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CONTENT

I. INTRODUCTION

Crab bottom gill net is very popular small-scale fishing gear in the Gulf of Thailand. The crab caught by this fishing gear is swimming crab *Portunus pelagicus* (Linnaeus). This type of net usually consists of plane sheet of netting with a weighted ground rope and a buoyant head line. This gill net is normally shot in fleets and is anchored at each with bridles. It can be set across or in line with the tide.

This type of net has the advantages that it has a simple structure, which allows relatively easy handling and the cath obtained by this gear commands much higher prices because they are fresher than the catch by trawl when they reach the market.

However, the crab bottom gill net that is used in the Gulf of Thailand can be divided into two kinds; one is monofilament bottom gill net and the other the multifilament one. It has long been suspectable which one is a more effective bottom gill net to catch a swimming crab or which one is a profitable one.

The test of fishing by the monofilament and the multifilament bottom gill nets was carried out in the Gulf of Thailand with M.V. Plalung to compare their catching efficiency.

The objectives of the present study can be summarized as follows.

1. Comparison of catch between the monofilament bottom gill net and the multifilament one.
2. Comparison of catch of gill nets with different hang-in ratios.
3. Comparison of catch by the daytime and the night time operations.

II. MATERIALS AND METHODS

1. Fishing gear

Two kinds of bottom gill net, the monofilament and the multifilament bottom gill nets were employed in this experiment. Each type has three kinds with different hang-in ratios. For convenience' sake they were called net A, B, C and net D, E, F. The specifications of each of nets are shown in Table 1. and Figure 1, 2.

The monofilament and the multifilament gill nets were constructed so as to enable us to compare the catching efficiency of nets with different twine.

On the other hand net A, B, C and D, E, F were prepared for comparing the catching efficiency of nets with different hang-in ratios.

2. Date and location of experimental fishing

Three rounds of experimental fishing were carried out from August 1984 to February 1985 in the area of Ko Sichang, Sriracha and Ko Man in the Gulf of Thailand.

Date and other relevant details concerning the experimental fishing are summerized in Table 2 and Figure 3.

3. Fishing method

The two groups of the bottom gill nets were prepared. The first group is monofilament bottom gill net consisted of three kinds namely net A, B and C with different hang-in ratio, A : 30%, B : 40% and C : 50%.

The second group is multifilament bottom gill nets consisted of three kinds namely net D, E and F with different hang-in ratios, D : 30%, E : 40% and F : 50%.

The experimental set of bottom gill nets consisted of 18 pieces of net (3 of each kind of net). A schematic diagram of bottom gill net fishing arrangement is shown in Figure 4.

III. RESULTS

The data concerning the times and locations of all 36 experiments, as well as the amounts of catch, are given in Table 3. The number of captured crabs per 100 meters of float line length of gill net was also recorded. Each crab was weighed and its carapace width was measured.

These 36 experimental operations were carried out in three different fishing grounds:

a) 19 operations around Ko Sichang

b) 13 operations along the coast of Sri Racha

c) 5 operations around Ko Man in the eastern part of Rayong Province.

The catch per unit effort (CPUE) of each fishing ground was dependent on the unit stock of the crabs during the period of those operation. Therefore, to clarify the catching efficiency of each type of gill net, we should use the CPUE of each fishing ground as one of the factors for the statistical calculation in order to reduce the erronous results caused by the difference in unit stock of the crabs in each fishing ground.

In order to compare the catching efficiency of each type of gill nets, the number of captured crabs per 100 meters of float line length of gill net is used as CPUE.

The results of this study put emphasis on the following comparison of catching efficiency.

1. Comparison of catch between monofilament and multifilament bottom gill net.

The analysis of variance was applied for the test of the difference of CPUE. In this case the material of the net is supposed as factor A. Factor A can seperate into 2. A_1 is the monofilament nylon and A_2 is the multifilament nylon. The location is supposed as factor B. Factor B can seperate into 3, B_1 is Ko Sichang, B_2 is Sriracha and B_3 is Ko Man. (see Table 4)

The results show the difference in CPUE which is effected by both the materials and locations. The F-ratio of the factor A (material) is rejected at 10% level and F- ratios of factor B (location) and the interaction are rejected at 1% level. (see Table 5)

Due to these statistical results, the average CPUE of multifilament gill net should be bigger than the average CPUE of monofilament gill net. Regarding to the locations, the CPUE of crabs caught by gill net at Ko Man should be the highest.

The Figure 5 and 6 show the interaction between average CPUE of the each location and average CPUE of crabs caught by gill net of different twine.

2. Comparison of catch by bottom gill nets with different hang-in ratios.

In accordance with the difference of catching efficiency of the monofilament and multifilament gill nets, for this part within each type the difference in hang-in ratio is also clarified for the difference in catching efficiency.

2.1 Monofilament gill net

The analysis of variance was applied to test for the difference of CPUE. The hang-in ratio is supposed as factor A. The factor A can be divided in-to three types, A_1 : 30%, A_2 : 40% and A_3 : 50% of hang-in ratios.

The location is supposed as factor B. The factor B can be divided into three types, B_1 is Ko Sichang, B_2 is Sriracha and B_3 is Ko Man. (see Table 6) At the first step, the data were tested by the method of variance analysis and the results of test (see Table 7) is shown that the interaction is accepted, this will affect the result of the F-ratio of each factor. In order to get more accuracy of the difference in each factor the interaction is supposed to be zero.

And when the interaction is zero the results show that there is no difference in CPUE which is effected by different hang-in ratios of the monofilament gill net. However the F-ratio shows the difference of CPUE in different fishing ground at 1% level. (see Table 8) The figure 7 and 8 show the interation of the average CPUE of the different hang-in ratios net and average CPUE of each fishing ground.

2.2 Multifilament gill net

The analysis of variance was applied to test for the difference of catch of difference net, the same as monofilament gill net, hang-in ratio is supposed as factor A and location as factor B. (see Table 9) At the first step, the data were tested by the method of varience analysis and, the results of test (see Table 10) is shown that. The interaction is accepted, this will affect the result of the F-ratio of each factor. In order to get more accurate result, the interaction is supposed to be zero.

And when the interaction is zero the results show the difference in CPUE effected by both hang-in ratio and location, the factor A is rejected at the level of less than 25%. The factor B and sub-total are rejected at 1% level. (see Table 11)

Due to these statistical results, the average CPUE of 40% hang-in ratio should be the best. Regarding to the locations, the CPUE of crabs caught by multifilament gill net at Ko Man should be the highest. The Figure 9 and 10 show the interaction of the average CPUE of different hang-in ratios net and average CPUE of each fishing ground.

3. Comparison of the catch of gill net in day-time and night-time operations.

The analysis of variance was applied to test the difference of the catch of gill net in day-time and night-time operations. The operation time is supposed as factor A the location is supposed as factor B. (see Table 12) At first the data were tested by the method of variance analysis and, the results of test (see Table 13) is shown that the interaction is accepted, this will affect the result of the F-ratio of each factor. In order to get more accurate result, the interaction is supposed to be zero.

And when the interaction is zero the results show that there is no difference in CPUE between day and night-time operation. However the CPUE of each fishing ground is different at 1% level. (see Table 13 and Figure 11, 12)

In addition, the method of variance analysis was also carried out to test the significant difference of mean carapace width of crabs caught around Ko Sichang, the results of those indicate that there were highly significant difference of mean carapace width of crabs caught between day-time and night-time fishing operation. And the mean carapace width of crabs caught by night-time fishing operation was bigger than the mean carapace width of crabs caught by day-time fishing operation.

On the contrary, the result of test significant difference around Sriracha and Ko Man were highly significant difference and significance difference with the mean carapace width of crabs caught by day-time fishing operation was bigger than the mean carapace width of crabs caught by night-time fishing operation.

It seems to be that the size of crabs caught in different operation time are effected by the depth of water. The depth of water around Sriracha and Ko Man are less than 10 meters but around Ko Sichang it ranges from 8.5 to 34 meters.

The size composition of crabs caught by day-time and night-time can be seen in Figure 13.

DISCUSSION

1. Catch of monofilament and multifilament gill nets

In the area of Ko Sichang the catch per 100 meters of monofilament gill net seemed to be a bit higher than that of multifilament gill net.

On the contrary, in the area of Sriracha and Ko Man the catch per 100 meters of multifilament gill net seemed to be higher than that of the monofilament gill net.

However, in the statistical analysis, it can be said that the average catch per 100 meters of multifilament gill net was higher than that of monofilament significant at the level of 90% (= 0.1)

And the abundance of crab in the fishing ground of Ko Man seemed to be the highest. Sriracha and Ko Sichang seemed to be the second and third respectively.

The other noticeable result is that the multifilament gill net seemed to be higher catching efficiency than the monofilament gill net in the abundance of crab fishing ground

2. Catch of gill nets of different hang-in ratio.

2.1 Monofilament gill net

In the area of Ko Sichang the catch per 100 meters of monofilament gill net with different hang-in seemed no different.

In the area of Sriracha the catch per 100 meters of hang-in 40% seemed to be the highest. But in the area of Ko Man the catch by gill net of the hang-in ratio of 50% seemed to be the highest.

However, in the statistical view-point, the average catch per 100 meters of the different hang-in of monofilament gill net were not different.

But in the abundant area of crab the higher hang-in gill net seems to catch better than the lower hang-in gill net.

2.2 Multifilament gill net

From the statistical analysis the 40% hang-in gill net was the most effective net catching the crab and significant at the level of 75% (= 0.25).

And the average of catch per 100 meter in Ko Man area is better than in Sriracha and Ko Sichang respectively.

