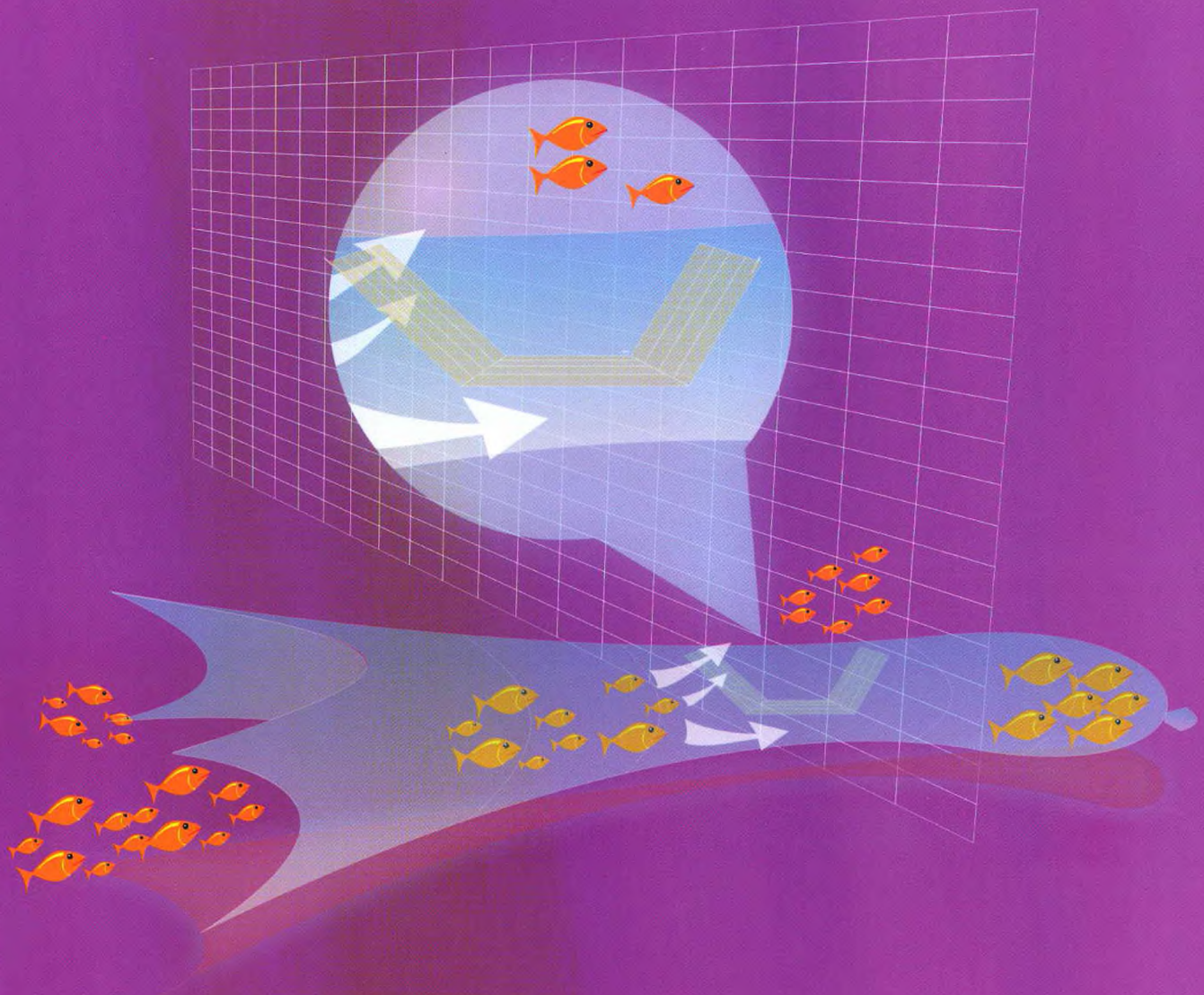
STUDY ON

JTEDs

JUVENILE AND TRASH EXCLUDER DEVICES IN THAILAND



SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER
TRAINING DEPARTMENT

TD/RES/47

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ABSTRACT

SEAFDEC Training Department, in cooperation with the Thai Department of Fisheries has initially conducted the experiments on Juvenile and Trash Excluder Device (JTED) since 1998 in Thailand. The objective being to study the catching and releasing efficiency for juvenile and trash fishes using different escape opening in JTEDs. 2 types of JTEDs namely rectangular shape and semi-curve JTEDs with 8 different escape opening were designed and each was tested for 9 replications.

CPUEs of fish trawl net operated in Chumporn and Prachub Kirikan Areas were 21.2 and 13.4 kg/hr, about 50% and 30% of these catches were represented with commercial fish species, respectively. Percentage of escapement of commercial fishes, by weight, of trawl net attached with the rectangular shape and semi-curve JTEDs with different escape openings did not obtain significantly selectivity of the JTEDs. However, the percentage of escape, by numbers, of juvenile and young commercial fishes show clearly that the percentage of escape using Semi-curve JTEDs is 7 times higher than that of the Rectangular JTEDs. In addition, to the trash fishes about 50% were released when using the Semi-curve JTEDs.

Improvements in JTED design is needed for more selective JTEDs in increase the catching and escape efficiency for commercial juvenile/young and trash fishes.

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 overexploited and unwanted catch contributes to the reduction of fish stocks. It is now vital that the natural resources must be harvested selectively to eventually improve the yield. Future fishing development is governed by the availability of sustainable fish stock which dictates the need for the 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, Juvenile and Trash Fishes Excluder Devices (JTEDs) have the aim and purpose of selectively harvesting the target catch while at the same time reducing the level of unwanted catch in form of juveniles and immature and trash fish. In an attempt to come up with initial study on reduction of bycatch using JTED in the Southeast Asia Region, SEAFDEC has planed to conduct experiments covering all these areas. In June-October of 1998 in Thailand, a series of experiments was conducted to see whether using JTED in the fish trawl fisheries would be effective in releasing the juveniles of some commercial species, particularly *Rastrelliger neglectus, R. kanagurta*, Nemispteridae group, Scolopsidae group, and trash fishes which are the most important trawl fishery.

Many studies are concerned on the concept of using rigid separator grates in otter trawls for reduction of bycatch or to improve codend selectivity. In generally, grates are inserted in the codend of trawl nets and function by diverting unwanted parts of catch to an escape opening while retaining the target size groups or species.

