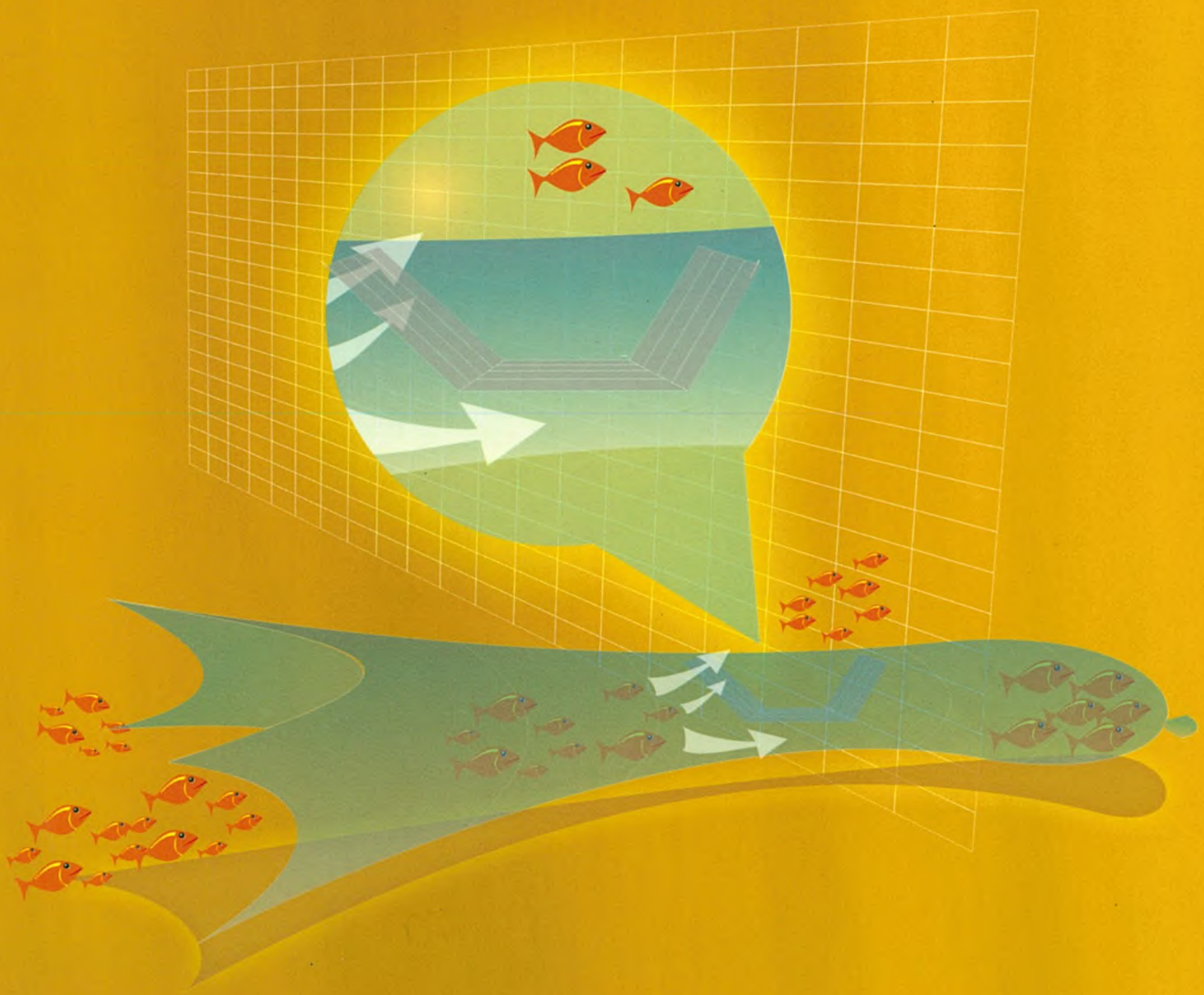
STUDY ON

JTEDs

JUVENILE AND TRASH EXCLUDER DEVICES IN BRUNEI DARUSSALAM



SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER
TRAINING DEPARTMENT

TD/RES/82

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ABSTRACT

SEAFDEC Training Department, in cooperation with the Brunei Darussalam Department of Fisheries conducted experiments on Juvenile and Trash Excluder Devices (JTEDs) during the year 2000 in Brunei Darussalam waters. The objective being to study the catch and release efficiency of juvenile and trash fish devices using differences in the escape opening of JTEDs. Two types of JTED namely a rigid sorting grid (bar spacing 30 mm.) and a two codend type (50/35 mm. codend mesh size) were designed. Five operations were carried out using the rigid sorting grid JTED and two codend types respectively. Separation efficiency by size in the same species between a body length *(i)*, in the codend and body length *(j)* in the cover net is defined as $y_i + y_j - 1$, where y_i is the recovery ratio in the codend, that means the proportion of the catch number retained in the codend and y_j is the recovery ratio in the cover net.

The recovery ratio from the codend of the rigid sorting grid JTED (bar space 30 mm.) of *Nemipterus sp.* with a body length 13.0 cm. was 0.83 while the recovery ratio in the cover net having the same body length was 0.17 which indicates that the thread fin bream group with a body length of 13.0 cm. can enter the codend rather than go into the cover net. For a two cover codend trawl net (50-35 mm. codend mesh size) the recovery ratio in the codend was 0.39, while the recovery ratio in cover net was 0.61, which indicates that this fish species may go into the cover net rather than remain in the codend. A comparison between the two types of JTED and the rigid sorting grid type with a bar spacing of 30 mm. shows that thread fin bream with a body length 13.0 cm has a higher recovery ratio in the codend than in two-cover codend type. This implies that the separation performance of the sieving grid of the JTED depends on the design of the releasing device, grid bar spacing and codend mesh size as well as the swimming ability of each species in the net.

KEYWORDS: Juvenile and trash excluder device, bottom trawl, selectivity, separation efficiency,

Introduction