3. Catch of gill nets by the daytime and night time.

In the area of Ko Sichang the night-time seemed to be a bit better than day-time in catch per 100 m. But in Siracha and Ko Man the catch per 100 m. of the net in day-time seemed to be better than in night-time.

However, from the statistic point of view there was no significant difference in catch per 100 m of day-time and night-time of both monofilament and multifilament gill net.

From the three main sults we may say that the multifilament seemed to be better than the monofilament gill net. Anyhow in to the real operation we had better to know about each characteristics of these two kinds of gill nets, as follows.

Monofilament gill net	Multifilament gill net
1. Material easily damaged, net can be used only 1-2 months	1. The net can be used longer
2. Hauling, net are not so heavy	2. Hauling, net are heavier
3. Easy to remove crabs from the net	3. A bit difficult to remove crabs from the net

Monofilament gill net	Multifiment gill net
4. The price is cheaper	4. The price is more expensive
5. Easily constructing	5. Need more accessory things in constructing.

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Table 1. The specifications of monofilament and multifilament bottom gill nets

Net Type / Net	A	B	C	D	E	F
Webbing						
Material	PA MONO	PA MONO	PA MONO	PA MULTI	PA MULTI	PA MULTI
Netting cord	Ø 0.20m/mx3	Ø 0.20m/mx3	Ø 0.20m/mx3	210d/18	210d/18	210d/18
Mesh size (cm)	12	12	12	9.8	9.8	9.8
Hang-in ratio (%)	30%	40%	50%	30%	40%	50%
Meshes depth	9.5	9.5	9.5	12	12	12
Float Line						
Line (mm)	PE Ø 2.5	PE Ø 2.5	PE Ø 2.5	PE Ø 2.5	PE Ø 2.5	PE Ø 2.5
Total length (m)	126	108	90	126	108	90
Float material	PVA	PVA	PVA	PVA	PVA	PVA
Float size (mm)	Ø38 L20	Ø38 L20	Ø38 L20	Ø21 L33	Ø21 L33	Ø21 L33
Buoyancy/pieces(gm)	16	16	16	7.6	7.6	7.6
Float interval (m)	5	4.5	3.75	0.95	0.82	0.68
Sinker Line						
Line (mm)	PE Ø 2.5	PE Ø 2.5	PE Ø 2.5	PE Ø 2.5	PE Ø 2.5	PE Ø 2.5
Total length (m)	126	108	90	126	108	90
Sinker material	Pb	Pb	Pb	Porcelain	Porcelain	Porcelain
Sinking force (gm)	10	10	10	13.8	13.8	13.8
Sinker interval (m)	0.85	0.72	0.60	0.50	0.43	0.35

Table 2. Dates, places of the experiment

Date	Station	Position	Depth(m)	Operation
16/8/84	1	L 13° 11.01 N - L 13° 11.30 N λ 100° 48.4 E λ 100° 45.19 E	11	Night-time
16/8/84	2	L 13° 11.00 N - L 13° 11.06 N λ 100° 48.26 E λ 100° 49.25 E	8.5	Night-time
17/8/84	3	L 13° 06.29 N - L 13° 07.27 N λ 100° 48.56 E λ 100° 49.23 E	19	Day-time
17/8/84	4	L 13° 06.17 N - L 13° 06.10 N λ 100° 48.55 E λ 100° 48.17 E	22	Day-time
17/8/84	5	L 13° 06.30 N - L 13° 07.30 N λ 100° 47.50 E λ 100° 47.35 E	34	Night-time
18/8/84	6	L 13° 09.46 N - L 13° 09.11 N λ 100° 49.05 E λ 100° 49.34 E	10	Day-time
18/8/84	7	L 13° 09.02 N - L 13° 09.50 N λ 100° 50.29 E λ 100° 50.55 E	30	Night-time
18/8/84	8	L 13° 10.27 N - L 13° 11.04 N λ 100° 49.38 E λ 100° 49.51 E	10.5	Night-time
19/8/84	9	L 13° 11.45 N - L 13° 11.50 N λ 100° 50.07 E λ 100° 50.46 E	17	Day-time
19/8/84	10	L 13° 11.25 N - L 13° 10.41 N λ 100° 49.49 E λ 100° 49.12 E	16	Day-time
19/8/84	11	L 13° 11.15 N - L 13° 11.08 N λ 100° 49.44 E λ 100° 49.01 E	10	Night-time

Table 2 (cont.)

Date	Station	Position	Depth(m)	Operation
20/8/84	12	L 13° 09.18 N - L 13° 10.04 N λ 100° 53.39 E λ 100° 54.27 E	8	Day-time
20/8/84	13	L 13° 09.52 N - L 13° 10.23 N λ 100° 54.23 E λ 100° 55.11 E	8	Night-time
20/8/84	14	L 13° 11.07 N - L 13° 12.55 N λ 100° 55.28 E λ 100° 55.32 E	6	Night-time
21/8/84	15	L 13° 12.51 N - L 13° 13.05 N λ 100° 54.59 E λ 100° 54.22 E	6	Day-time
21/8/84	16	L 13° 14.54 N - L 13° 16.25 N λ 100° 55.02 E λ 100° 54.48 E	4	Night-time
22/8/84	17	L 13° 07.28 N - L 13° 08.24 N λ 100° 48.33 E λ 100° 48.02 E	16.5	Night-time
22/8/84	18	L 13° 07.58 N - L 13° 07.11 N λ 100° 48.28 E λ 100° 48.20 E	18	Night-time
23/8/84	19	L 13° 06.32 N - L 13° 06.19 N λ 100° 48.43 E λ 100° 48.19 E	18	Day-time
23/8/84	20	L 13° 06.27 N - L 13° 07.14 N λ 100° 48.54 E λ 100° 49.22 E	22	Day-time
23/8/84	21	L 13° 08.06 N - L 13° 08.57 N λ 100° 49.32 E λ 100° 49.28 E	12	Night-time
24/8/84	22	L 13° 09.08 N - L 13° 08.33 N λ 100° 48.14 E λ 100° 47.50 E	27	Day-time

Table 2 (cont.)

Date	Station	Position	Depth(m)	Operation
24/8/84	23	L 13° 08.42 N - L 13° 07.50 N λ 100° 49.42 E λ 100° 49.29 E	17	Night-time
24/8/84	24	L 13° 08.18 N - L 13° 08.53 N λ 100° 49.27 E λ 100° 49.44 E	14	Night-time
25/8/84	25	L 13° 16.08 N - L 13° 17.36 N λ 100° 54.15 E λ 100° 54.09 E	7.5	Night-time
26/8/84	26	L 13° 16.26 N - L 13° 16.37 N λ 100° 54.42 E λ 100° 53.27 E	6	Day-time
26/8/84	27	L 13° 16.04 N - L 13° 15.26 N λ 100° 54.21 E λ 100° 53.25 E	6	Day-time
26/8/84	28	L 13° 17.18 N - L 13° 15.21 N λ 100° 54.07 E λ 100° 55.05 E	4	Night-time
26/8/84	29	L 13° 17.01 N - L 13° 16.18 N λ 100° 54.24 E λ 100° 53.18 E	7.5	Night-time
27/8/84	30	L 13° 21.48 N - L 13° 23.01 N λ 100° 54.24 E λ 100° 54.00 E	5	Day-time
27/8/84	31	L 13° 21.25 N - L 13° 22.12 N λ 100° 54.57 E λ 100° 54.58 E	5	Day-time
3/2/85	32	L 12° 36.7 N - L 12° 37.4 N λ 101° 42.4 E λ 101° 42.8 E	7	Night time
4/2/85	33	L 12° 38.0 N - L 12° 38.8 N λ 101° 43.5 E λ 101° 44.1 E	7	Day-time

Table 2 (cont.)

Date	Station	Position	Depth(m)	Operation
4/2/85	34	L 12° 36.3 N - L 12° 37.2 N λ 101° 42.3 E λ 101° 42.6 E	10	Night-time
5/2/85	35	L 12° 36.8 N - L 12° 37.6 N λ 101° 42.6 E λ 101° 43.0 E	6	Day-time
6/2/85	36	L 12° 36.3 N - L 12° 37.2 N λ 101° 43.5 E λ 101° 43.9 E	6	Night-time

Table 3. Number of crabs per 100 m of gill net float line caught by bottom gill net. Numbers in parentheses show the total number of crabs

