimens, 0.02 kg, of Yellow stripe trevally (*Selaroides leptolepis*) caught by the third operation. Yellow stripe trevally accounted for 0.06% of the grand total catch. Station No.3 has shown the highest catches followed by station No.2 and No.1 respectively. Range of total length of 2 Yellow stripe trevallys were 11.0-11.5 cm.

Pelagic catches by MV Plalung1 were found very low as 0.07 kg/hr, different species from the pelagic catches by experiments conducted by Department of Fisheries during year 1998 to 2000 that Engraulidae, Clupioidae and Carangidae were catches recorded.

Marine species	Total Weight (kg)			Total	*Percentage1	*Percentage2	Average
	Station 1	Station 2	Station 3	(kg)	(%)	(%)	(kg/Station)
Selaroides leptopepis	0.000	0.000	0.020	0.020	100	0.060	0.007
Total	0.000	0.000	0.020	0.020	100	0.060	0.007

* Percentage1: Catching percentage compare with the total catch of the shrimp group.
Percentage2: Catching percentage compare with the grand total catch.

Table 7 Result of Pelagic fish caught by beam trawl

6. Demersal fishes Catch quantity of demersal fishes, by 3 operations, was 5.57 kg, accounted 17.42% of the grand total catches (32.30 kg). The average CPUE was 1.89 kg/hour. Station No.3 has shown the highest catches followed by station No.2 and No.1 respectively.

The group of demersal fishes was consisted of 8 fish species. Most of them are marketable requirement species.

6.1 Tongue sole (*Cynoglossus* spp.) was dominant species of group of demersal fish. Total catch of Tongue sole by 3 fishing operations was 3.4 kg with 106 specimens, showing the average CPUE was 1.13 kg/hour. Flat fish accounted for 61.04% of demersal fish group and 10.54% of the grand total catches.

Total length of Tongue sole varied from 7.0 to 29.5 cm. with the average total length as 14.9 cm. The distribution of tongue sole total length can be divided into 2 group ranges. The first group of total length of juvenile tongue sole varied from 7.0 to 9.5 cm. with 43 specimens. The range of total length between 8.0 to 8.9 cm. was the highest number of frequency as 29 specimens. The large group range of tongue sole had total length distribution from 12.0 to 29.5 with 63 specimens. Range of total length between 18.0-18.9 cm. was the highest number of frequency as 17 specimens.

CPUE of Tongue sole caught by MV Plalung1 was found much higher than the experiments conducted by Department of Fisheries during year 1998 to 2000, which caught 0.1 kg/hour.

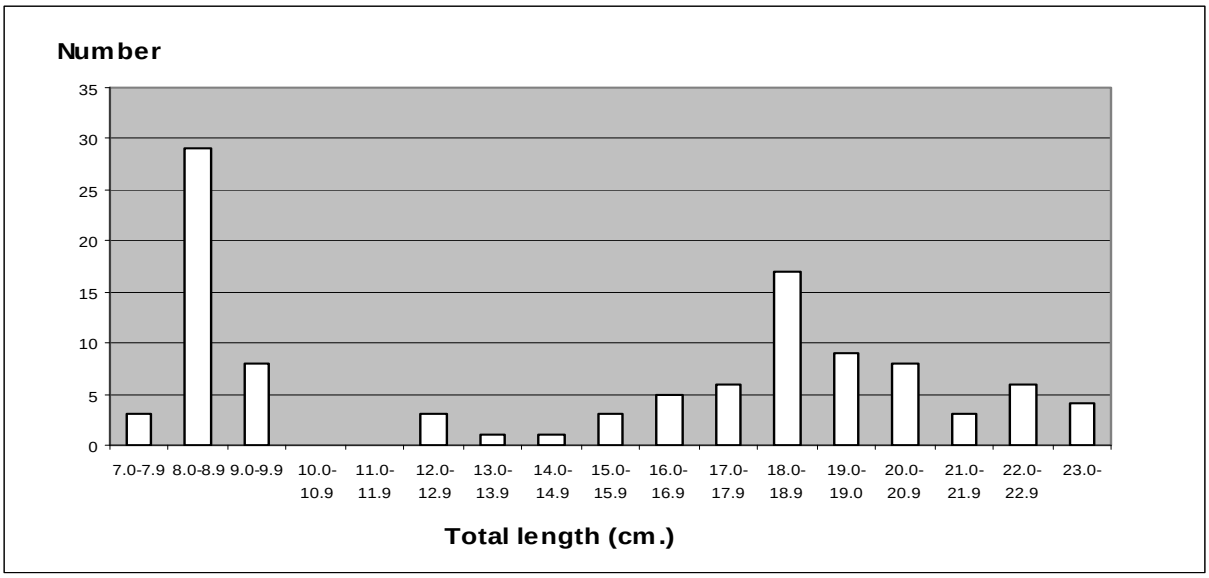


Figure 13 Total length distribution of Tongue sole caught by beam trawl

6.2 Flathead fish (*Platycephalus* spp.) was second dominant species of group of demersal fish. Catch quantities of Flathead fish by 3 operations was 1.3 kg with 4 specimens, shown 0.33 kg/hour. Flathead fish accounted for 23.33% of demersal fish group and 4.02% of grand total catches.