In this paper describes the results of juvenile and trash fishes excluder device tests conducted aboard the Research Trawler in cooperation with the Department of Fisheries, Thailand. In particular, it provides estimates of Catch per Unit Effort of trawl fishery, the percentage of bycatch species, length-frequencies of and released by the various designed of JTEDs tested in these experiments.

Materials and Methods

Experiments on JTEDs attached on fish trawl nets were conducted separately in two cruises; the first cruise was conducted between 1-12 June and the second was between 28 Sept. – 9 Oct. 1998 in the waters off the Coast of Prachub Kirikan and Chumporn province (Fig. 1). The vessel used for these experiments was MV PROMONG No.1. in cooperation with the Department of Fisheries, Thailand.

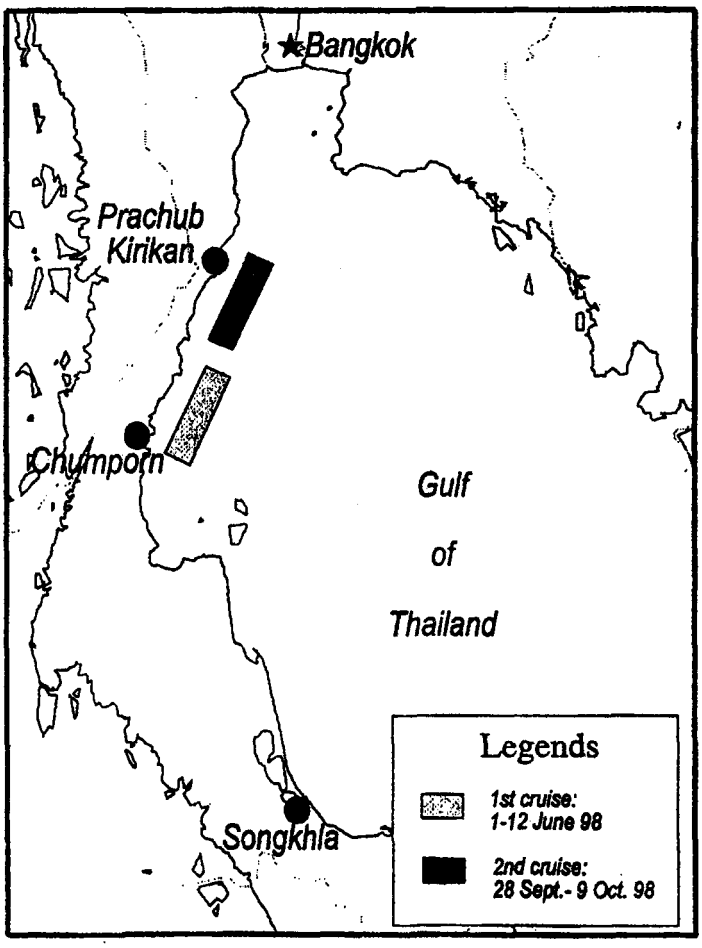

Fig. 1. Experimental areas in the first (rectangular shape JTEDs tests) and the second cruise (semi-cruve JTEDs tests)

JTED Designs

Two types of JTEDs used in this study were developed by the SEAFDEC/Training Department with consideration to the installation, these JTEDs, Rectangular Shape Window and Semi-Curve Window JTEDs (Fig. 2 and 3). Both types of JTEDs were 80 x 100 cm stainless steel frames, of 13 mm diameter rod, and each were made for 4 different size of escape opening using vertical soft grid (8 mm diameter polyethylene rope). The size of escape opening used in the experiments were 8, 12, 16 and 24 cm for rectangular shape type, and 4, 6, 8 and 12 cm for the semi-curve type.

Fig. 2 and 3 show the installation and operation diagram of the rectangular shape and semi-curve JTEDs.

In the experiments, a cover net as the second condend was designed for each type of JTEDs to compare the catch from both codends. The cover net was designed as a small sac-like structure for the rectangular shape JTED and as a tube-like structure for the semi-curve JTED.

Fishing Trails and Data Collection

Fishing trails for JTEDs were scheduled and carried out during daytime between 07.00 and 17.00 hrs. The rectangular shape JTEDs with 4 different size of escape opening were tested during the first cruise (off Chumporn province). Each escape opening size was tested for 9 times except for the 12 cm escape opening was only tested 8 times.

The semi-curve JTED was tested in the second cruise off Prachub Kirikan province. There were 4 different size of escape opening and each of these were tested 9 times.

Fish trawl nets used in the experiment were two-seam type as shown in Fig. 5. the total of trawl operations was 35 and 36 operations for the first and second cruises. Each operation took one hour with the towing speed of two to three knots. Fishing depths were in a range from 15 to 25 m.

Catch data, by weight taken from the codend and covernet were recorded. For species identification, samples were randomly drawn from each haul. They were sorted into species and group. Each group or species was weighed in gram and the fork length individually measured using measuring punch card for the determination of the length-compositions for catching and escape.

Data analysis

All catch data from each cruise were recorded in percentage of catch composition and catch per unit effort (CPUE in kg/hr).

Escape levels determined experimentally due to the size compositions of populations fished differ, thus estimated escape-at-length are applied to length

frequencies of commercial catches. Estimates of "escape" were calculated as the weight or number of fish in the covernet compared to he total caught in the covernet and codend.

Length-frequencies of all important economic species, and trash fishes obtained from both covernet and codend were analyzed in relation to the percentage escape at length.