Date	Operation No.	Nylon Monofilament			Nylon Multifilament			Total catch
		A	B	C	D	E	F	
16/8/84	1	1.59 (6)	0.62 (2)	1.11 (3)	0.53 (2)	0.31 (1)	0 (0)	14
	2	0.26 (1)	0 (0)	0.37 (1)	0.79 (3)	1.85 (6)	1.48 (4)	15
17/8/84	3	2.38 (9)	2.47 (8)	4.07 (11)	0.53 (2)	1.23 (4)	0.37 (1)	35
	4	2.11 (8)	0.93 (3)	2.22 (6)	0 (0)	0.62 (2)	0.37 (1)	20
	5	0.79 (3)	1.54 (5)	0.37 (1)	0.79 (3)	2.16 (7)	2.59 (7)	26
18/8/84	6	0.53 (2)	0 (0)	0.37 (1)	0 (0)	0 (0)	0 (0)	3
	7	0 (0)	0.93 (3)	0 (0)	0 (0)	0 (0)	1.11 (3)	6
	8	0 (0)	0.93 (3)	0.74 (2)	0.79 (3)	0.93 (3)	0 (0)	11
19/8/84	9	1.06 (4)	0.93 (3)	0.37 (1)	0.53 (2)	0.31 (1)	1.11 (3)	14
	10	0 (0)	1.85 (6)	0 (0)	0.53 (2)	0.93 (3)	0.37 (1)	12
	11	0.79 (3)	0.62 (2)	1.11 (3)	0.26 (1)	0.62 (2)	0.37 (1)	12
20/8/84	12	0 (0)	0 (0)	0 (0)	1.32 (5)	1.23 (4)	2.96 (8)	17
	13	0.53 (2)	0.93 (3)	0.74 (2)	0.26 (1)	0.62 (2)	1.48 (4)	14
	14	0 (0)	0 (0)	1.11 (3)	0.79 (3)	4.01 (13)	1.85 (5)	24
21/8/84	15	1.59 (6)	2.16 (7)	0.37 (1)	0 (0)	0 (0)	0.37 (1)	15
	16	0 (0)	0 (0)	0 (0)	0.26 (1)	1.85 (6)	0.37 (1)	8
22/8/84	17	1.85 (7)	1.85 (6)	1.85 (5)	1.06 (4)	1.54 (5)	0.37 (1)	28
	18	0 (0)	0.93 (3)	0.37 (1)	0.53 (2)	0 (0)	0.37 (1)	7
23/8/84	19	0 (0)	0.37 (1)	0.74 (2)	0.79 (3)	1.54 (5)	0 (0)	11
	20	0 (0)	0 (0)	0.37 (1)	0.79 (3)	2.47 (8)	1.85 (5)	17
	21	1.98 (5)	0.93 (3)	2.22 (6)	0.53 (2)	1.23 (4)	2.22 (0)	26
24/8/84	22	1.98 (5)	0.93 (3)	0 (0)	0 (0)	0.31 (1)	0.37 (1)	10
	23	1.59 (4)	0.93 (3)	0.37 (1)	0.26 (1)	0.93 (3)	0.74 (2)	14
	24	0.40 (1)	0.93 (3)	1.11 (3)	0.79 (3)	0.93 (3)	1.11 (3)	16
25/8/84	25	0.40 (1)	0.62 (2)	0.37 (1)	0 (0)	0.31 (1)	2.22 (6)	11
26/8/84	26	0 (0)	0 (0)	0 (0)	0.53 (2)	0.31 (1)	1.11 (3)	6
	27	0 (0)	0.62 (2)	0.37 (1)	1.85 (7)	2.47 (8)	1.85 (5)	23
	28	0.40 (1)	0 (0)	0 (0)	0.20 (1)	0 (0)	0 (0)	2
	29	0.40 (1)	0.62 (2)	0.37 (1)	1.06 (4)	0.93 (3)	0 (0)	11

Table 3 (cont.)

Date	Operation no.	Nylon Monofilament			Nylon Multifilament			Total catch
		A	B	C	D	E	F	
27/8/84	30	0.40 (1)	0 (0)	0 (0)	0.26 (1)	0 (0)	0 (0)	2
	31	0.40 (1)	1.85 (6)	2.22 (6)	1.85 (7)	4.01 (13)	2.96 (8)	41
3/2/85	32	4.50 (17)	2.16 (7)	6.30 (17)	5.29 (20)	2.78 (9)	5.56 (15)	85
4/2/85	33	1.59 (6)	1.85 (6)	2.22 (6)	0.79 (3)	1.85 (6)	1.85 (5)	32
	34	1.32 (5)	3.09 (10)	7.41 (20)	2.91 (11)	12.65 (41)	10.74 (29)	116
5/2/85	35	3.70 (14)	5.25 (17)	5.19 (14)	5.03 (19)	14.51 (47)	7.04 (19)	130
6/2/85	36	1.06 (4)	0.93 (3)	0 (0)	1.85 (7)	0.31 (1)	1.11 (3)	18
		0.859 (117)	1.046 (122)	1.235 (120)	0.941 (128)	1.826 (213)	1.564 (152)	(852)

(Note : Two pieces of monofilament gill net 30% hang-in ratio were operated in station No. 18 to 31)

Table 4. The CPUE of each type of gill nets with different material in each fishing ground

LOCATION (B)	MATERIAL (A)												
	A_1 (NYLON MONOFILAMENT)						A_2 (NYLON MULTIFILAMENT)						
B_1 KO SICHANG	1.59(6)	0.62(2)	1.11(3)	0.79(3)	0.62(2)	1.11(3)	0.53(2)	0.31(1)	0(0)	0.26(1)	0.62(2)	0.37(1)	
	0.26(1)	0(0)	0.37(1)	1.85(7)	1.85(6)	1.85(5)	0.79(3)	1.85(6)	1.48(4)	1.06(4)	1.54(5)	0.37(1)	
	2.38(9)	2.47(8)	4.07(11)	0(0)	0.93(3)	0.37(1)	0.53(2)	1.23(4)	0.37(1)	0.53(2)	0(0)	0.37(1)	
	2.11(8)	0.93(3)	2.22(6)	0(0)	0.37(1)	0.74(2)	0(0)	0.62(2)	0.37(1)	0.79(3)	1.54(5)	0(0)	
	0.79(3)	1.54(5)	0.37(1)	0(0)	0(0)	0.37(1)	0.79(3)	2.16(7)	2.59(7)	0.79(3)	2.47(8)	1.85(5)	
	0.53(2)	0(0)	0.37(1)	1.98(5)	0.93(3)	2.22(6)	0(0)	0(0)	0(0)	0.53(2)	1.23(4)	2.22(6)	
	0(0)	0.93(3)	0(0)	1.98(5)	0.93(3)	0(0)	0(0)	0(0)	1.11(3)	0(0)	0.31(1)	0.37(1)	
	0(0)	0.93(3)	0.74(2)	1.59(4)	0.93(3)	0.37(1)	0.79(3)	0.93(3)	0(0)	0.26(1)	0.93(3)	0.74(2)	
	1.06(4)	0.93(3)	0.37(1)	0.40(1)	0.93(3)	1.11(3)	0.53(2)	0.31(1)	1.11(3)	0.79(3)	0.93(3)	1.11(3)	$n_{1..}$ =114
	0(0)	1.85(6)	0(0)				0.53(2)	0.93(3)	0.37(1)				$\bar{X}_{1..}$ =0.83
	$T_{11.}$ =52.7 $n_{11.}$ =57 $\bar{X}_{11.}$ =0.92						$T_{12.}$ =42.21 $n_{12.}$ =57 $\bar{X}_{12.}$ =0.74						$T_{1..}$ =94.91
B_2 SRIRACHA	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1.32(5)	1.23(4)	2.96(8)	0.53(2)	0.31(1)	1.11(3)	
	0.53(2)	0.93(3)	0.74(2)	0(0)	0.62(2)	0.37(1)	0.26(1)	0.62(2)	1.48(4)	1.85(7)	2.47(8)	1.85(5)	
	0(0)	0(0)	1.11(3)	0.40(1)	0(0)	0(0)	0.79(3)	4.01(13)	1.85(5)	0.26(1)	0(0)	0(0)	
	1.59(6)	2.16(7)	0.37(1)	0.40(1)	0.62(2)	0.37(1)	0(0)	0(0)	0.37(1)	1.06(4)	0.93(3)	0(0)	
	0(0)	0(0)	0(0)	0.40(1)	0(0)	0(0)	0.26(1)	1.85(6)	0.37(1)	0.26(1)	0(0)	0(0)	$n_{2..}$ =72
	0.40(1)	0.62(2)	0.37(1)	0.40(1)	1.85(6)	2.22(6)	0(0)	0.31(1)	2.22(6)	1.85(7)	4.01(13)	2.96(8)	$\bar{X}_{2..}$ =0.78
	$T_{21.}$ =16.47 $n_{21.}$ =36 $\bar{X}_{21.}$ =0.46						$T_{22.}$ =39.35 $n_{22.}$ =36 $\bar{X}_{22.}$ =1.09						$T_{2..}$ =55.82
B_3 KO MAN	4.50(17)	2.16(7)	6.30(17)				5.29(20)	2.78(9)	5.56(15)				
	1.59(16)	1.85(6)	2.22(6)				0.79(3)	1.85(6)	1.85(5)				
	1.32(5)	3.09(10)	7.41(20)				2.91(11)	12.65(41)	10.74(29)				
	3.70(14)	5.25(17)	5.19(14)				5.03(19)	14.5(47)	7.04(19)				
	1.06(4)	0.93(3)	0(0)				1.85(7)	0.31(1)	1.11(3)				$n_{3..}$ =30
	$T_{31.}$ =46.57 $n_{31.}$ =15 $\bar{X}_{31.}$ =3.10						$T_{32.}$ =74.27 $n_{32.}$ =15 $\bar{X}_{32.}$ =4.95						$\bar{X}_{3..}$ =4.03 $T_{3..}$ =120.84
	$T_{.1.}$ =115.74 $n_{.1.}$ =108 $\bar{X}_{.1.}$ =1.07						$T_{.2.}$ =155.83 $n_{.2.}$ =108 $\bar{X}_{.2.}$ =1.44						$T_{...}$ =271.57 $n_{...}$ =216

Table 5. The result of the test of difference by analysis of variance

S.V.	D.F.	S.S.	M.S.	F-RATIO
A (MONO, MULTI)	2 - 1 = 1	348.87 - 341.44 = 7.43	7.43	3.3*
B (LOCATION)	3 - 1 = 2	609.04 - 341.44 = 267.60	133.80	59.73**
INTERACTION	1 × 2 = 2	301.41 - 7.43 - 267.60 = 26.38	13.19	5.89**
SUB-TOTAL	6 - 1 = 5	642.85 - 341.44 = 301.41	60.28	26.91
BETWEEN A and B	215 - 5 = 210	772.50 - 301.41 = 471.09	2.24	
TOTAL	216 - 1 = 215	1,113.94 - 341.44 = 772.50		