Total length of Flat fishes varied from 26.0 to 45.0 cm. with the average total length as 34.3 cm.

CPUE of Flathead fish caught by M.V. Plalung1 was found higher than the experiments conducted by Department of Fisheries during year 1998 to 2000, which caught 0.23 kg/hour.

6.3 Crocker (*Sciaenidae* spp.) was third dominant species of group of demersal fish. Crocker caught by 3 fishing operations was 0.47 kg with 53 specimens, shown the average CPUE was 0.15 kg/hour. Crocker accounted for 8.44% of group of demersal fish and 1.42% of grand total catch.

Total length of Crocker varied from 6.5 to 19.5 cm. with the average total length as 8.8 cm. The range of total length between 8.0-8.9 cm. was the highest number as 34 Crocker specimens.

CPUE of Crocker caught by M.V. Plalung1 was found less than the experiment conducted by Department of Fisheries during year 1998 to 2000, which caught 0.44 kg/hour.

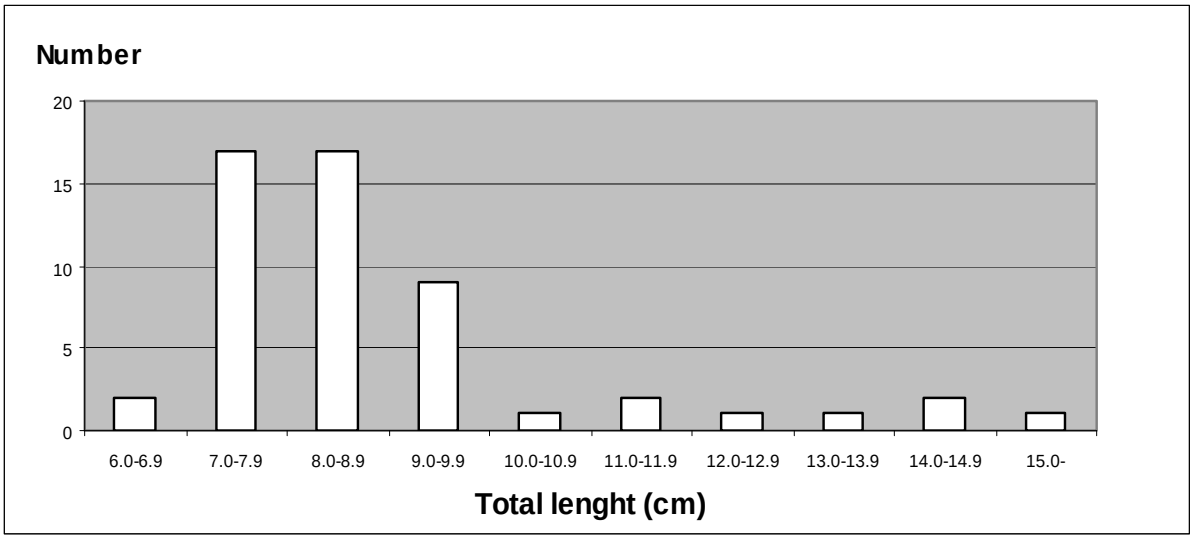


Figure 14 Total length distribution of Crocker caught by beam trawl

6.4 Threadfin bream (*Nemipterus* spp.) Catch quantities of Threadfin bream by 3 fishing operations was 0.2 kg with 4 specimens, shown the average CPUE was 0.07 kg/hour. Threadfin bream accounted for 3.6% of group of demersal fish and 0.60% of grand total catches.

The total length was various from 13.0 to 14.5 cm. with the average length as 14.1 cm. The range of total length between 14.0-14.9 cm. was the highest number of frequency as 3 Threadfin bream specimens.

CPUE of Threadfin bream caught by M.V. Plalung1 was found closely to the experiments conducted by Department of Fisheries in 1999, which caught 0.04 kg/hour.

6.5 Silver Sillago (*Sillago sihama*) Catch quantities of Silver Sillago by 3 operations was 0.1 kg with 2 specimens, shown the average CPUE was 0.03 kg/hour. Silver Sillago accounted for 1.79 % of group of demersal fish and 0.31% of grand total catch. Distribution range of total length was 15.5 to 17.0 cm.