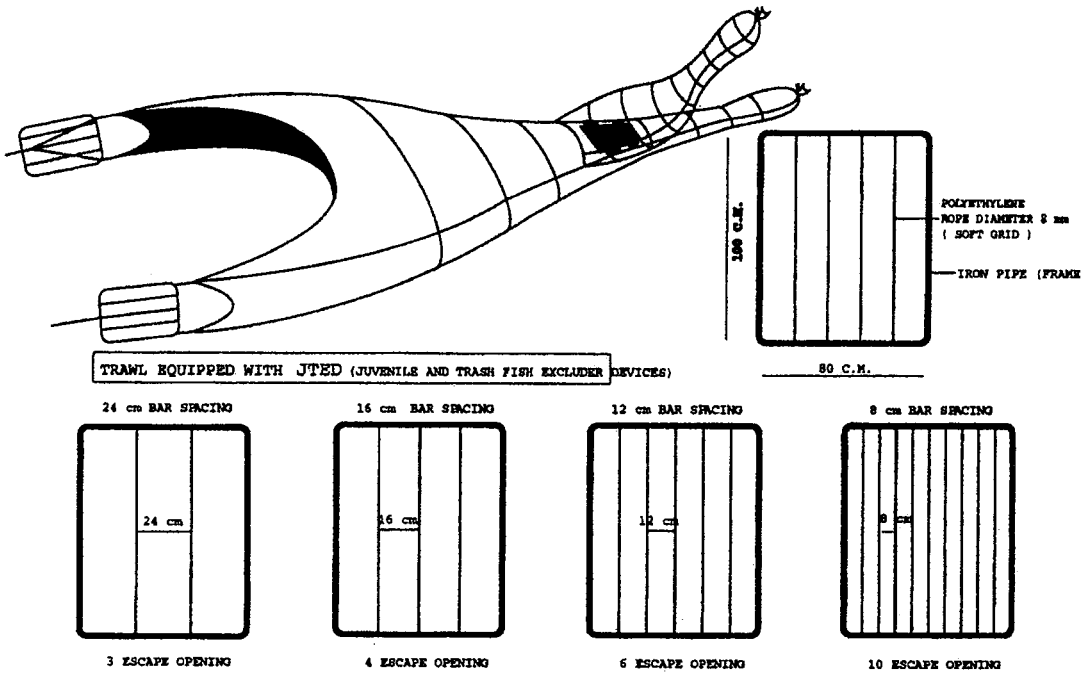

Fig. 2. Diagram of construction and installation of the Rectangular Shape JTEDs.

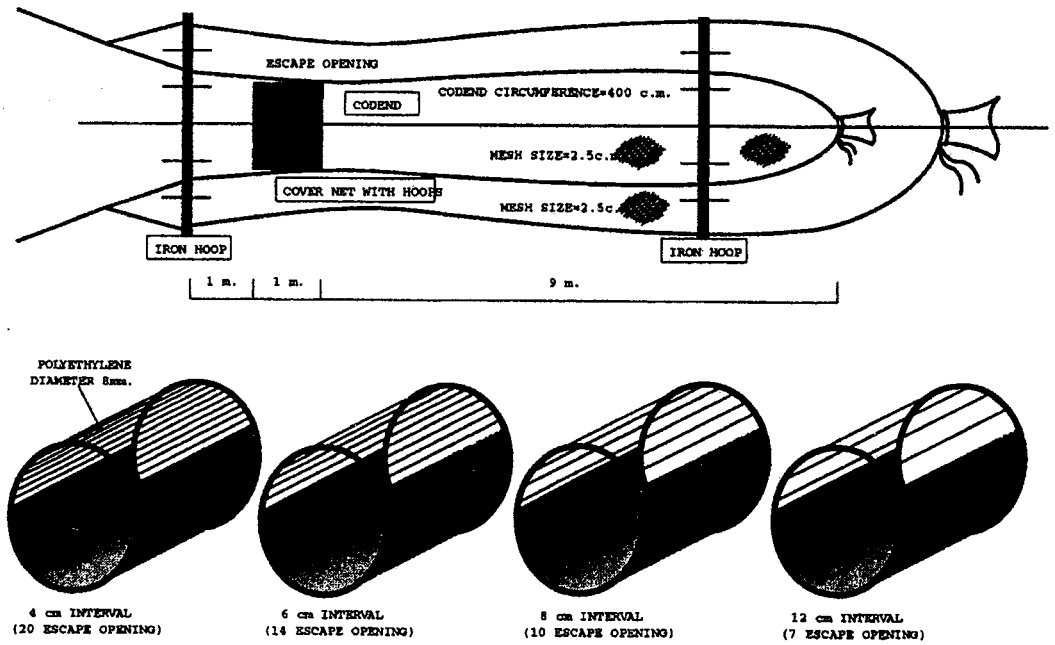

Fig. 3. Diagram of construction and installation of the Semi-curve JTEDs.