Table 6. The CPUE of monofilament gill net with different hang-in ratio in each location

LOCATION (B)	HANG-IN RATIO (A)			
	A_1 (30%)	A_2 (40%)	A_3 (50%)	
B_1 KO SICHANG	1.59(6) 0.26(1) 2.38(9) 2.11(8) 0.79(3) 0.53(2) 0(0) 0(0) 1.06(4) 0(0) 0.79(3) 1.85(7) 0(0) 0(0) 0(0) 1.98(5) 1.98(5) 1.59(4) 0.40(1)	0.62(2) 0(0) 2.47(8) 0.93(3) 1.54(5) 0(0) 0.93(3) 0.93(3) 0.93(3) 1.85(6) 0.62(2) 1.85(6) 0.93(3) 0.37(1) 0(0) 0.93(3) 0.93(3) 0.93(3) 0.93(3)	1.11(3) 0.37(1) 4.07(11) 2.22(6) 0.37(1) 0.37(1) 0(0) 0.74(2) 0.37(1) 0(0) 1.11(3) 1.85(5) 0.37(1) 0.74(2) 0.37(1) 2.22(6) 0(0) 0.37(1) 1.11(3)	$n_{1..}$=57 $\bar{X}_{1..}$=0.92
	$T_{11.}$=17.31 $n_{11.}$=19 $\bar{X}_{11.}$=0.91	$T_{12.}$=17.63 $n_{12.}$=19 $\bar{X}_{12.}$=0.93	$T_{13.}$=17.76 $n_{13.}$=19 $\bar{X}_{18.}$=0.93	$T_{1..}$=52.7
B_2 SRIRACHA	0(0) 0.53(2) 0(0) 1.59(6) 0(0) 0.40(1) 0(0) 0(0) 0.40(1) 0.40(1) 0.40(1) 0.40(1)	0(0) 0.93(3) 0(0) 2.16(7) 0(0) 0.62(2) 0(0) 0.62(2) 0(0) 0.62(2) 0(0) 1.85(6)	0(0) 0.74(2) 1.11(3) 0.37(1) 0(0) 0.37(1) 0(0) 0.37(1) 0(0) 0.37(1) 0(0) 2.22(6)	$n_{2..}$=36 $\bar{X}_{2..}$=0.46
	$T_{21.}$=4.12 $n_{21.}$=12 $\bar{X}_{21.}$=0.34	$T_{22.}$=6.8 $n_{22.}$=12 $\bar{X}_{22.}$=0.57	$T_{23.}$=5.55 $n_{23.}$=12 $\bar{X}_{23.}$=0.46	$T_{2..}$=16.47
B_3 KO MAN	4.50(17) 1.59(6) 1.32(5) 3.70(14) 1.06(4)	2.16(7) 1.85(6) 3.09(10) 5.25(17) 0.93(3)	6.30(17) 2.22(6) 7.41(20) 5.19(14) 0(0)	$n_{3..}$=15 $\bar{X}_{3..}$=3.10
	$T_{31.}$=12.17 $n_{31.}$=5 $\bar{X}_{31.}$=2.43	$T_{32.}$=13.28 $n_{32.}$=5 $\bar{X}_{32.}$=2.66	$T_{33.}$=21.12 $n_{33.}$=5 $\bar{X}_{33.}$=4.22	$T_{3..}$=46.57
	$T_{.1.}$=33.6 $n_{.1.}$=36 $\bar{X}_{.1.}$=0.93	$T_{.2.}$=37.71 $n_{.2.}$=36 $\bar{X}_{.2.}$=1.05	$T_{.3.}$=44.43 $n_{.3.}$=36 $\bar{X}_{.3.}$=1.23	$T_{...}$=115.74 $n_{...}$=108

Table 7. The results of the test of the difference by analysis of variance

S.V.	D.F.	S.S.	M.S.	F-RATIO
A (HANG-IN RATIO)	3 - 1 = 2	125.69 - 124.03 = 1.66	0.83	0.74
B (LOCATION)	3 - 1 = 2	200.84 - 124.03 = 76.81	38.40	34.29**
INTERACTION	2 × 2 = 4	86.63 - 1.66 - 76.81 = 8.16	2.04	1.82
SUB-TOTAL	9 - 1 = 8	210.66 - 124.03 = 86.63	10.83	9.67**
BETWEEN A and B	107 - 8 = 99	197.68 - 86.63 = 111.05	1.12	
TOTAL	108 - 1 = 107	321.71 - 124.03 = 197.68		

Table 8. The results of the test of difference by analysis of variance when interaction is 0.

S.V.	D.F.	S.S.	M.S.	F-RATIO
A (HANG-IN RATIO)	3 - 1 = 2	1.66	0.83	0.72
B (LOCATION)	3 - 1 = 2	76.81	38.40	31.10**
BETWEEN A and B	103	119.21	1.16	
TOTAL	107	321.71 - 124.03 = 197.68		

Table 9. The CPUE of multifilament gill net with different hang-in ratios in each location

LOCATION (B)	HANG-IN RATIO (A)									
	A_1 (30%)			A_2 (40%)			A_3 (50%)			
B_1 KO SICHANG	0.53(2)	0.79(3)	0.53(2)	0.31(1)	1.85(6)	1.23(4)	0(0)	1.48(4)	0.37(1)	$n_{1..}$=57
	0(0)	0.79(3)	0(0)	0.62(2)	2.16(7)	0(0)	0.37(1)	2.59(7)	0(0)	$\bar{X}_{1..}$=0.74
	0(0)	0.79(3)	0.53(2)	0(0)	0.93(3)	0.31(1)	1.11(3)	0(0)	1.11(3)	
	0.53(2)	0.26(1)	1.06(4)	0.93(3)	0.62(2)	1.54(5)	0.37(1)	0.37(1)	0.37(1)	
	0.53(2)	0.79(3)	0.79(3)	0(0)	1.54(5)	2.47(8)	0.37(1)	0(0)	1.85(5)	
	0.53(2)	0(0)	0.26(1)	1.23(4)	0.31(1)	0.93(3)	2.22(6)	0.37(1)	0.74(2)	
	0.79(3)			0.93(3)			1.11(3)			
	$T_{11.}$=9.5	$n_{11.}$=19	$\bar{X}_{11.}$=0.50	$T_{12.}$=17.91	$n_{12.}$=19	$\bar{X}_{12.}$=0.94	$T_{13.}$=14.8	$n_{13.}$=19	$\bar{X}_{13.}$=0.78	$T_{1..}$=42.21
B_2 SRIRACHA	1.32(5)	0.26(1)	0.79(3)	1.23(4)	0.62(2)	4.01(13)	2.96(8)	1.48(4)	1.85(5)	$N_{2..}$=36
	0(0)	0.26(1)	0(0)	0(0)	1.85(6)	0.31(1)	0.37(1)	0.37(1)	2.22(6)	$\bar{X}_{2..}$=1.09
	0.53(2)	1.85(7)	0.26(1)	0.31(1)	2.47(8)	0(0)	1.11(3)	1.85(5)	0(0)	
	1.06(4)	0.26(1)	1.85(7)	0.93(3)	0(0)	4.01(13)	0(0)	0(0)	2.96(8)	
	$T_{21.}$=8.44	$n_{21.}$=12	$\bar{X}_{21.}$=0.70	$T_{22.}$=15.74	$n_{22.}$=12	$\bar{X}_{22.}$=1.31	$T_{23.}$=15.17	$n_{23.}$=12	$\bar{X}_{23.}$=1.26	$T_{2..}$=39.35
B_3 KO MAN	5.29(20)	0.79(3)	2.91(11)	2.78(9)	1.85(6)	12.65(41)	5.56(15)	1.85(5)	10.74(29)	$n_{3..}$=15
	5.03(19)	1.85(7)		14.51(47)	0.31(1)		7.04(19)	1.11(3)		$\bar{X}_{3..}$=4.95
	$T_{31.}$=15.87	$n_{31.}$=5	$\bar{X}_{31.}$=3.17	$T_{32.}$=32.10	$n_{32.}$=5	$\bar{X}_{32.}$=6.42	$T_{33.}$=26.30	$n_{33.}$=5	$\bar{X}_{33.}$=5.26	$T_{3..}$=74.27
	$T_{.1.}$=33.81	$n_{.1.}$=35	$\bar{X}_{.1.}$=0.94	$T_{.2.}$=65.75	$n_{.2.}$=36	$\bar{X}_{.2.}$=1.83	$T_{.3.}$=56.27	$n_{.3.}$=36	$\bar{X}_{.3.}$=1.56	$T_{...}$=155.83 $n_{...}$=108

Table 10. The results of the test of the difference by analysis of variance

S.V.	D.F.	S.S.	M.S.	F-RATIO
A (HANG-IN RATIO)	3 - 1 = 2	239.79 - 224.84 = 14.95	7.48	2.32
B (LOCATION)	3 - 1 = 2	442.01 - 224.84 = 217.17	108.58	33.72**
INTERACTION	2 × 2 = 4	248.88 - 14.95 - 217.17 = 16.76	4.19	1.30
SUB-TOTAL	9 - 1 = 8	473.72 - 224.84 = 248.88	31.11	9.66**
BETWEEN A and B	107 - 8 = 99	567.38 - 248.88 = 318.50	3.22	
TOTAL	108-1 = 107	792.22 - 224.84 = 567.38		

Table 11. The results of the test of the difference by analysis of variance when interaction is zero