CPUE of Silver Sillago caught by M.V. Plalung1 was found closed to the experiments conducted by Department of Fisheries during year 1998 to 2000, which caught 0.01 kg/hour.

6. Sting ray (*Dasyatis* sp.) Catch quantities of Sting ray by 3 fishing operations was 0.09 kg with only specimen, shown the average CPUE was 0.03 kg/hour. Sting ray accounted for 1.62 % of demersal fish group and 0.27% of grand total catch. Disc length of Sting ray was 17.5 cm.

CPUE of Ray caught by M.V. Plalung1 was found much less than the experiments conducted by Department of Fisheries during year 1998 to 2000, which caught 0.69 kg/hour.

6.7 Monocle bream (*Scolopsis* sp.) Catch quantities of Monocle bream by 3 fishomg operations was 0.05 kg with only specimen, shown the average CPUE was 0.02 kg/hour. Monocle bream accounted for 0.9 % of group of demersal fish and 0.15% of grand total catch. Total length of Monocle bream was 7.20 cm.

CPUE of Monocle bream caught by M.V. Plalung1 was found closed to the experiments conducted by Department of Fisheries during year 1998-2000, which average catch was 0.01 kg/operation/hour.

6.8 Leopard fish (*Scatophagus argus*) Catch quantities of Leopard fish by 3 fishing operations was 0.05 kg with only specimen, shown the average CPUE was less than 0.02 kg /hour. Leopard fish accounted for 0.9 % of group of demersal fish and 0.15% of grand total catch. Total length of Leopard fish was 15.0 cm.

There were not any Leopard fishes recorded from the experiments conducted by Department of Fisheries during year 1998 to 2000

Marine species	Total Weight (kg)			Total	*Percentage1	*Percentage2	Average
	Station 1	Station 2	Station 3	(kg)	(%)	(%)	Station 1
Sciaenidae spp.	0.10	0.12	0.25	0.47	8.31	1.42	0.16
Nemiperus sp.	0.00	0.00	0.20	0.20	3.53	0.60	0.07
Scolopsis sp.	0.05	0.00	0.00	0.05	0.88	0.15	0.02
Sillago sihama	0.00	0.00	0.10	0.10	1.77	0.30	0.03
Cynoglossus spp.	0.20	1.50	1.70	3.40	60.07	10.27	1.13
Scatophagus argus	0.00	0.00	0.05	0.05	0.88	0.15	0.02
Platycephalus sp.	0.00	0.00	1.30	1.30	22.97	3.93	0.43
Dasyatis sp.	0.00	0.00	0.09	0.09	1.59	0.27	0.03
Total	0.35	1.62	3.69	5.66	100	17.09	1.89

* Percentage1: Catching percentage compare with the total catch of the shrimp group.
Percentage2: Catching percentage compare with the grand total catch.

Table 8 Result of demersal fish caught by beam trawl

7. Trash fish Group of trash fishes which were caught by beam trawl consisted of 4 species i.e. Pony fish, Cardinal fish, Goby fish and a Miscellaneous crab. Total catch of trash fish was 2.39 kg. Average CPUE was 0.8 kg/hour. Station No.3 has shown the highest catches followed by station No.2 and No.1 respectively. Trash fish accounted 7.23% of the grand total catch.

CPUE of trash fishes caught by MV Plalung1 were found less than trash fish from the experiments conducted by Department of Fisheries during year 1998 to 2000, which the average CPUE was 2.6 kg/hour.

7.1 Pony fish, (*Leiognathus* spp.), was the first dominant trash fish caught by 3 fishing operations. The total catch was 1.85 kg with 105 specimens. Average CPUE was 0.62 kg/hour. Pony fish accounted for 77.41% of group of trash fish and 5.59% of the grand total catches. Total length of pony fish varied from 5.5 to 11.0 cm. and the average total length was 8.5 cm. The range of total length between 8.0-8.9 cm. was found the highest number of as 52 Pony fish specimens.

CPUE of Pony fish caught by MV Plalung1 was much less than the experiments conducted by Department of Fisheries during year 1998-2000, which the average CPUE was 1.18 kg/hour.

7.2 Cardinal fish (*Apogon* spp.) was the second dominant trash fishes caught by 3 fishing operations. The total catch was 0.33 kg with 37 specimens. Average CPUE was 011 kg/hour. Cardinal fish accounted for 13.8% of group of trash fish and 1.0% of the grand total catch.

Total length of cardinal fish varied from 4.0 to 9.0 cm. and the average total length was 6.69 cm. The range of total length between 7.0-7.9 cm. was the highest number of frequency as 19 Crocker specimens.

CPUE of Cardinal fish caught by MV Plalung1 was much higher than the experiments conducted by Department of Fisheries during year 1998 to 2000, which the average CPUE was 0.03 kg/hour.