Juvenile and trash fish catch is a serious regional problem in fisheries management. Where this catch was once seen as a nuisance rather than a waste of resources, the situation today is that many fish stocks are grossly over exploited and unwanted catch contributes to a reduction of fish stocks. It is now vital that the natural resources must be harvested selectivity to eventually improve the yield.

Future fishing development is governed by the availability of sustainable fish stock, which dictates the need for juveniles and immature fish to be released. These must be left to reach maturity and reproduce to maintain harvestable numbers of stock. In fishing technology, the bottom trawling in shallow coastal waters has an adverse effect upon the bio-diversity of the areas and more directly catches the juveniles and immature fish that seek for food, nutrient and protection zone in the coastal waters. It has been found possible to selectively harvest mature or marketable size species but there is a diversity of target species in tropical water, the identification of the most suitable Juvenile and Trash Fishes Excluder Devices (JTEDs) to conduct the selective harvesting has to be established.

In attempt to design study on reduction of by-catch using JTEDs in the Southeast Asian Region, Planned to conduct experiments covering these factors. In September of 2000, a series of experiments was conducted to see whether using JTEDs in the bottom trawl fishery would be effective in reducing the juvenile catch of some commercial species particularly the thread fin bream, lizard fish and barracuda group.

This study is concerned on the concept of grid separator in bottom otter board trawl in order to reduce by catch or improve the selective codend. Grids installed in the begin of codend part of the bottom trawl net in order to release unwanted species to the cover net while retained the target size group or species.

This research describe the result of the juvenile and trash fishes excluder device tests conducted by a Research Trawler in cooperation with the Department of Fisheries, Brunei Darussalam. In particular, it provides estimates of separation efficiency by size, length-proportion retained, recovery ratio and the release figures of the various designs of JTEDs tests in this experiment.

Materials and Methods

Experiment on JTEDs attached to bottom trawl net were conducted during 20 –28 September 2000 in the waters off the coast of Maura town, Brunei Darussalam (Fig 1). The vessel used for these experiment was M.V. Tenggili in cooperation with the Fisheries Department, Ministry of Industry and Primary Resources, Brunei Darussalam.