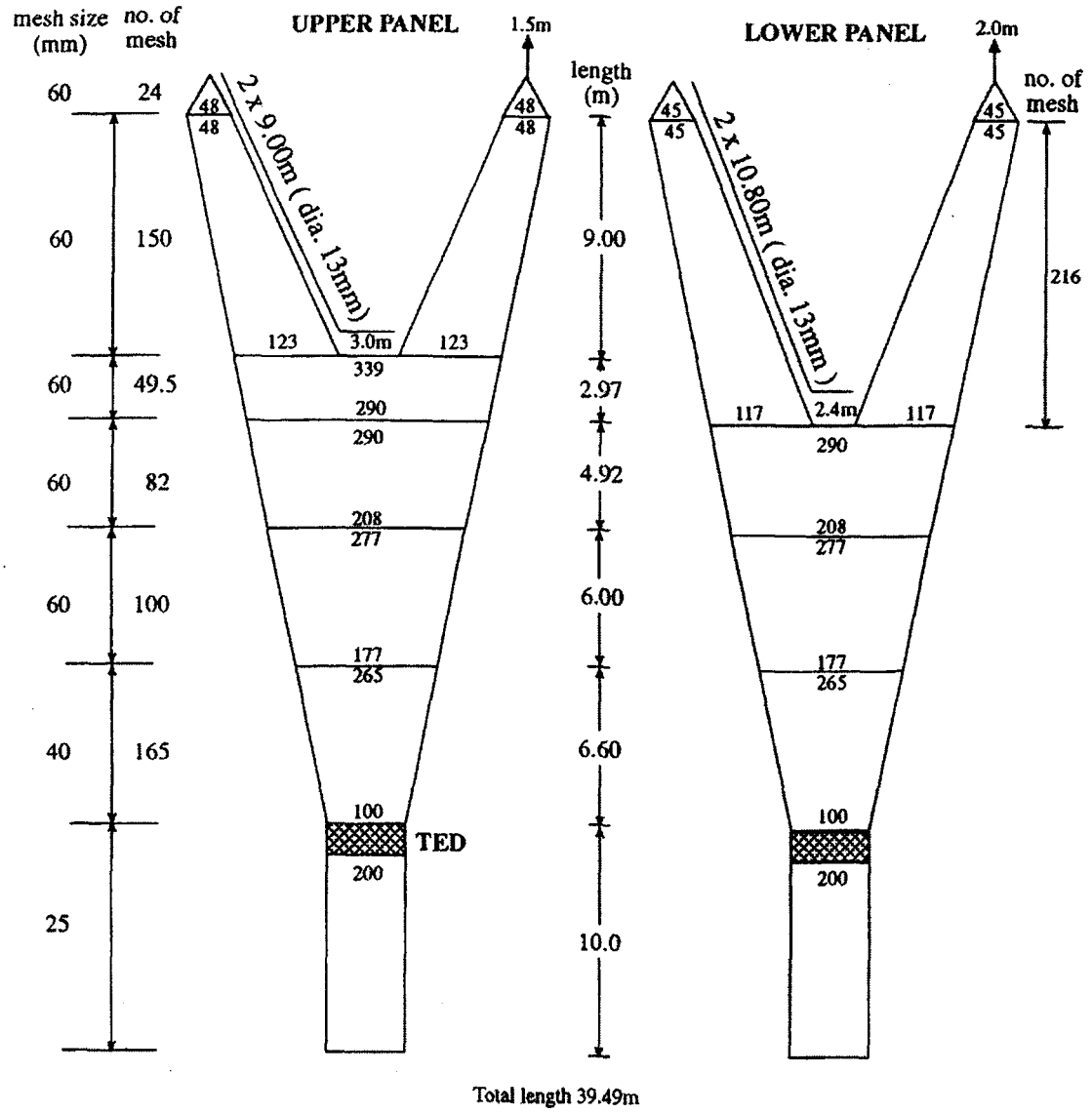

Fig. 4. Diagram of the fish trawl net used in the experiments.

Results and Discussion

Catch Compositions and CPUE

The catch compositions of fish trawl net consisted of the commercial fish species, particularly *Rastrelliger neglectus, R. kanagurta,* Lizard fish (*Saurida elongata, S. undosquamis,* and *S. isarankuraii*), Threadfin bream (*Nemipterus hexodon, N. japonicus* and *N. mesoprion*) and trash fished (*Leiognathus leuciscus* and *L. splendens*). About 50% and 30% of a total catch in Chumporn and Prachub Kirikan areas were commercial fish species and about 39% and 63% were trash fishes, respectively. Less than 7% of the total catch in both areas were cephalopod. Figure 5 shows the catch compositions and catch per unit effor (CPUE) of fish trawl nets in Chumporn and Prachub Kirikhan areas. The CPUEs of fish trawl net in both areas were 21.2 and 13.4 kg/hr, respectively.

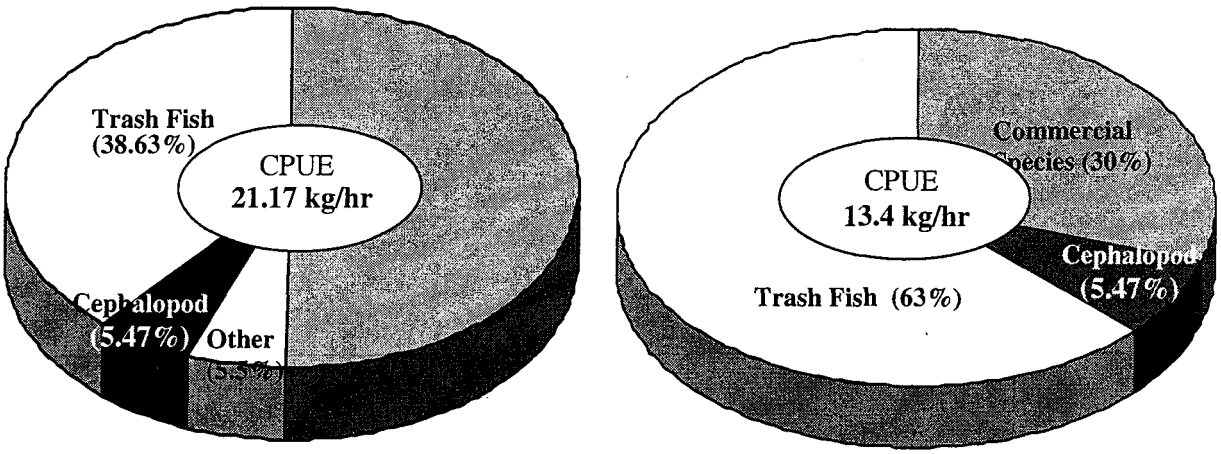

Fig. 5. Catch compositions and catch per unit effort of fish trawl nets in the Chumporn (a) and Prachub kirikan areas (b).

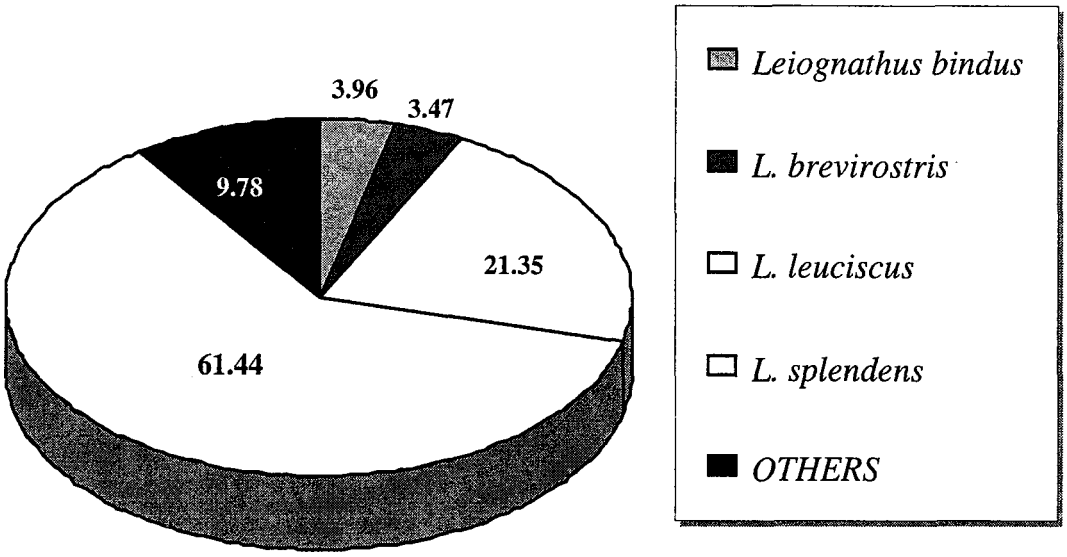

Fig. 6. Species compositions of trash fishes in percentage in the waters off Prachub Kirikan province

An analysis of species compositions of trash fishes in the Prachub Kirikan area shows that *Leiognathus splendens* was the dominant species being about 61% of the total trash fishes and about 21% was *L. leuciscus* (Fig. 6).