7.3 Miscellaneous crab was classified within the trash fishes group. The total catch was 0.12 kg, with 37 specimens. The average catch was 0.01 kg/operation/hour. The average carapace width was 2.5 cm.

CPUE of Miscellaneous crab caught by MV Plalung1 was much less than the experiments conducted by Department of Fisheries during year 1998-2000, which the average CPUE was 0.63 kg./hour.

7.4 Gobiidae Goby fish was consisted of 2 sub families, i.e. Trypaucheninae and Gobioidinae. Total catch of Goby fish was 0.08 kg with 8 specimens. Average CPUE was 0.03 kg/hour. Goby fish accounted for 3.35% of group of trash fish and 0.24% of the grand total catch.

Total length was various from 6.5 to 15.0 cm. and the average total length was 10.4 cm and. The range of total length between 6.0-6.5 cm. was the highest number of frequency as 2 Goby specimens.

Catches by MV Plalung1 was little higher than the experiments conducted by Department of Fisheries during year 1998-2000 which caught 0.01 kg./operation/hour.

Other trash fishes were Leatherjacket fish (*Monacanthus* sp.) and Goat fish (*Upeneus* sp.). They had not any significant in quantities and both of them were not marketable requirement species. Catching percentage of them shared less than 1% of trash fish total catch and less than 0.1% of the grand total catch.

Figure 15 Fish and trash fish caught by bean trawl

Marine species	Total Weight (kg)			Total	*Percentage1	*Percentage2	Average
	Station 1	Station 2	Station 3	(kg)	(%)	(%)	Station 1
Apogon spp.	0.00	0.08	0.25	0.33	13.808	0.997	0.110
Leiognathus spp.	0.10	0.75	1.00	1.85	77.406	5.587	0.617
Gobiidae	0.00	0.03	0.05	0.08	3.347	0.242	0.027
(Included Trypaucheninae and Gobioidinae)							
Monacanthus sp.	0.000	0.005	0.000	0.005	0.209	0.030	0.003
Upeneus sp.	0.00	0.00	0.01	0.01	0.418	0.015	<0.002
Miscellaneous crab	0.01	0.01	0.10	0.12	5.020	0.347	0.038
Total	0.11	0.87	1.41	2.39	100	7.219	0.797

* Percentage1: Catching percentage compare with the total catch of the shrimp group.
Percentage2: Catching percentage compare with the grand total catch.