JTED Designs

The SEAFDEC/Training Department gave consideration to the ease of installation, developed the types of JTED for this experiment is rigid sorting grid (Fig. 2). For the sorting grid JTED were made of rigid rod steel and consisted of three sections join together. Two separate grid with fixed bar spacing of 30 mm. were connected to poly-ethylene net covered steel frame, the main function of which was guide escaping fish away from the trawl net and to keep the system balanced during operation. The sorting grid weighed about 27 kg, and neutral buoyancy was achieved with plastic floats. In the sea trial fishing operation, the sorting grid opened and was kept in a steady position by using chains. The angle of attachment is 60° in the first part of the sorting grid. (Fig. 3).

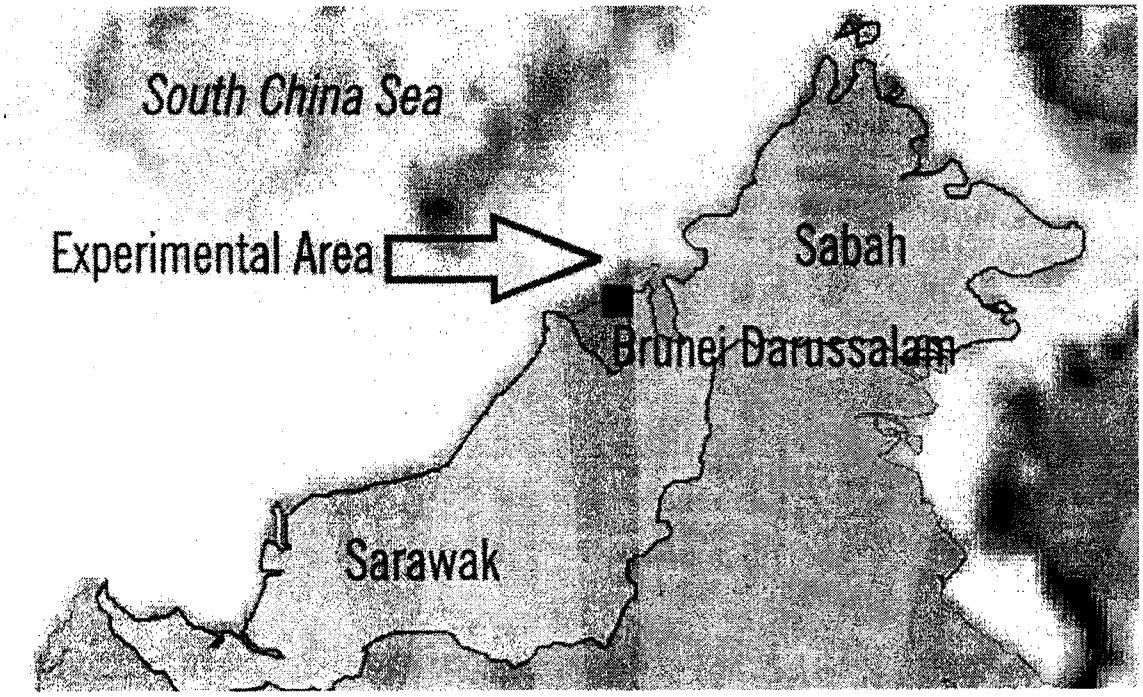

Figure 1. Experimental Area in the waters off Brunei Darussalam

In addition, the Department of Fisheries, Brunei had designed the cove net for two codend (inside 50 mm., outside 35 mm. mesh size) trawl net (Fig. 4). The results from

experiment using the two codend were considerate in this study too. The rigid sorting grid and two codend types were used for analyze in this experiment.