Escapement Levels

Table 1 shows the results of catch, by weight overall, and percentage of the escape for the different sizes of escape opening of the Rectangular shape-JTEDs in the Chumporn area. It is show that the percentage of escape for commercial fish species and trash fishes were in a range between 32 and 59% and between 5 and 20%, respectively. The percentage of escape of the cephalopod is highest between 78 and 100%.

Table 1 Results of catch, by weight overall, and percentage of escapement for The Rectangular shape JTED types.

Escape Opening	Commercial species (kg)		% Escape	Cephalopod (kg)		% Escape	Trash Fishes (kg)		% Escape
	Codend	Cover net		Codend	Cover net		Codend	Cover net	
8 CM	7.27	4.34	37.39	0.02	0.94	98.37	7.11	0.39	5.19
12 CM	3.49	5.13	59.52	0.00	1.15	100.00	9.20	2.15	18.93
16 CM	7.19	3.93	35.38	0.30	1.33	81.72	3.94	0.97	19.85
24 CM	8.21	3.94	32.44	0.18	0.65	78.72	12.07	0.78	6.09

Table 2 Results of catch, by weight overall, and percentage of escape for semi-curve JTED types.

Escape Opening	Commercial species (kg)		% Escape	Cephalopod (kg)		% Escape	Trash Fishes (kg)		% Escape
	Codend	Cover net		Codend	Cover net		Codend	Cover net	
4 CM	8.52	3.50	29.09	2.72	2.15	44.14	3.22	2.97	8.95
6 CM	8.50	4.78	36.01	1.64	0.56	25.46	21.42	1.17	5.17
8 CM	13.85	6.83	33.04	2.89	0.69	19.34	38.13	5.41	12.42
12 CM	12.23	6.02	32.99	2.58	0.78	23.17	32.24	3.89	10.78

Table 2 shows the results of catch, by weigh overall, and percentage of escape for the different sizes of escape opening of the Semi-curve shape JTEDs in the Prachub Kirikan area. It is show that the percentage of escapement for commercial fish species and trash fishes were in a range between 29 and 36% and between 5 and 12%, respectively. The percentage of escape of cephalopod is in a range between 19 and 44%

These results of both types of JTEDs are show in term of weight overall, and it does not mention how many juveniles and adults of the commercial fishes could escape. Therefore, to decide which types of JTEDs is good and selective one is difficult. In case, if we just consider on the percentage of trash fishes, then, it can say that the Rectangular shape JTEDs is more selective than the Semi-curve ones.

Length Composition Related to Escapement levels

Figures 7a, b, and c show the length compositions of commercial fish species in both codend and covered net with different sizes of escape opening in the Chumporn area. The fork length of the major commercial fishes, particularly, Scombroid mackerel, Lizard fishes and Threadfin bream in this area are ranged from 7 – 22 cm., 7-26 cm, and 6 – 27 cm., respectively.

In figure 7a about 79% of scombroid mackerel caught by Rectangular shape TEDs are in a range form 15.0 to 18.5 cm. The percentage of escape in the mentioned range is about 50% for the JTED with 24cm escape opening. In addition, about 8% of the total catch of this fish are less than 13 cm. fork length which is assumed to be in young and juvenile stage.

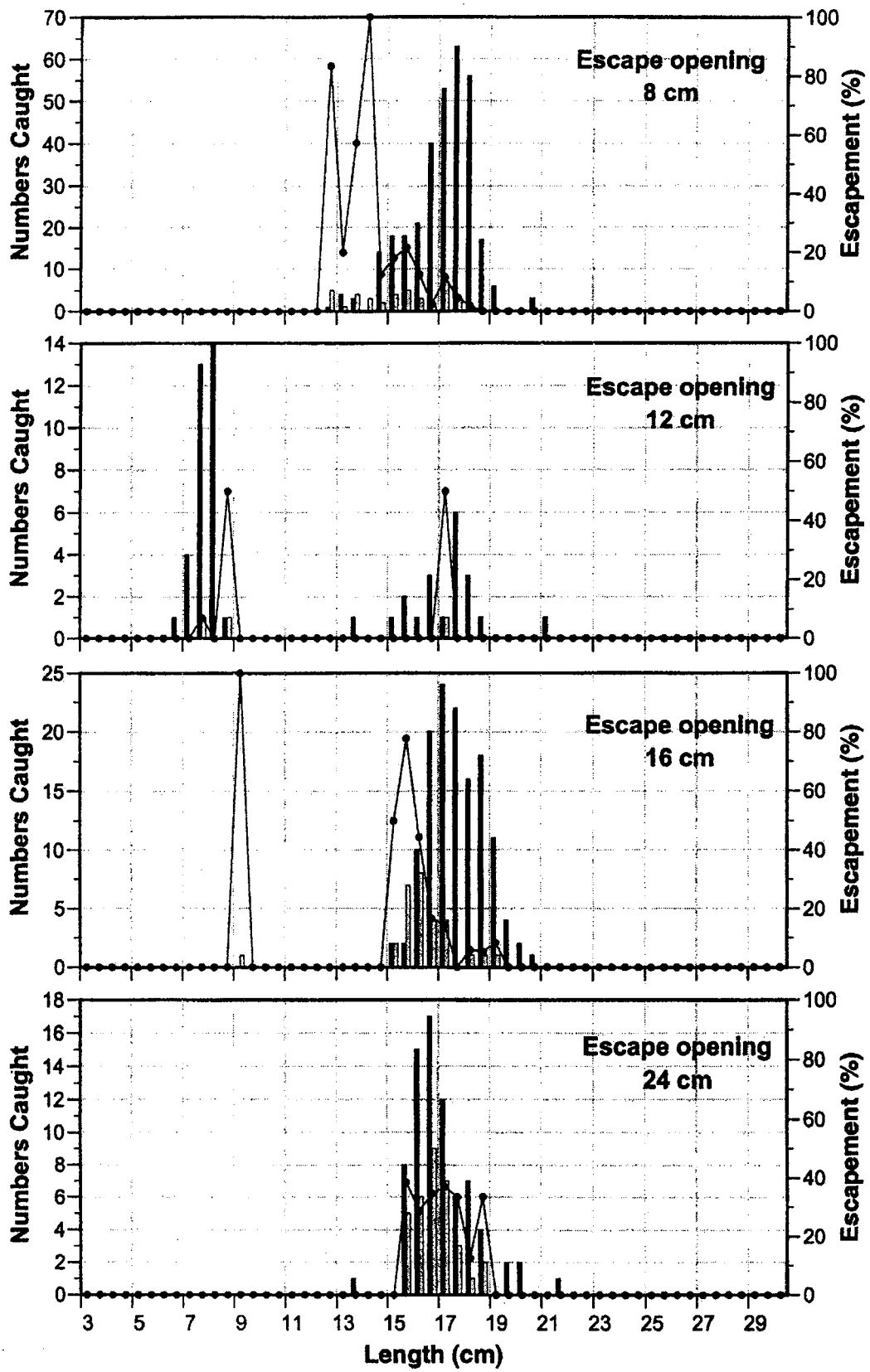

Fig. 7a. Length compositions of scombroid mackerels in codends (dark bar) and covered net (white bar) and estimated escapement at length (line), Chumporn area.