Table 9 Result of others group caught by beam trawl

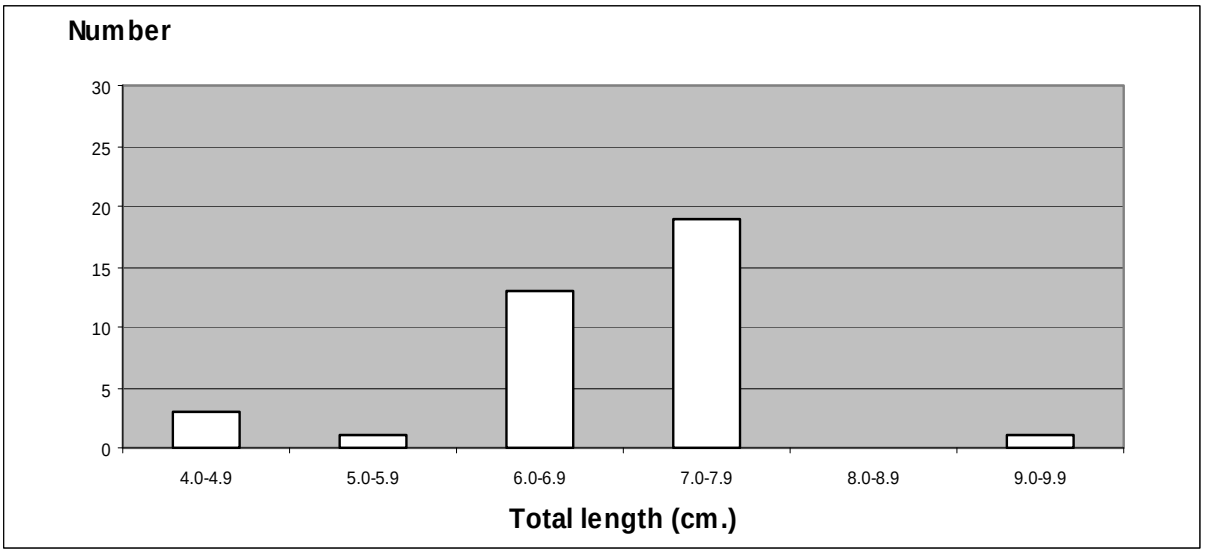


Figure 16 Total length distribution of Cardinal fish caught by beam trawl

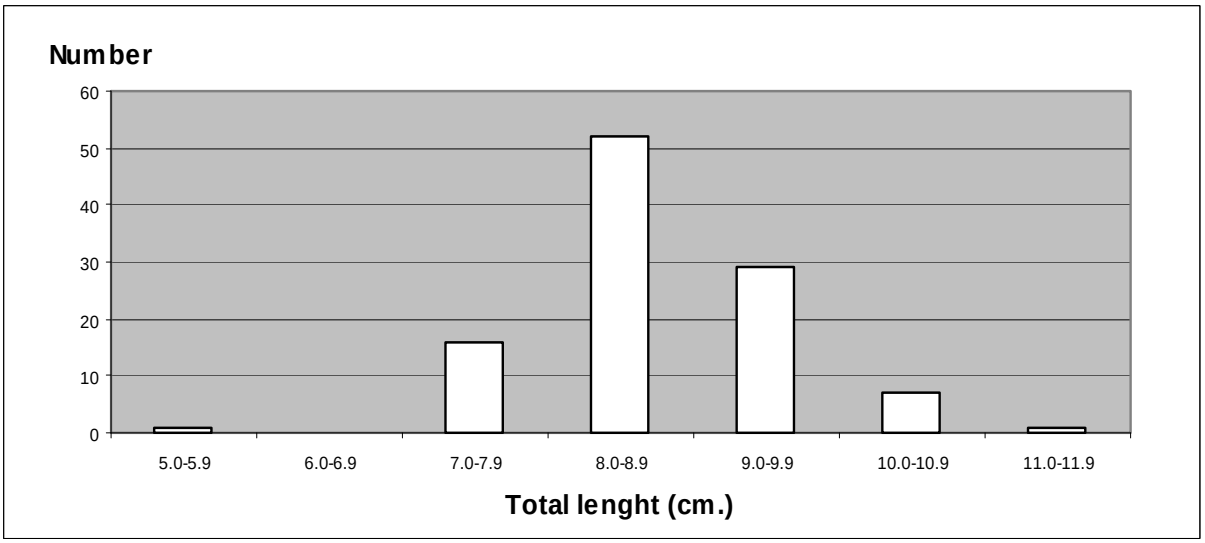


Figure 17 Total length distribution of Pony fish caught by beam trawl

Conclusion and Recommendation

Although the beam trawl had introduce to Thailand more than 50 years, fishing gear technologists of SEAFDEC/TD have not any experience yet. Sea trial experimental of beam trawl was very important for understanding the fishing gear and fishing operation mechanism. Knowledge and experience gained from the preliminary experiment is the tools for understanding beam trawl fishing that possible to be options on the development selectivity fishing gear and practices for sustainable fishing in the future

1. Optimum towing speed of beam trawl should be 4-5 knots. Because the sea bottom is soft muddy, ground rope was dragged and easily to sunk under the soft muddy fishing ground, high towing speed make the ground rope rise up at the surface of sea bottom, and be able to reduce the damage of the trawl net. By the observation, bottom sediment as well as many garbage in the cod-end of towing speed 2 knots was more than bottom sediment in the cod-end of towing speed 4-5 knots. To prevent the sinking of ground rope and digging plenty bottom sediment, towing with high speed, 4-5 knots is the solution.

Fast towing speed can extends the sweeping area and catch quantity is able to be increase. The result of sea trial operation showed the different of catch quantity between towing speed 2 knot and 4-5 knot which were absolutely different.

2. Accidents are occurred by heavy bottom sediment. Recommend not to tow more than an hour, in order to prevent the massive bottom sediment and garbage in the cod-end. The heavy load of sediment caused the broken of stern deck boom of the second operation.

3. Platform at the stern-deck is one of the most important devices for beam trawl operation. Shooting and hauling operation would be convenient if the vessel was installed stern-deck platform. The important other devices are stern deck derrick boom for hauling up the cod-end. Two stern rollers for passing the two towing ropes are used when hauling operation is done.

4. Mesh size should be enlarged enough for releasing fineness bottom sediment. Recommend to select the mesh size of Cod-end larger than 3.0 cm. The twine size of cod-end should be 700/18-21 deniers, to prevent the belly of cod-end damaged by abrading with the sea bottom. The 380 deniers twine size of cod-end had shown some damages by the abrasion with sea bottom.

5. The muddy mix sandy with shell fishing ground is made the belly part damage by the abrasion and the sediment hardly to release. Before the fishing operation is conducted, operators must investigate the proper type sea bottom. Appropriate sea bottom should by soft muddy fishing ground.

6. The catch quantity of pelagic animal, compare with the demersal animal is very rare because trawl net have short vertical opening. Genuine trash fishes have shown much less than the quantity of target species, i.e. shrimp and crab.