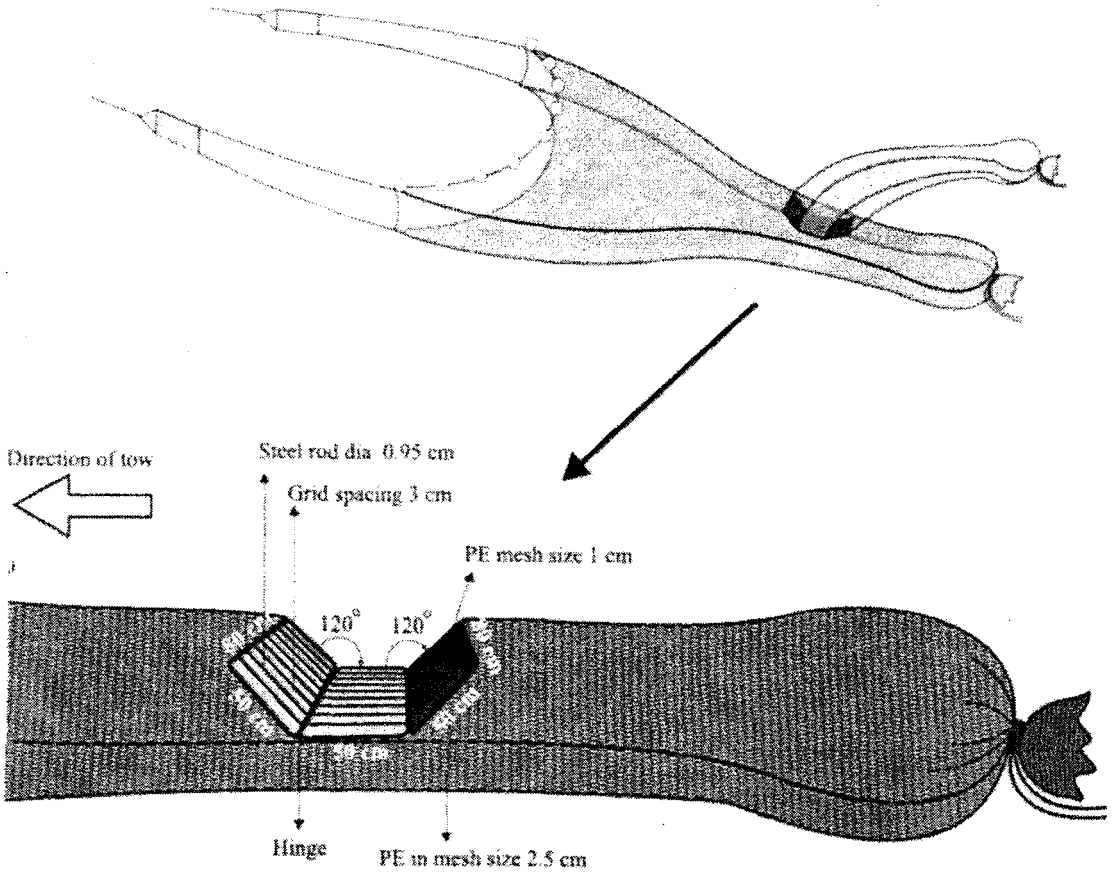

Figure 2. Schematic diagram of rigid sorting grid mounted onto fish trawl net

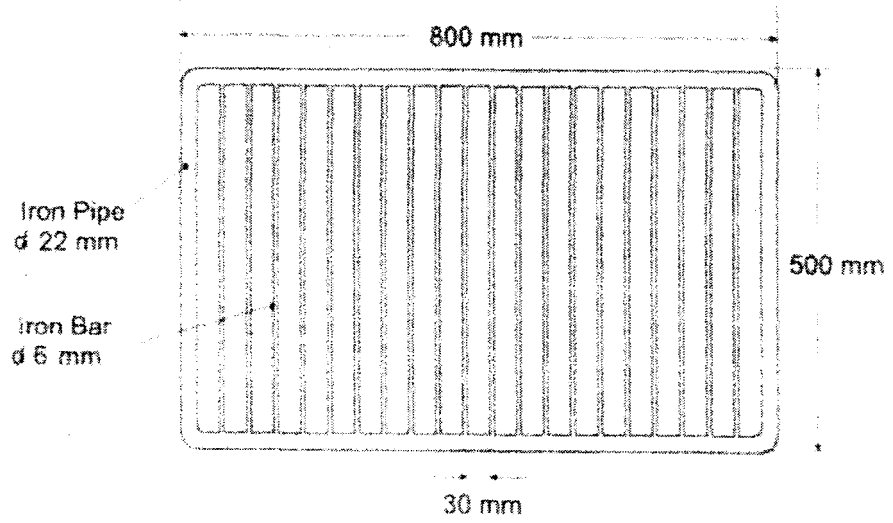

Figure 3. Schematic diagram of rigid sorting grid

Figure 4. Preparation of the two codend trawl net (inside 50 mm, outside 35 mm. mesh size)