In figure 7b, Lizard fishes caught in this area are ranged from 6.5 to 27.5 cm. in length. About 79% of the total Lizard fishes caught by Rectangular shape JTEDs are in a range from 6.5 to 12.0 cm. Less than 5% of this amount can escape from the JTEDs.

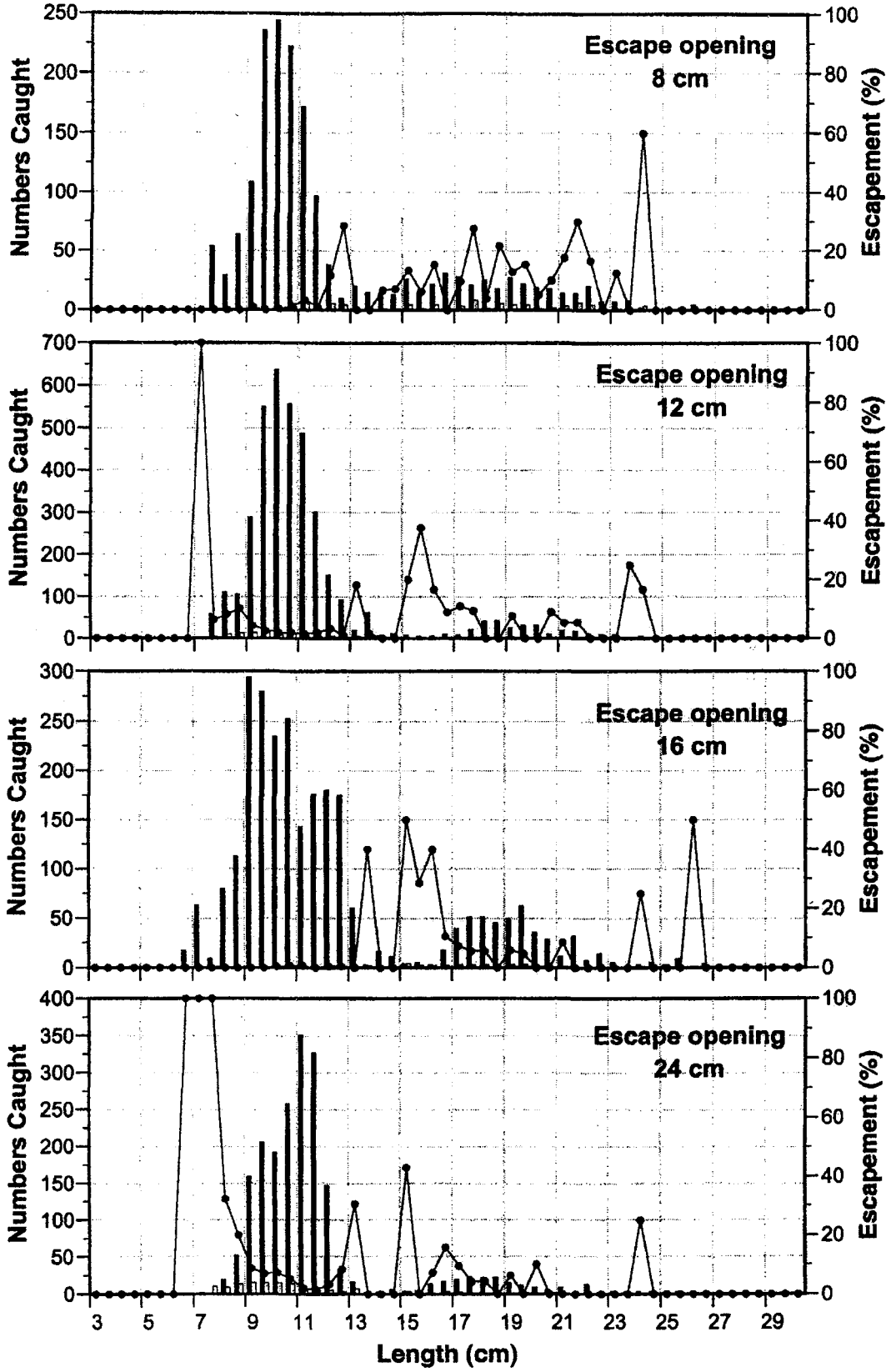

Fig. 7b. Length compositions of Lizardfish in codends (dark bar) and cover net (white bar) and estimated escapement at length (line), Chumporn area.

In figure 7c, Threadfin bream caught in this area are ranged form 6.0 to 26.0 cm. fork length. 40% of the total threadfin fin caught by trawl net attached with the Rectangular shape JTEDs are in a range from 6.0 to 10.5 cm. About 50% of this amount of fish could escape from the JTED, particularly if the escape opening are larger than 12 cm.