S.V.	D.F.	S.S.	M.S.	F-RATIO
A (HANG-IN RATIO)	2	14.95	7.48	2.30
B (LOCATION)	2	217.17	108.58	33.41**
BETWEEN A and B	103	335.26	3.25	
TOTAL	107	567.38		

Table 12. The CPUE of gill net with different operation time in each location

LOCATION (B)	OPERATION TIME (A)												
	A_1 (DAY TIME)						A_2 (NIGHT TIME)						
B_1 KO SICHANG	2.38(9)	2.47(8)	4.07(11)	0.53(2)	1.23(4)	0.37(1)	1.59(6)	0.62(2)	1.11(3)	0.53(2)	0.31(1)	0(0)	
	2.11(8)	0.93(3)	2.22(6)	0(0)	0.62(2)	0.37(1)	0.26(1)	0(0)	0.37(1)	0.79(3)	1.85(6)	1.48(4)	
	0.53(2)	0(0)	0.37(1)	0(0)	0(0)	0(0)	0.79(3)	1.54(5)	0.37(1)	0.79(3)	2.16(7)	2.59(7)	
	1.06(4)	0.93(3)	0.37(1)	0.53(2)	0.31(1)	1.11(3)	0(0)	0.93(3)	0(0)	0(0)	0(0)	1.11(3)	
	0(0)	1.85(6)	0(0)	0.53(2)	0.93(3)	0.37(1)	0(0)	0.93(3)	0.74(2)	0.79(3)	0.93(3)	0(0)	
	0(0)	0.37(1)	0.74(2)	0.79(3)	1.54(5)	0(0)	0.79(3)	0.62(2)	1.11(3)	0.26(1)	0.62(2)	0.37(1)	
	0(0)	0(0)	0.37(1)	0.79(3)	2.47(8)	1.85(5)	1.85(7)	1.85(6)	1.85(5)	1.06(4)	1.54(5)	0.37(1)	
	1.98(5)	0.93(3)	0(0)	0(0)	0.31(1)	0.37(1)	0(0)	0.93(3)	0.37(1)	0.53(2)	0(0)	0.37(1)	
							1.98(5)	0.93(3)	2.22(6)	0.53(2)	1.23(4)	2.22(6)	$n_{1..}$=114
							1.59(4)	0.93(3)	0.37(1)	0.26(1)	0.93(3)	0.74(2)	$\bar{X}_{1..}$=0.83
							0.40(1)	0.93(3)	1.11(3)	0.79(3)	0.93(3)	1.11(3)	$T_{1..}$=94.97
	$T_{11.}$=38.7 $n_{11.}$=48 $\bar{X}_{11.}$=0.81						$T_{12.}$=56.27 $n_{12.}$=66 $\bar{X}_{12.}$=0.85						
B_2 SRIRACHA	0(0)	0(0)	0(0)	1.32(5)	1.23(4)	2.96(8)	0.53(2)	0.93(3)	0.74(2)	0.26(1)	0.62(2)	1.48(4)	
	1.59(6)	2.16(7)	0.37(1)	0(0)	0(0)	0.37(1)	0(0)	0(0)	1.11(3)	0.79(3)	4.01(13)	1.85(5)	
	0(0)	0(0)	0(0)	0.53(2)	0.31(1)	1.11(3)	0(0)	0(0)	0(0)	0.26(1)	1.85(6)	0.37(1)	
	0(0)	0.62(2)	0.37(1)	1.85(7)	2.47(8)	1.85(5)	0.40(1)	0.62(2)	0.37(1)	0(0)	0.31(1)	2.22(6)	
	0.40(1)	0(0)	0(0)	0.26(1)	0(0)	0(0)	0.40(1)	0(0)	0(0)	0.26(1)	0(0)	0(0)	$n_{2..}$=72
	0.40(1)	1.85(6)	2.22(6)	1.85(7)	4.01(13)	2.96(8)	0.40(1)	0.62(2)	0.37(1)	1.06(4)	0.93(3)	0(0)	$\bar{X}_{2..}$=0.77
	$T_{21.}$=33.06 $n_{21.}$=36 $\bar{X}_{21.}$=0.92						$T_{22.}$=22.7 $n_{22.}$=36 $\bar{X}_{22.}$=0.63						$T_{2..}$=55.76
B_3 KO MAN	1.59(6)	1.85(6)	2.22(6)	0.79(3)	1.85(6)	1.85(5)	4.50(17)	2.16(7)	6.30(17)	5.29(20)	2.78(9)	5.56(15)	
	3.70(14)	5.25(17)	5.19(14)	5.03(19)	14.51(47)	7.04(19)	1.32(5)	3.09(10)	7.41(20)	2.91(11)	12.65(41)	10.74(29)	
							1.06(4)	0.93(3)	0(0)	1.85(7)	0.31(1)	1.11(3)	$n_{3..}$=30
													$\bar{X}_{3..}$=4.03
	$T_{31.}$=50.87 $n_{31.}$=12 $\bar{X}_{31.}$=4.24						$T_{32.}$=69.97 $n_{32.}$=18 $\bar{X}_{32.}$ 3.89						$T_{3..}$=120.84
	$T_{.1.}$=122.63 $n_{.1.}$=96 $\bar{X}_{.1.}$=1.28						$T_{.2.}$=148.94 $n_{.2.}$=120 $\bar{X}_{.2.}$=1.24						$T_{...}$=271.57 $n_{...}$=216

Table 13. Results of the test of difference by analysis of variance

S.V.	D.F.	S.S.	M.S.	F-RATIO
A (OPERATION TIME)	2 - 1 = 1	341.51 - 341.44 = 0.07	0.07	0.03
B (LOCATION)	3 - 1 = 2	609.04 - 341.44 = 267.60	133.80	55.98**
INTERACTION	1 × 2 = 2	270.04 - 267.60 - 0.07 = 2.37	1.18	0.49
SUB-TOTAL	6 - 1 = 5	611.48 - 341.44 = 270.04	54.01	22.60**
BETWEEN A and B	216 - 6 = 210	772.50 - 270.04 = 502.46	2.39	
TOTAL	216 - 1 = 215	1,113.94 - 341.44 = 772.50		

Table 14. The results of the test of difference by analysis of variance when interaction is zero

S.V.	D.F.	S.S.	M.S.	F-RATIO
A (OPERATION TIME)	1	0.07	0.07	0.03
B (LOCATION)	2	267.60	133.80	56.22**
BETWEEN A and B	212	504.83	2.38	
TOTAL	215	772.50		

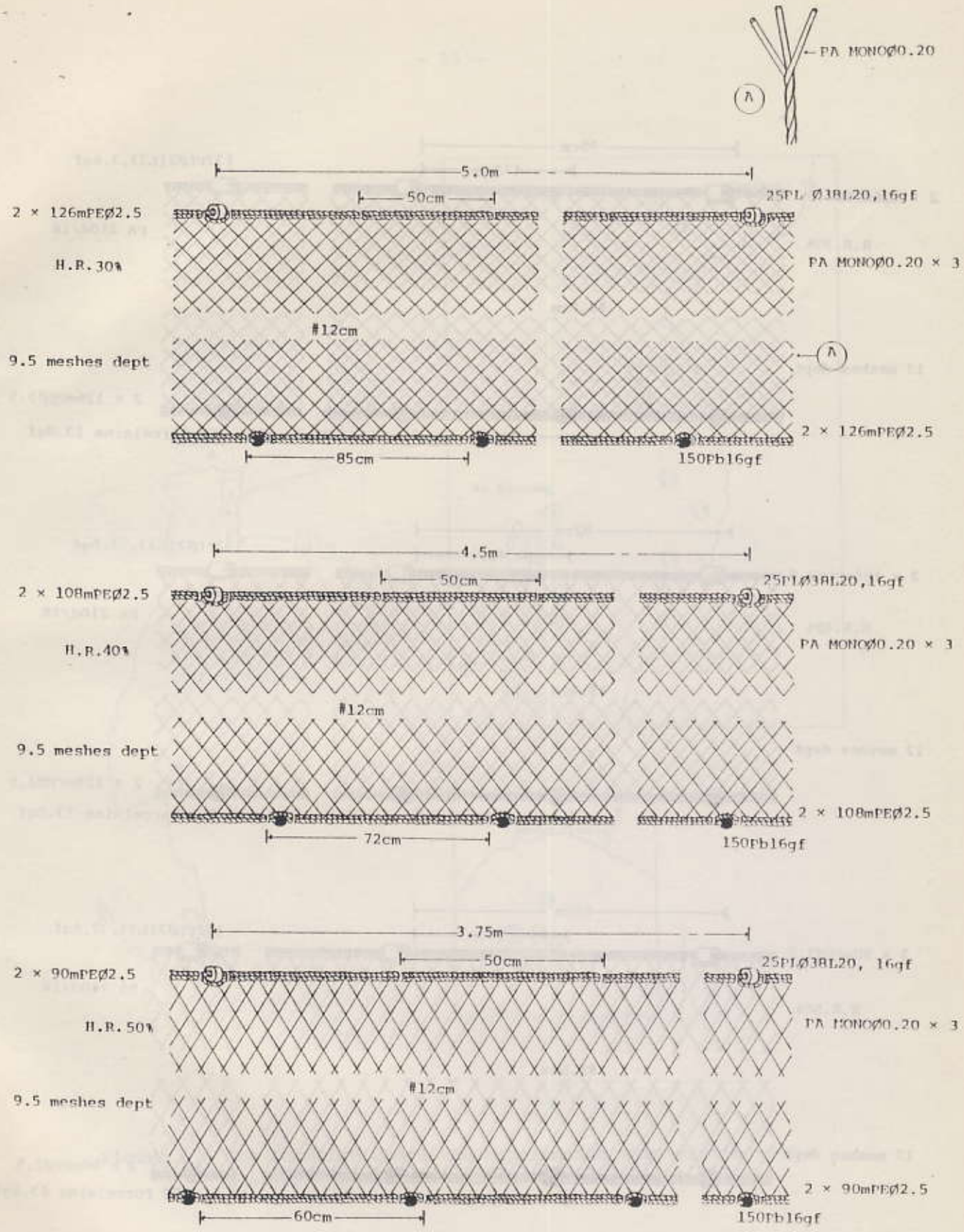

Figure 1. The constructions of three types of monofilament bottom gill nets (Hangin ratios 30%, 40% and 50%)