Fishing Trial and Data Collection

JTEDs experiment were scheduled for, and carried out during day time, between 0700 to 1700 hrs. The rigid sorting grid (30 mm. bar spacing) and two codend designed were each tested through 5 times.

Bottom trawl nets used in this experiment were the 2 seam type. Ten operations were conducted in this experiment cruise. Each operation took one hour with a towing speed from 2.5 to 4.0 knots. The depth of fishing ground surveys were in the range of 19 to 32 m. Appendix 1 shows general information of fishing experiment.

Catch data, by weight taken from the codend and cover net were recorded. Species identification, sorting and grouping, samples were randomly drawn from each haul. Each group or species were weighed in grams and individually measured to the body length using a measuring board for determination of length-compositions for both catch in codend and cover net.

Data Collection

All catch data from experiment was determined into proportion retained of catch composition and Separation Efficiency by size.

Due to the size composition of total fish caught, separation efficiency by size of bottom trawl used for estimation both codend and cover net of the commercial species. Estimation of separation were calculated as the total number of fish which escaped in to the cover net with total caught in the codend plus cover net.

Data Analysis

The total catch from each fishing operation in the both codend and cover net showed in the table of appendix section.

For this experiment study, the size of some commercial fish species which indicated body length (BL.) were measured both in codend and cover net.

Recovery ratio in codend,

$$\mathbf{Y_i = C_i / N_i}$$

Recovery ratio in cover net,

$$\mathbf{Y_j = C_j / N_j}$$

Separation efficiency by size,

$$\mathbf{\Sigma_{ij} = Y_i + Y_j - 1}$$

So, the Separation Efficiency (by size in the same species between a body length in the codend and body length) in the cover net is defined as $y_i + y_j - 1$, where y_i is the recovery ratio in the codend, that is the proportion of the catch number retained in the codend. y_j is the recovery ratio in the cover net.

Results and Discussion

Catch results from the experiment show that the catch per unit effort (CPUEs) in the experimental area were varied from 29-410 kb/haul/hour. Comparison of the CPUE in Brunei Darussalam and other SEAFDEC member countries such as Thailand and Vietnam, it is clearly show that the CPUE in Brunei Darussalam is about 10 times higher.

The recovery ratio of *Nemipterus sp.* (Threadfin bream one of commercial species) by sorting grid (30 mm. bar space) type which start from the body length 6.00 cm. is 0.750, while the body length 20 cm. indicated 1.00 (Table 1). Fig.5 show the relationship between the recovery ratio of *Nemipterus* sp. and body length of fish.

In case of the recovery ratio of *Nemipterus sp.* by two codend type which start from the body length 6.00 cm. is 0.667, while the body length 17 cm. indicated 0.750 (Table 2). Fig.6 show the relationship between the recovery ratio of *Nemipterus* sp. and body length of fish.

Table 3 shows the Separation efficiancy of commercialfish by size of *Nemipterus* sp. in sorting grid (bar spacing 30 mm JTED). The recovery ratio from the codend of the rigid sorting grid JTED (bar space 30 mm.) of *Nemipterus* sp. with a body length 13.0 cm was 0.83, while the recovery ratio in the cover net having the same body length was 0.17 which indicates that the thread fin bream group with a body length of 13.0 cm can enter the codend rather than go into the cover net. In case of the recovery ratio for a two cover codend trawl net (50/35 mm. codend mesh size) in the codend was 0.39, while the recovery ratio in cover net was 0.61 which indicates that this fish species may go into the cover net rather than remain in the codend. It should be take times for carry out in this research