7. Ground rope of beam trawl is very severe dragging with the soft seabed because there were plenty of cockles catch by beam trawl. In order to reduce cockle and bottom sediment which retained in the cod end, weight of beam trawl should be reduced appropriately. However if reducing of ground rope weight, the towing speed must be reduced and the sweep area is reduced consequently. It should be affected to the quantity of total catch.

8. The further studied of beam trawl should be the reducing of the incidental catches by install some sorting devices or select approximate mesh size for constructing the trawl net. As well as the dragging characteristic of beam trawl by heavy ground rope and ski must be investigated in order to reduce the impact to sea bottom, suspended solid and benthic organism.

This information has been collected and concluded by 3 fishing operations of beam trawl. It is the basic knowledge to improve the fishing gear, fishing boat and fishing operation

for the managing of the next program, i.e. the study on the efficiency of beam trawl compare with the push net, Effect of bottom characteristic from near future.

Figure 18 (Top) Catches before Sorting, (Down) Catches after sorting

Figure 19: Researchers; Back-left: Aussanee Munprasit, Back-right: Isara Chanrachkij
Front left: Pratakphol Prajakjitt, Front right: Anurak Loog-ong

Reference

Aussanee Munprasit, Isara Chanrachkij, Pratakphol Prajakjitt, Nopporn Manajit, and et al. 2004 Fishing Gear and Methods in Southeast Asia: I.; Thailand (Revised Edition). TD/RES 09 Samut Prakan: SEAFDEC/TD, 416 pp

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Acknowledgement

Authors would like to express appreciate to crew of M.V.Plalung1 under commanded by Mr. Trakul Sunglhuke who fully cooperated on the experiment not only the sea trial but also fishing boat modification, Captain Sutee Ship head of Division on his suggestion about hauling devices. Author also present special thank you to Dr. Somboon Siriraksophon, Head of Research Division and Mr. Panu Tevaratmaneekul Secretary General/Chief of Training Department on their fully supporting.