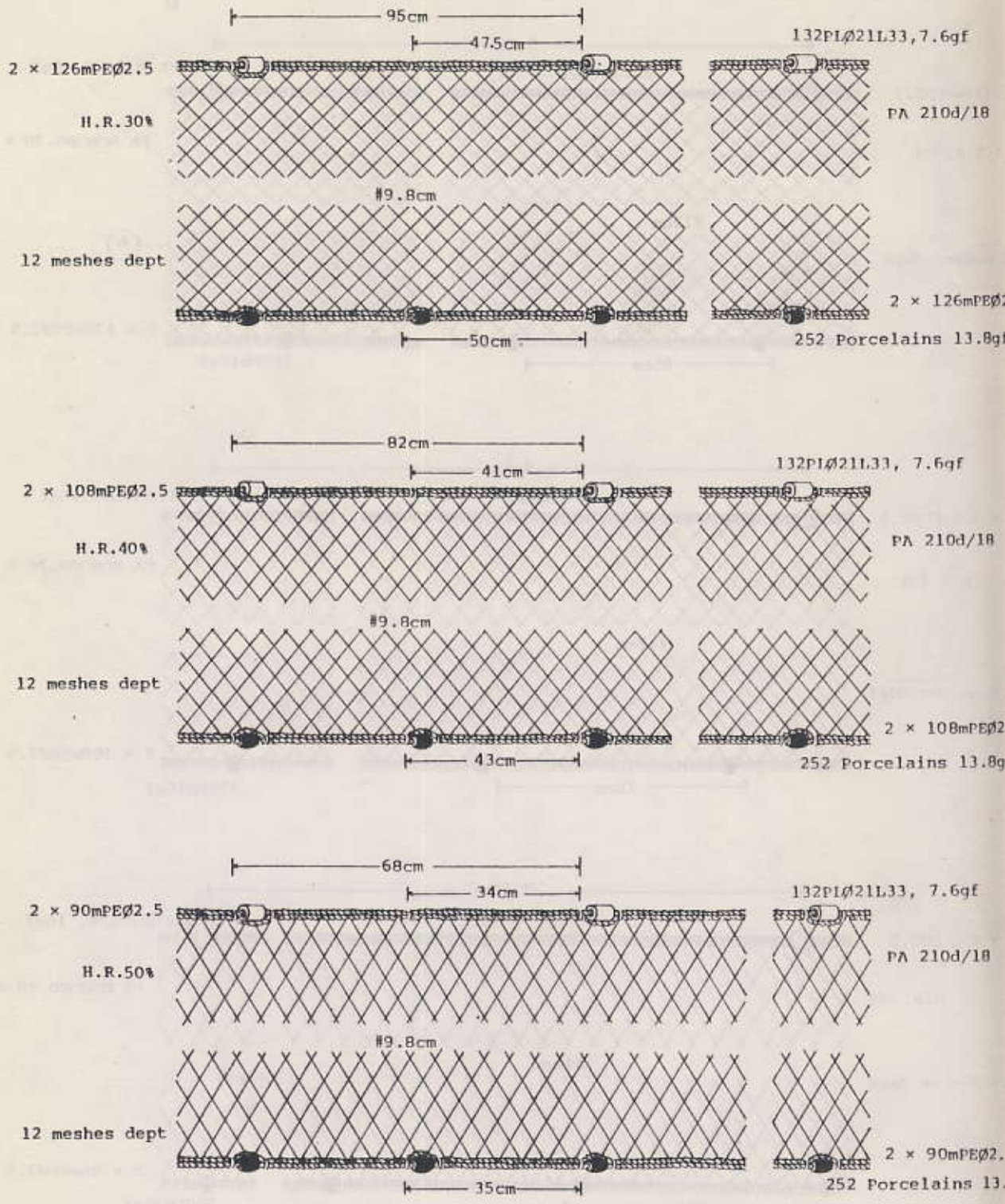

Figure 2. The constructions of three types of multifilament bottom gill nets (Hangin ratios 30%, 40% and 50%)

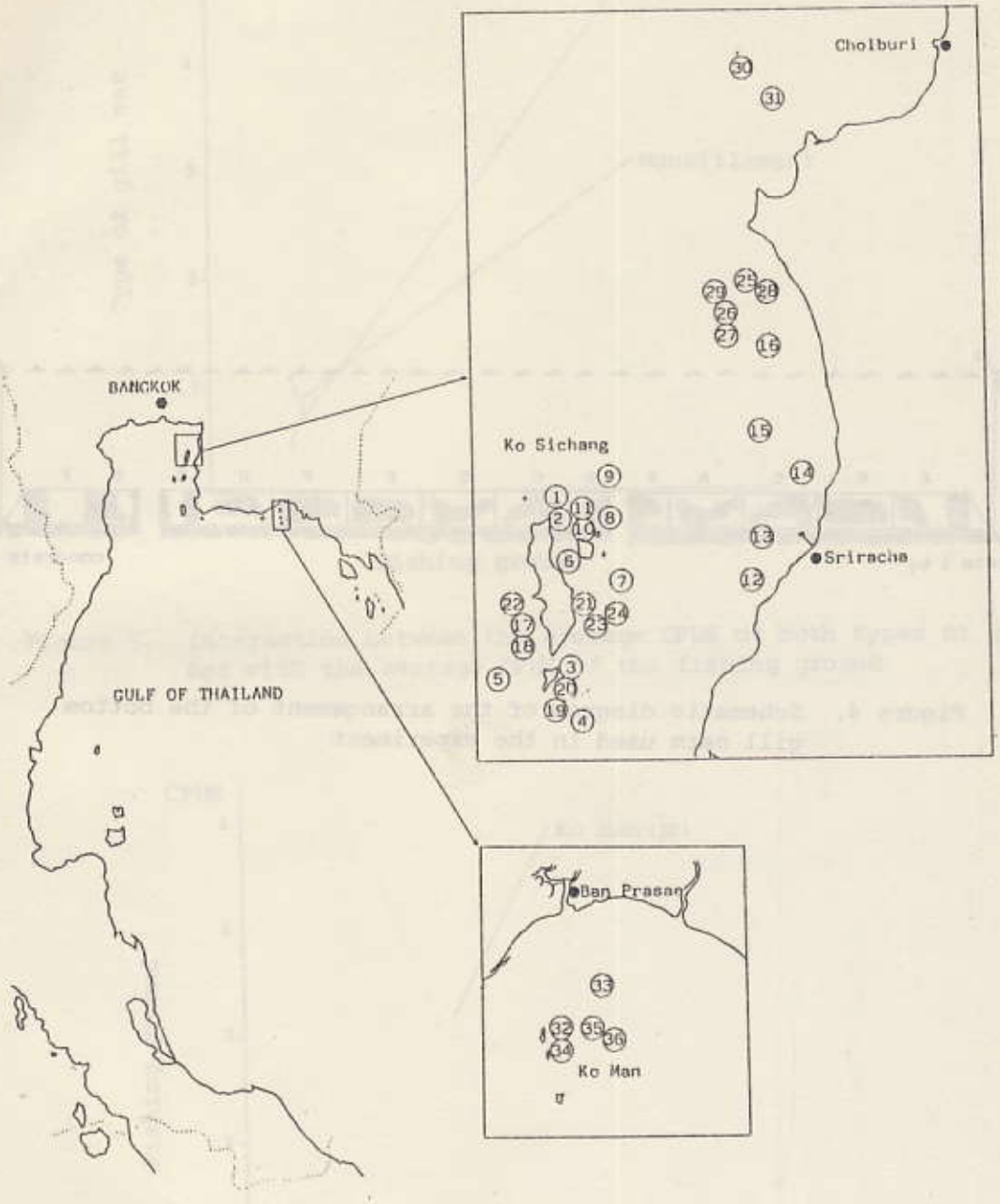

Figure 3. The location where the experiments were carried out stations (1-36) are marked in the inset

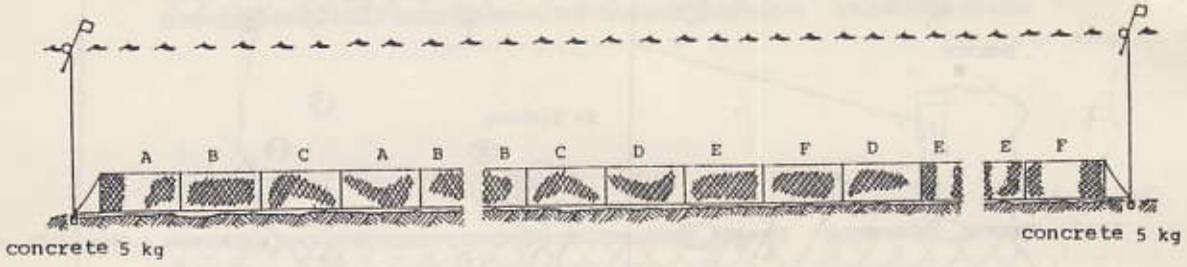

Figure 4. Schematic diagram of the arrangement of the bottom gill nets used in the experiment