Table 1. Catch number of *Nemipterus sp.* In the codend, cover net and recovery ratio in the codend by sorting grid (30 mm. bar space)

Body length (cm.)	**Catch number in codend**	**Catch number in cover net**	**Recovery ratio In codend**
6	3	1	0.750
7	5	1	0.833
8	0	1	0.000
9	13	1	0.929
10	8	0	1.000
11	5	1	0.833
12	8	1	0.889
13	5	1	0.833
14	12	3	0.800
15	4	1	0.800
16	3	0	1.000
17	0	0	0.000
18	0	1	0.000
19	1	0	1.000
20	1	0	1.000

Note : Recovery ratio in the codend is defined as the proportion retained in the codend to the total catch

Table 2. Catch number of *Nemipterus sp.* In the codend, cover net and recovery ratio in the codend by Two codend type

Body length (cm.)	Catch number in codend	Catch number in cover net	Recovery ratio In codend
6	2	1	0.667
7	1	5	0.167
8	2	3	0.400
9	3	2	0.600
10	3	9	0.250
11	6	9	0.400
12	7	11	0.389
13	7	11	0.389
14	5	11	0.313
15	4	4	0.500
16	6	3	0.667
17	3	1	0.750

Note : Recovery ratio in the codend is defined as the proportion retained in the codend to the total catch

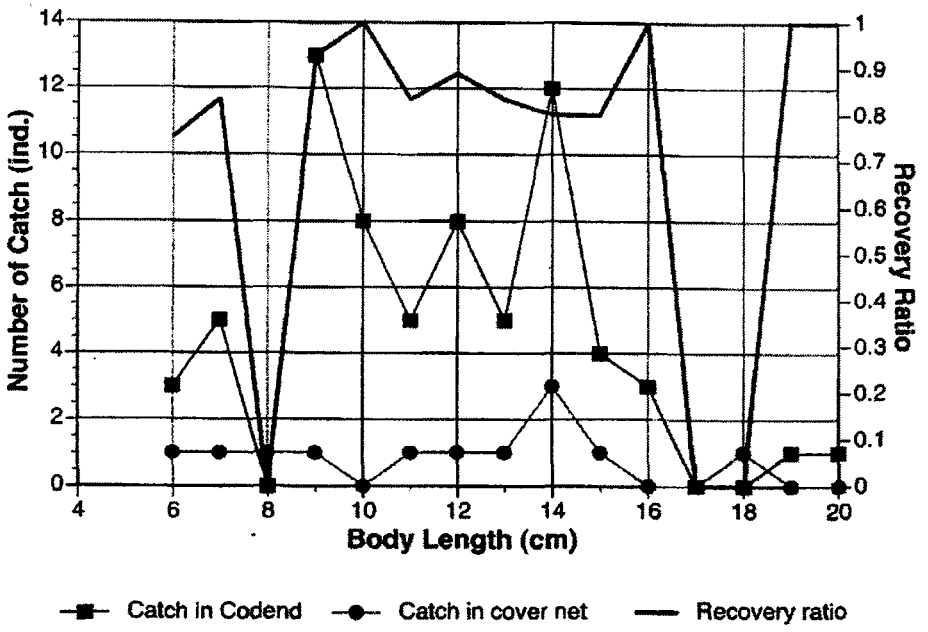

Figure 5. Relationship between the catch number of *Nemipterus sp.* in the codend, covernet and recovery ratio in the codend using the sorting grid of 30 mm.