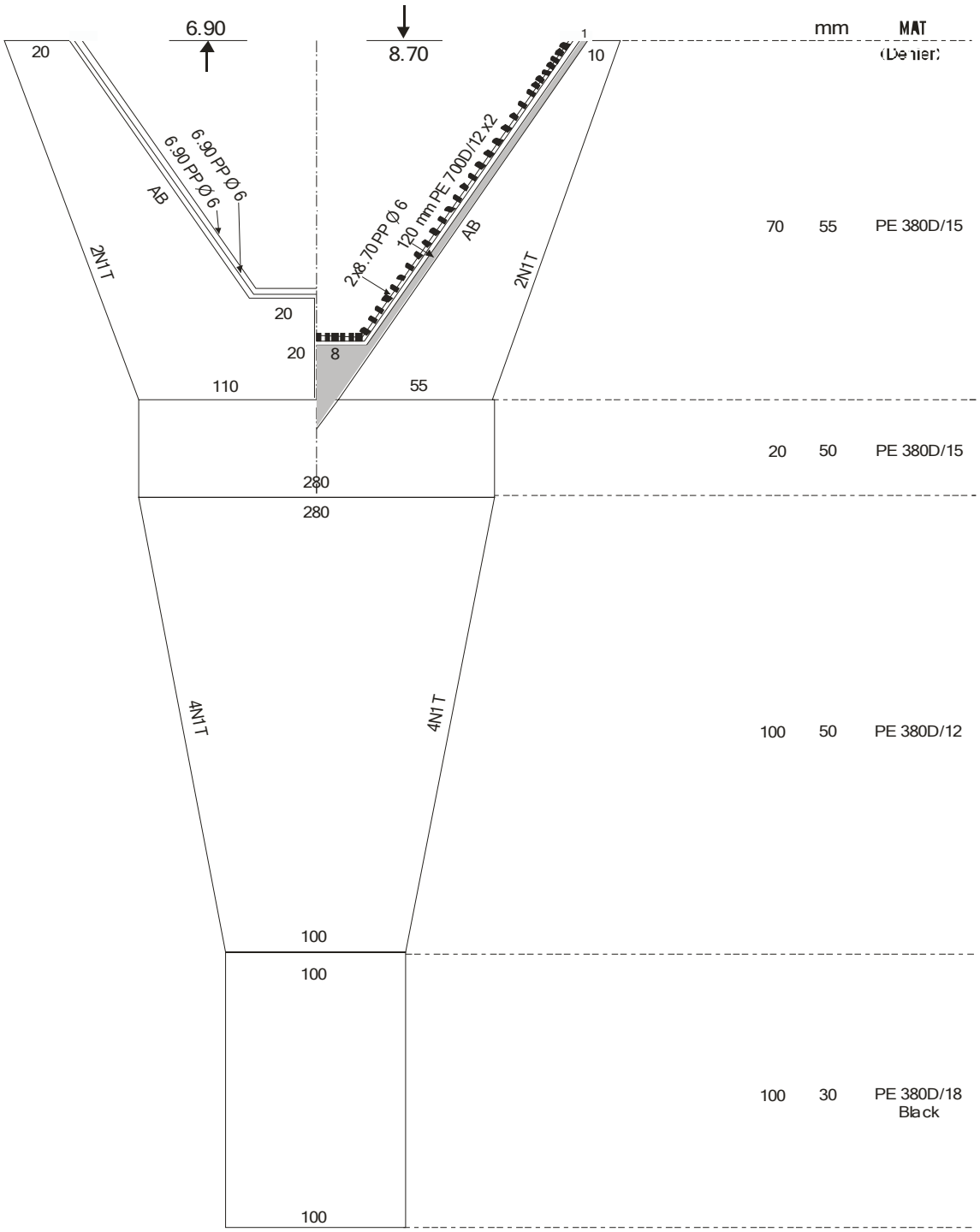
Annex 1: Details of M.V. Plalung1

Name	M.V. PLALUNG1
Call sign	-
Port of register	Bangkok, Thailand
Ship owner	Southeast Asian Fisheries Development Center
Place of birth	Prachaub-kirikarn
Date of launch	N/A
Date of delivery	N/A
Gross tonnage	35 GT
Length overall	18.0 m.
Breadth	5.0 m.
Depth	3.5 m.
Main engine	275 HP Hino EK-100
Maximum speed	8 knot
Service speed	7 knot
Fuel oil tank	8 m^3
Lubrication oil tank	N/A
Freshwater tank	14 m^3
Crew	4