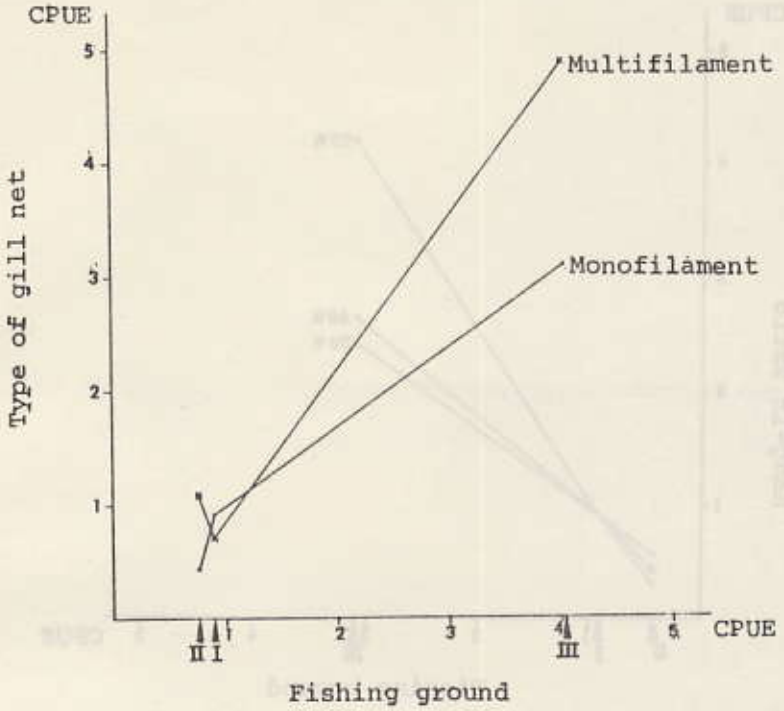

Figure 5. Interaction between the average CPUE of both types of gill net with the average CPUE of the fishing ground

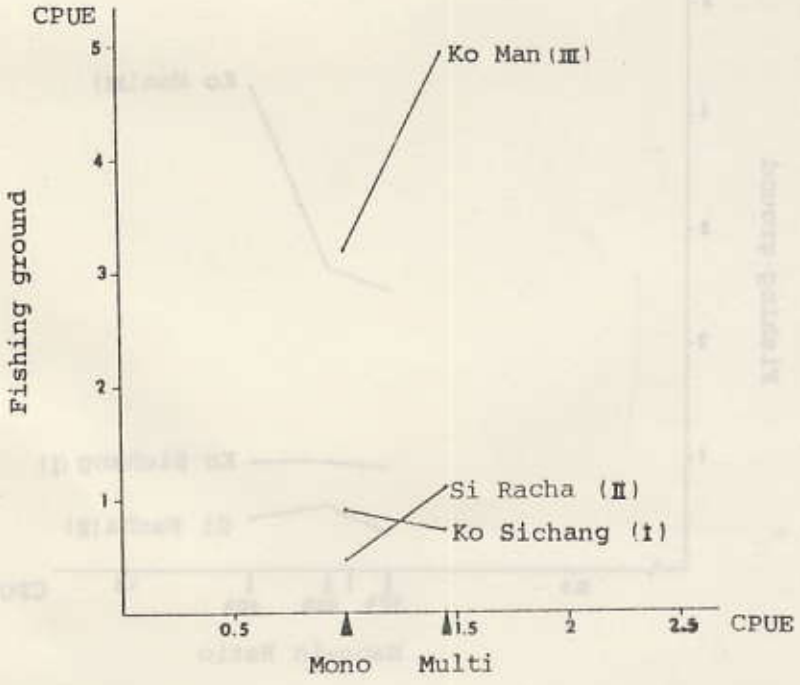

Figure 6. Interaction between Type of gill net the average CPUE of the fishing ground with the average CPUE of both types of gill net

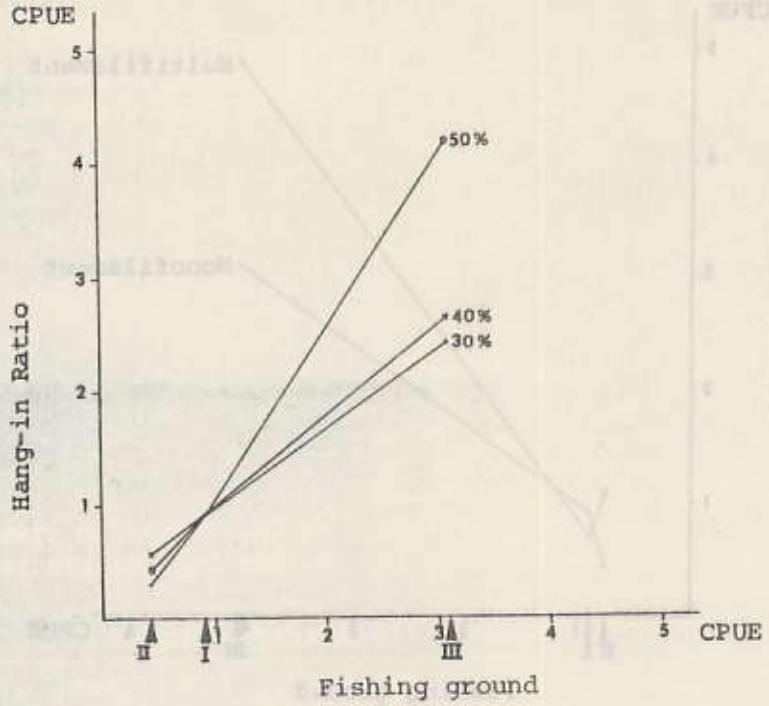

Figure 7. Interaction between the average CPUE of the different hang-in ratios of monofilament gill nets and the average CPUE of the fishing ground

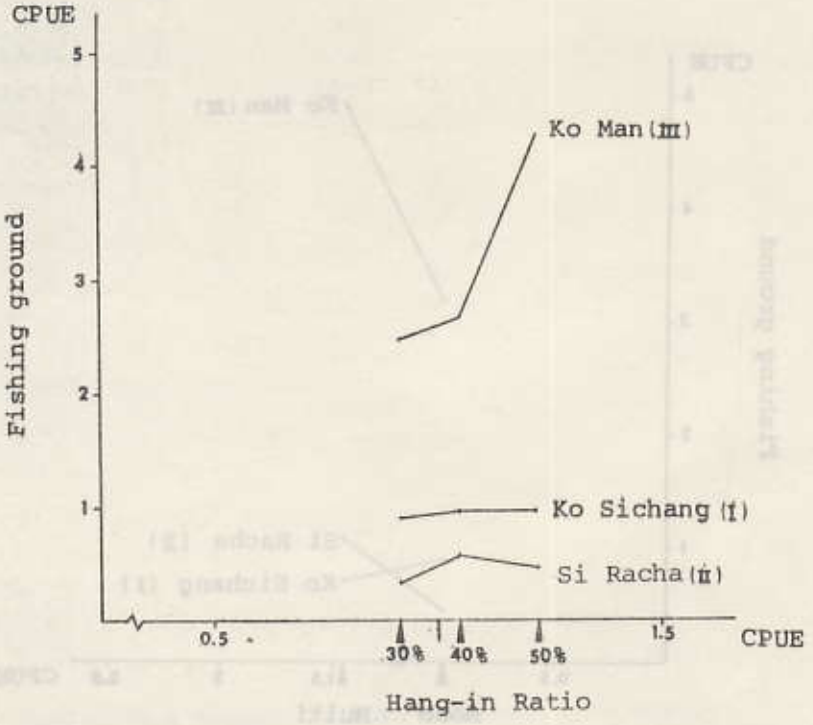

Figure 8. Interaction between the average CPUE of the fishing ground and the average CPUE of the different hang-in ratios of monofilament gill nets

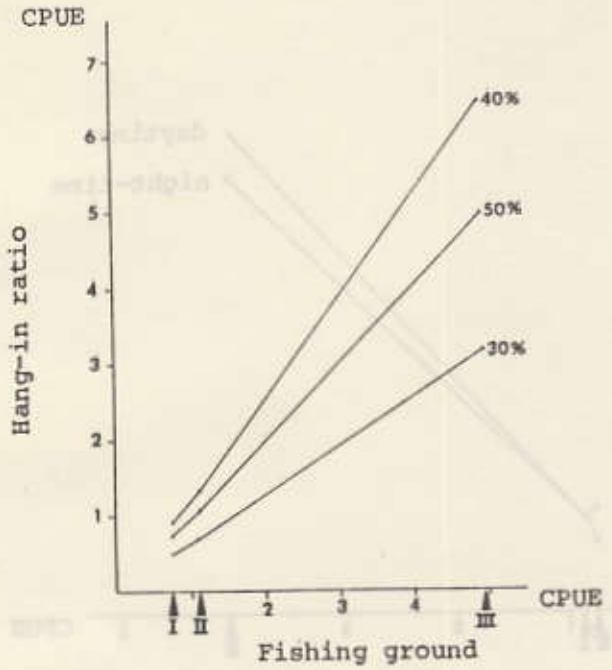

Figure 9. Interaction between the average CPUE of the different hang-in ratios of multifilament gill nets and the average CPUE of the fishing ground