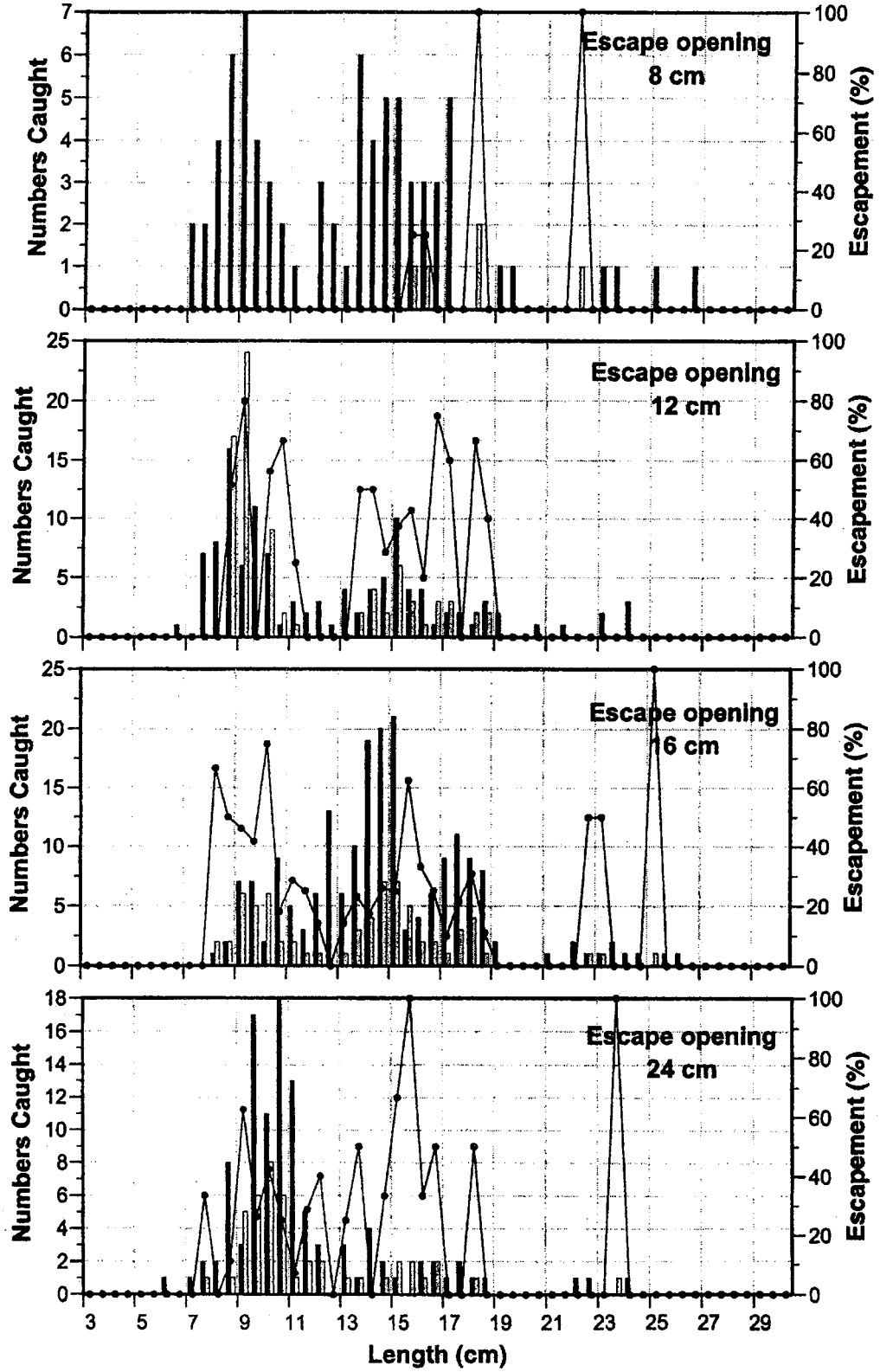

Fig. 7c. Length compositions of Threadfin bream in codends (dark bar) and cover net (white bar) and estimated escapement at length (line), Chumporn area.

Figures 8a, b, and c show the length compositions of commercial fish species in both codends and covered net with different sizes of escape opening in Prachub Kirikan area. The fork length of the major commercial fishes, particularly, Scombroid mackerel, Lizard fishes and Threadfin bream in this area are ranged form 12.5 – 21.5 cm., 6.0 – 30.0 cm., and 6.5 – 29.0 cm., respectively.

In figure 8a, about 87% of scombroid mackerel caught by trawl net with the Semi-curve JTEDs are ranged from 14.0 to 18.0 cm. More than 50% of this amount of catch can escape through the JTEDs of all escape opening sizes. This show that the JTEDs are not suitable to catch the adult scombroid mackerel.