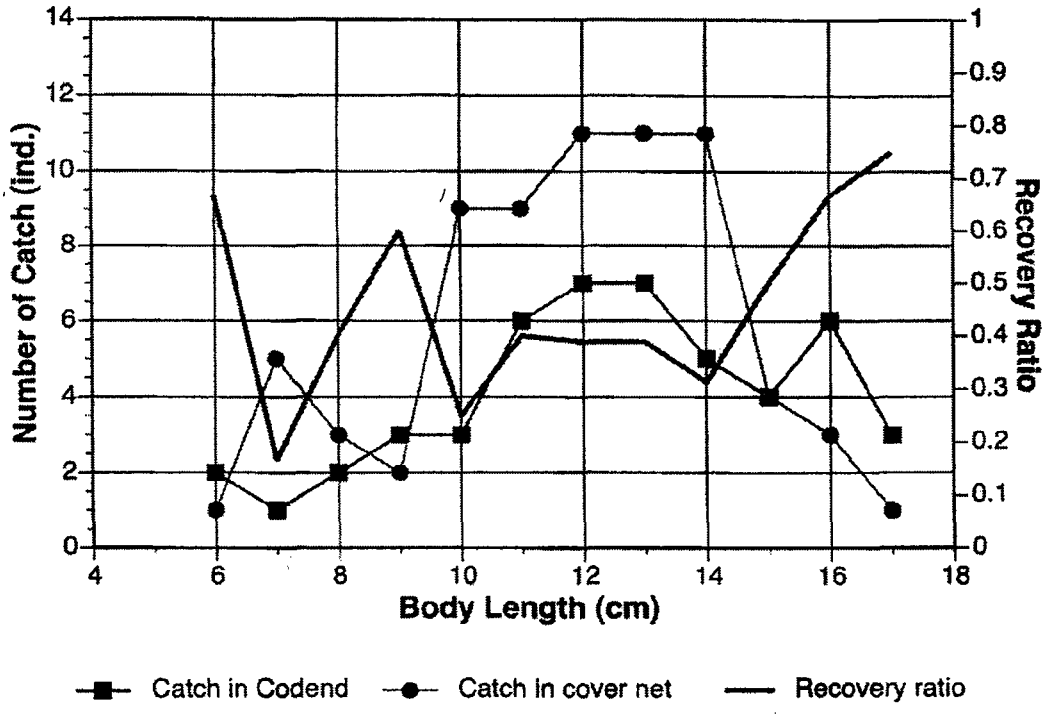

Figure 6. Relationship between the catch number of *Nemipterus sp.* in the codend, covernet and recovery ratio in the codend using two codend type.

Table 3. Separation efficiency of economical fish by size of *Nemipterus sp.* in sorting grid (bar spacing 3 cm.)

B L(cm.) in the codend net	Recovery ratio in codend net	B L (cm.) in the cover net and its recovery ratio in the cover net													
		6	7	8	9	10	11	12	13	14	15	16	17	18	19
		0.250	0.167	1.000	0.071	0.000	0.167	0.111	0.167	0.200	0.200	0.000	1.000	1.000	0.000
6	0.750		-0.08	0.75	-0.18	-0.25	-0.08	-0.14	-0.08	-0.05	-0.05	-0.25	0.75	0.75	-0.25
7	0.833	0.08		0.83	-0.10	-0.17	0.00	-0.06	0.00	0.03	0.03	-0.17	0.83	0.83	-0.17
8	0.000	-0.75	-0.83		-0.93	-1.00	-0.83	-0.89	-0.83	-0.80	-0.80	-1.00	0.00	0.00	-1.00
9	0.929	0.18	0.10	0.93		-0.07	0.10	0.04	0.10	0.13	0.13	-0.07	0.93	0.93	-0.07
10	1.000	0.25	0.17	1.00	0.07		0.17	0.11	0.17	0.20	0.20	0.00	1.00	1.00	0.00
11	0.833	0.08	0.00	0.83	-0.10	-0.17		-0.06	0.00	0.03	0.03	-0.17	0.83	0.83	-0.17
12	0.889	0.14	0.06	0.89	-0.04	-0.11	0.06		0.06	0.09	0.09	-0.11	0.89	0.89	-0.11
13	0.833	0.08	0.00	0.83	-0.10	-0.17	0.00	-0.06		0.03	0.03	-0.17	0.83	0.83	-0.17
14	0.800	0.05	-0.03	0.80	-0.13	-0.20	-0.03	-0.09	-0.03		0.00	-0.20	0.80	0.80	-0.20
15	0.800	0.05	-0.03	0.80	-0.13	-0.20	-0.03	-0.09	-0.03	0.00		-0.20	0.80	0.80	-0.20
16	1.000	0.25	0.17	1.00	0.07	0.00	0.17	0.11	0.17	0.20	0.20		1.00	1.00	0.00
17	0.000	-0.75	-0.83	0.00	-0.93	-1.00	-0.83	-0.89	-0.83	-0.80	-0.80	-1.00		0.00	-1.00
18	0.000	-0.75	-0.83	0.00	-0.93	-1.00	-0.83	-0.89	-0.83	-0.80	-0.80	-1.00	0.00		-1.00
19	1.000	0.25	0.17	1.00	0.07	0.00	0.17	0.11	0.17	0.20	0.20	0.00	1.00	1.00	
20	1.000	0.25	0.17	1.00	0.07	0.00	0.17	0.11	0.17	0.20	0.20	0.00	1.00	1.00	0.00