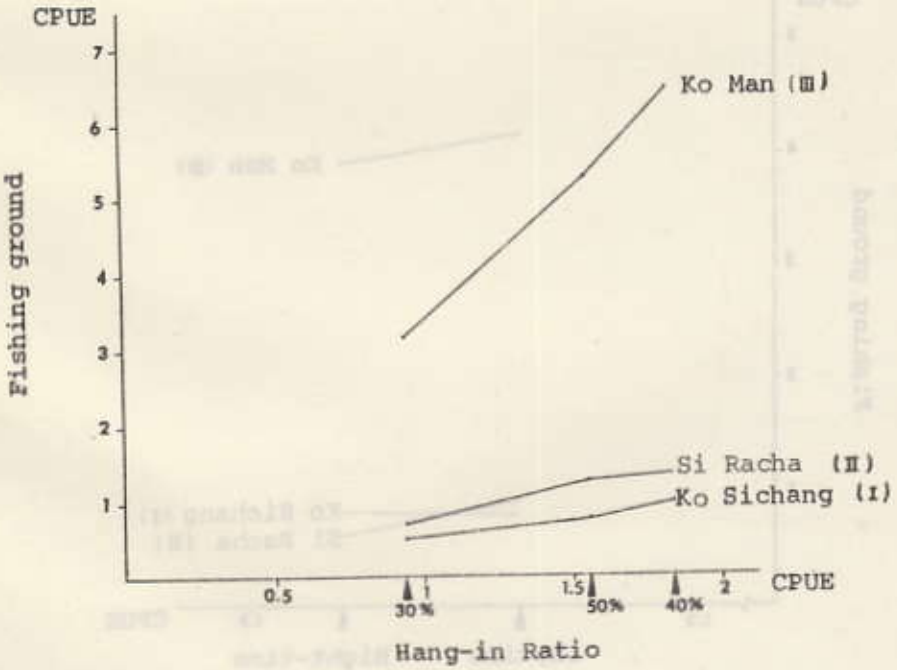

Figure 10. Interaction between the average CPUE of the fishing ground and the average CPUE of the different hang-in ratios of multifilament gill nets

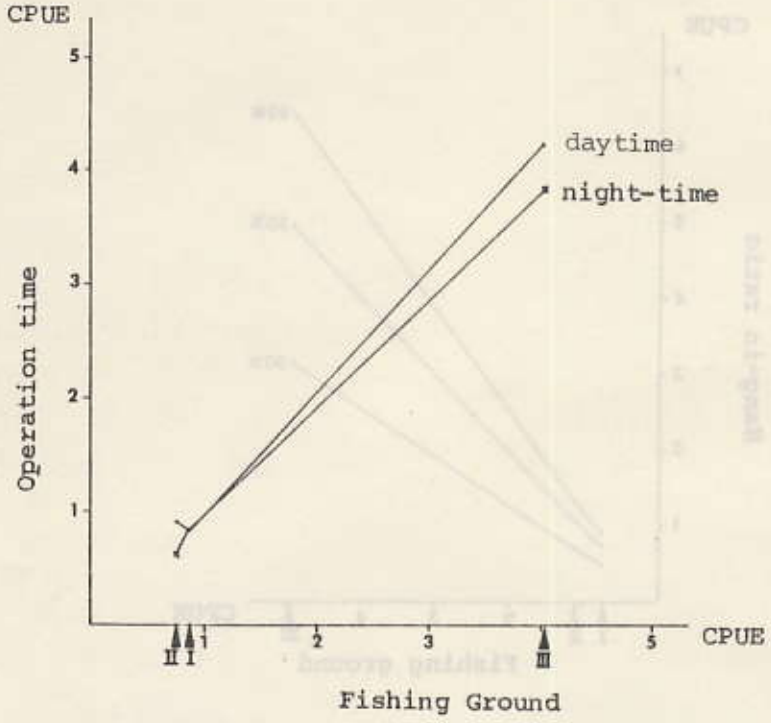

Figure 11. Interaction between the average CPUE of the operation time (daytime & night-time) and the average CPUE of the fishing ground

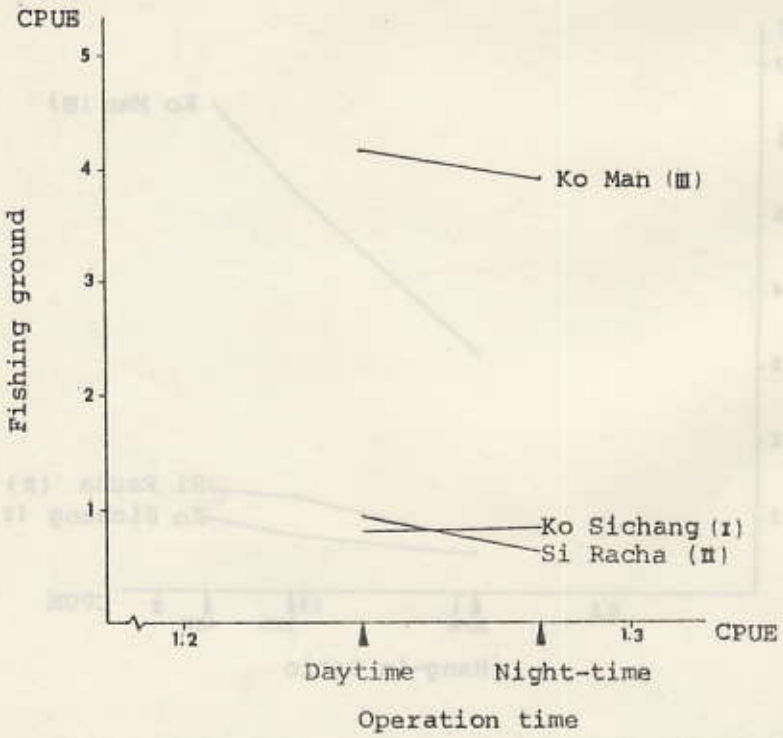

Figure 12. Interaction of the average CPUE of the fishing ground on the average CPUE of the operation time (day-time & night-time)

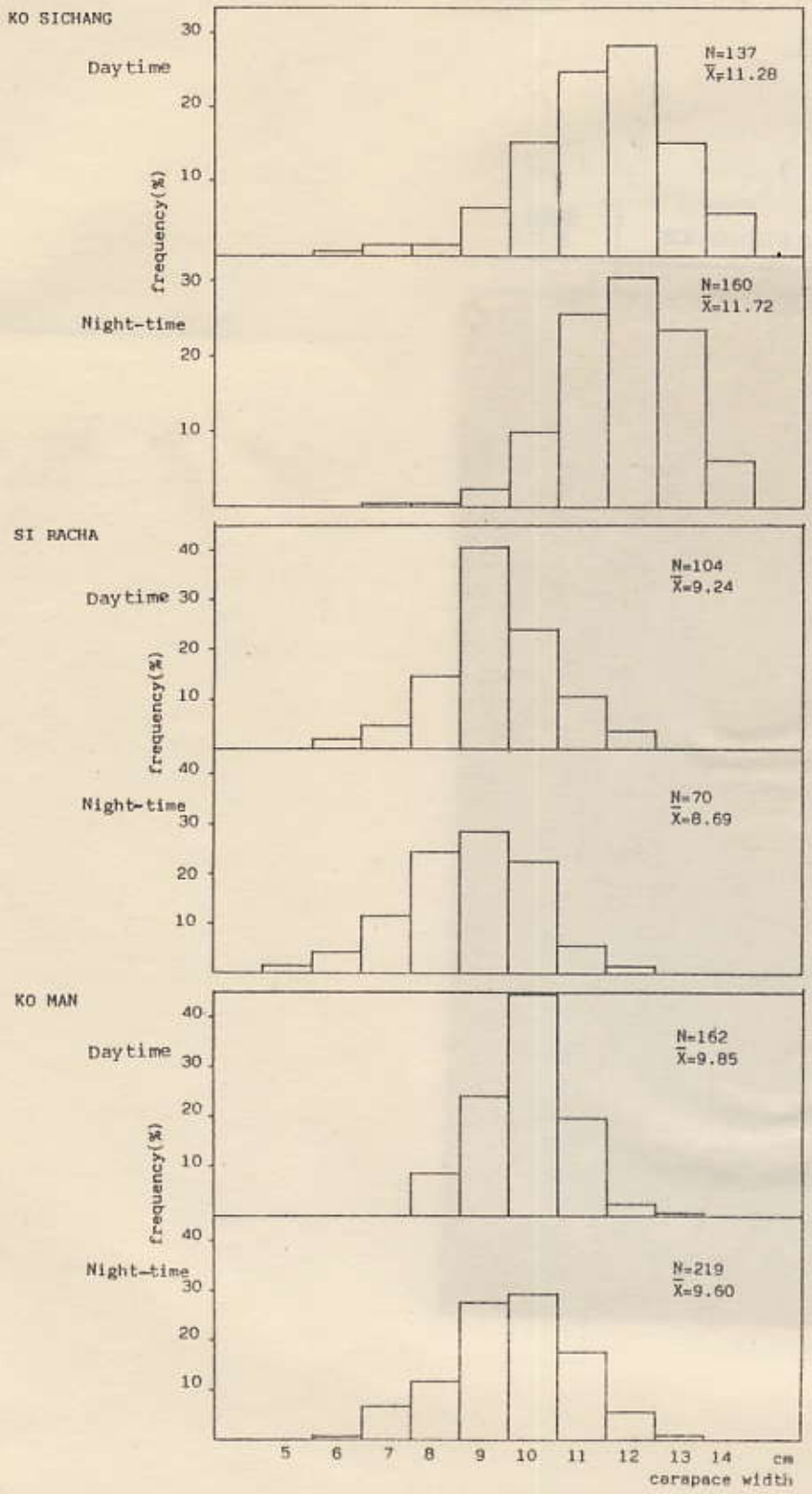

Figure 13. Length and frequency (%) of crabs caught during daytime and night-time fishing operation