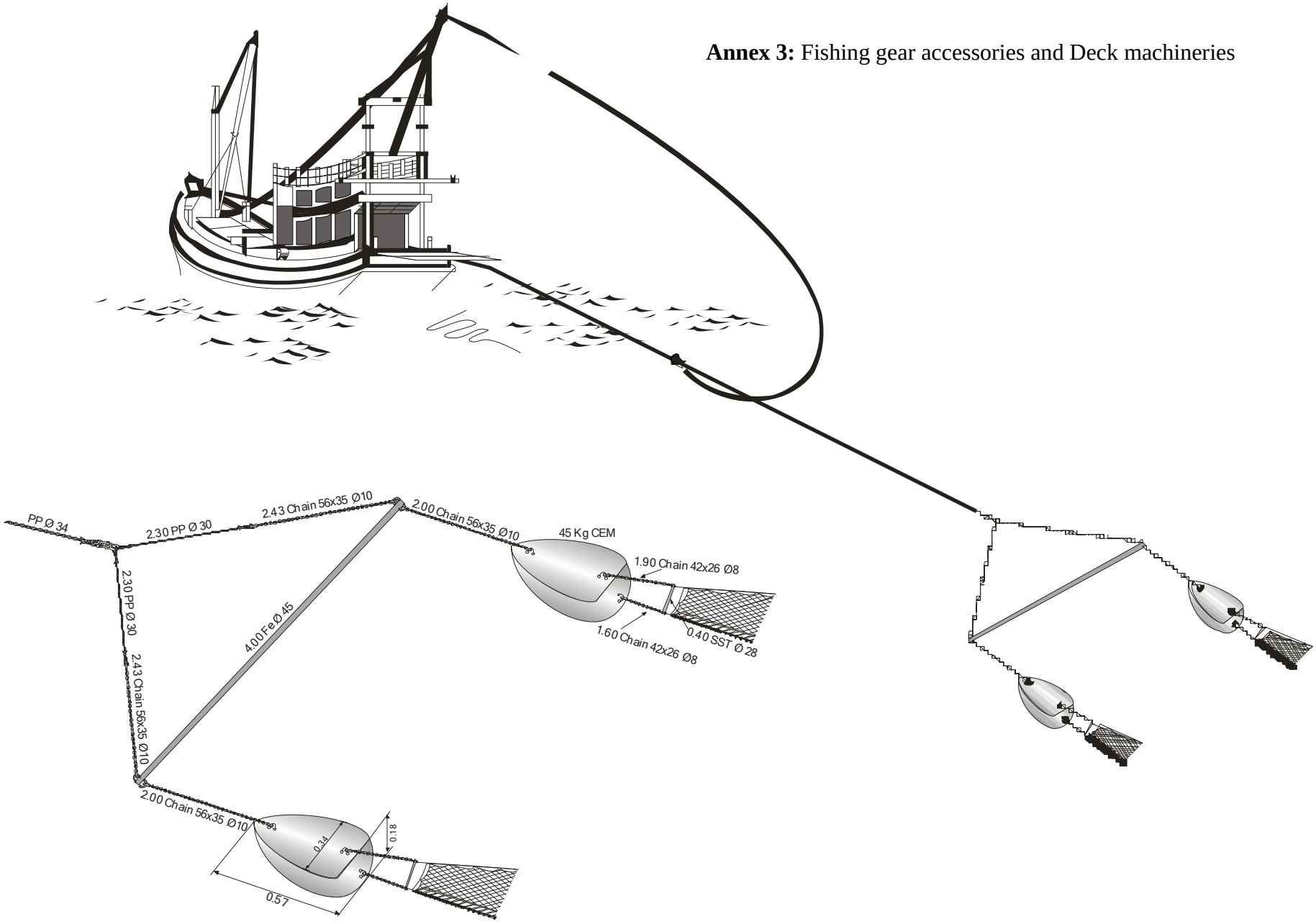
Figure 20: M.V. Plalung1

N/A: Not available

Annex 2: Beam trawl net design



Annex 3: Fishing gear accessories and Deck machineries



Annex 4: Result of total catch

Marine species	Total Weight (kg.)			Total Catch (kg)	Percentage	Average
	Operation 1	Operation 2	Operation 3			
Shrimp						
Peneus merguiensis	0.000	0.100	0.250	0.350	1.057	0.117
Metapeneus spp	0.150	1.100	1.700	2.950	8.910	0.983
Other small shrimp	0.001	0.000	0.003	0.004	0.012	0.001
Total	**0.151**	**1.200**	**1.953**	**3.304**	**9.979**	**1.101**
Cepholopod						
Sepioteuthis spp.	0.000	1.100	1.400	2.500	7.551	0.833
Other small cephalopod	0.000	0.001	0.000	0.001	0.003	0.000
Total	**0.000**	**1.101**	**1.400**	**2.501**	**7.554**	**0.834**
Crab						
Portunus pelagicus	0.450	0.800	3.200	4.450	13.440	1.483
Total	**0.450**	**0.800**	**3.200**	**4.450**	**13.440**	**1.483**
Pelagic fishes						
Selaroides leptopepis	0.000	0.000	0.020	0.020	0.060	0.007
Total	**0.000**	**0.000**	**0.020**	**0.020**	**0.060**	**0.007**
Demersal fish						
Sciaenidae spp.	0.100	0.120	0.250	0.470	1.420	0.157
Nemiperus sp.	0.000	0.000	0.200	0.200	0.604	0.067
Scolopsis sp.	0.050	0.000	0.000	0.050	0.151	0.017
Ssillago sihama	0.000	0.000	0.100	0.100	0.302	0.033
Cynoglossus spp.	0.200	1.500	1.700	3.400	10.269	1.133
Scatophagus argus	0.000	0.000	0.050	0.050	0.151	0.017
Platycephalus sp.	0.000	0.000	1.300	1.300	3.926	0.433
Dasyatis sp.	0.000	0.000	0.090	0.090	0.272	0.030
Total	**0.350**	**1.620**	**3.690**	**5.660**	**17.095**	**1.887**
Trash fish						
Apogon spp.	0.000	0.080	0.250	0.330	0.997	0.110
Leiognathus spp.	0.100	0.750	1.000	1.850	5.587	0.617
Gobiidae	0.000	0.030	0.050	0.080	0.242	0.027
(Included *Trypaucheninae* and *Gobioidinae*)						
Monacanthus sp.	0.000	0.000	0.010	0.010	0.030	0.003
Upeneus sp.	0.000	0.005	0.000	0.005	0.015	0.0017
Miscelleneus crab	0.010	0.005	0.100	0.115	0.347	0.038
Total	**0.110**	**0.870**	**1.410**	**2.390**	**7.219**	**0.797**

Annex 4: Result of total catch (continue)

Marine species	Total Weight (kg.)			Total	Percentage	Average
	Operation 1	Operation 2	Operation 3			
Others						
Horse shoe crab	0.000	0.000	0.500	0.500	1.510	0.167
Squilla spp.	0.070	0.100	0.600	0.770	2.326	0.257
Thenus spp.	0.010	0.000	0.000	0.010	0.030	0.003
Bloody calm	0.700	0.000	12.000	12.700	38.357	4.233
Total	**0.780**	**0.100**	**13.100**	**13.980**	**42.223**	**4.660**
Grand Total	**1.841**	**5.691**	**22.733**	**32.305**	**100.00**	**10.768**

Annex 5: List of crew and researcher

Name	Position
1. Trakul Sangphuek	Captain
2. Nimitr Pattamapranee	Engineer
3. Dam Tanyajaroen	Oiler
4. Somyos pornprasert	Steerman and Fishing assistant
5. Aussanee Munprasit	Researcher and Fishing Master
6. Isara Chanrachkij	Researcher
7. Pratakphol Prajakjitt	Researcher
8. Anurak Loog-ong	Assistant Researcher