Acknowledgements

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Appendix. 1. General information of the experiment

Date (Y/M/D)	.No	Net setting		Net hauling		Trawling	Towing speed	Depth	Warp length	Towing	Sea	Trawl net with	Total Catch codend	Total Catch cover net
		Time	Location	Time	Location	(.min)time	(knot)	(meter)	(meter)	degr).dir (ee	ditioncon	JTED devices	(.kg)	(.kg)
2000/9/23	1	.hrs 1410	5.Lat°N '5.8- 114.Lon°E '54.2-	.hrs 1510	5.Lat°N '8.7- 114.Lon°E '54.2	60	4.2	29-20	133	343	Calm	Two cover codend (ezis hsem,.mm 35-50)	230.00	6.79
2000/9/25	2	.hrs 1310	5.Lat°N '9.6- 114.Lon°E '53.3-	.hrs 1410	5.Lat°N '6.9- 114.Lon°E '54.5-	60	3.1	32-23	133	169	Calm	"	23.00	0.63
	3	.hrs 1453	5.Lat°N '6.7- 114.Lon°E '53.3-	.hrs 1553	5.Lat°N '9.7- 114.Lon°E '54.1-	60	8..3	32-23	133	356	Calm	"	312.00	3.00
2000/9/26	4	.hrs 0910	5.Lat°N '08.8- 114.Lon°E '51.7-	.hrs 1010	5.Lat°N '09.8- 114.Lon°E '52.4-	60	3.7	30-28	133	339	Calm	"	23.20	5.50
	5	.hrs 1135	5.Lat°N '9.4- 114.Lon°E '53.4-	.hrs 1235	5.Lat°N '7.7- 114.Lon°E '55.4-	60	4.0	33-25	133	160	Calm	"	30.00	2.80
2000/9/27	6	.hrs 0835	5.Lat°N '6.4- 114.Lon°E '55.0-	.hrs 0935	5.Lat°N '8.1- 114.Lon°E '53.1	60	3.0	20	133	270	Calm	Rigid sorting grid (.cm 3space -bar)	95.00	26.00
	7	.hrs 1040	5.Lat°N '6.1- 114.Lon° E '51.0-	.hrs 1140	5.Lat°N 7.6- 114.Lon°E '55.3-	60	3.0	22-21	133	90	Calm	"	300.00	110.00
	8	.hrs 1402	5.Lat°N '5.4- 114.Lon°E 55.3-	.hrs 1502	5.Lat°N '7.4- 114.Lon°E '52.6-	60	3.0	25-19	133	270	Calm	"	37.00	4.50
	9	.hrs 1557	5.Lat°N '9.8- 114.Lon°E '4.2-	.hrs 1657	5.Lat°N '9.3- 114.Lon°E '54.4-	60	3.0	28	133	95	Calm	"	300.00	10.10
2000/9/28	10	.hrs 0730	5.Lat°N '6.8- 114.onL°E '54.9-	.hrs 0830	5.Lat°N '6.9- 114.Lon°E '52.0-	60	3.0	25-21	133	270	Calm	"	54.50	3.00

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