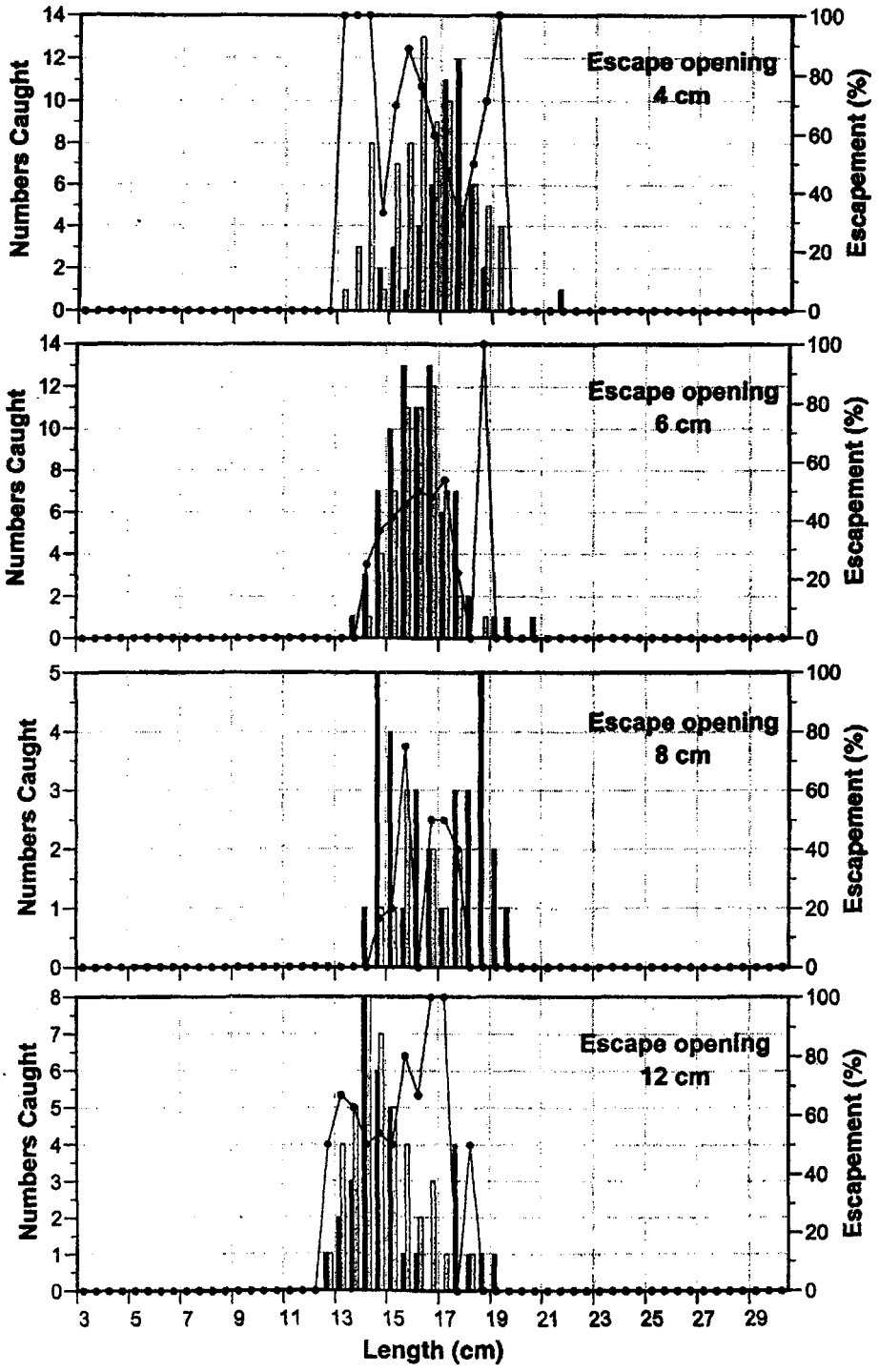

Fig. 8a. Length compositions of scombroid mackerels in codends (dark bar) and covered net (white bar) and estimated escapement at length (line), Prachub kirikan area.

In figure 8b, Lizard fishes caught in this area have different fork lengths, in addition the fish smaller than 13.0 cm. are about 51% of the total catch when used Semi-curve shape JTEDs. 45% of the total catch are adult size which are larger than 15.0 cm., and the percentage of escape for all size of escape opening (from 4 cm. – 12 cm.) are about 55% of total adult fish. It is indicated that the semi-curve JTEDs with different escape opening size ranged from 4 – 12 cm. are not selective enough for Lizard fish.

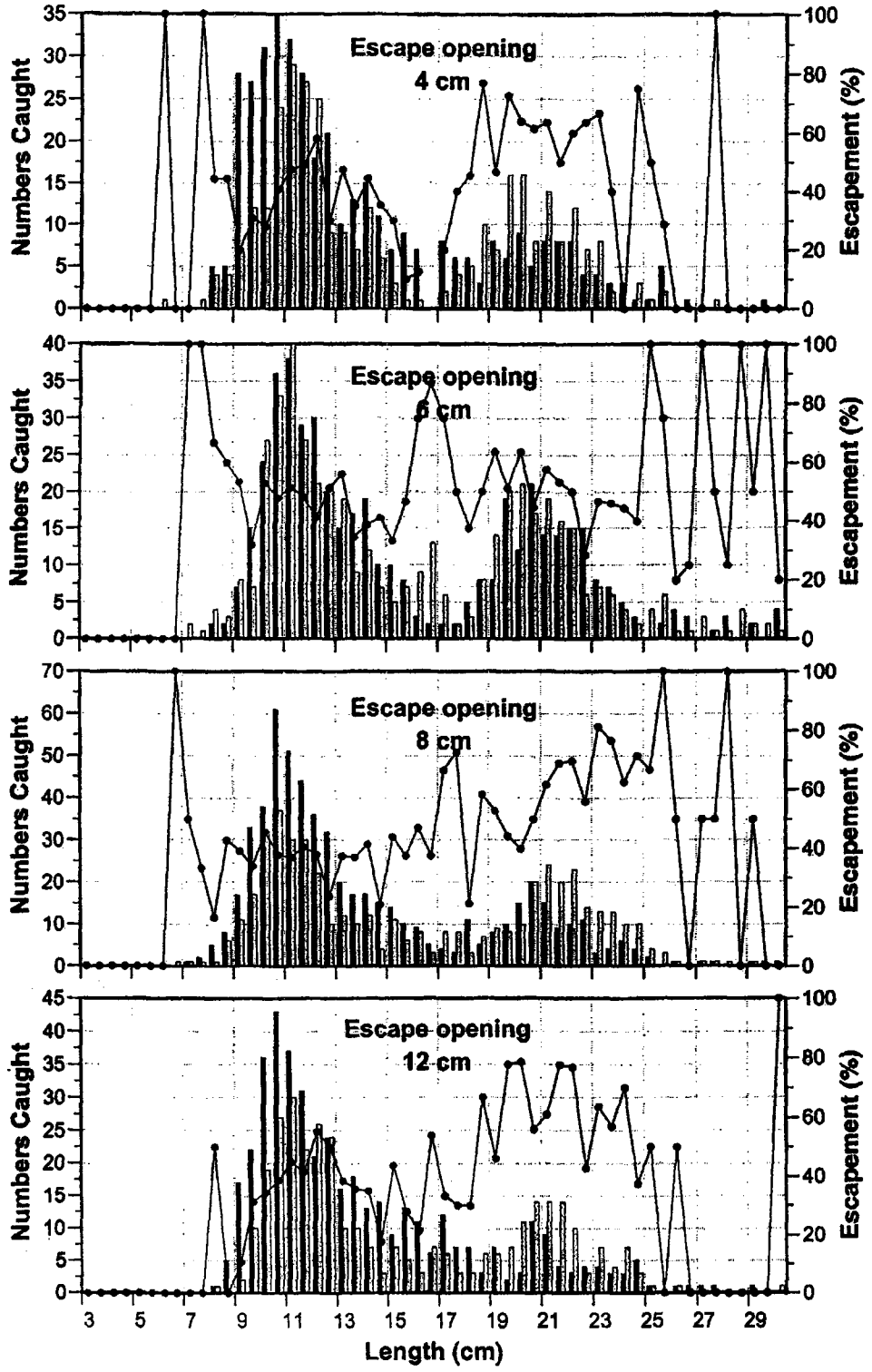

Fig. 8b. Length compositions of Lizardfish in codends (dark bar) and cover net (white bar) and estimated escapement at length (line), Prachub kirikan area.

In figure 8c, 81% of total Threadfin bream having a fork length ranging from 9.5-14.5 cm were caught in this area by trawl net attached with the semi-curved JTEDs Less than 15% of this amount of fish could escape through the JTEDs. In addition, particularly for the JTED with the 6 cm. escape opening, some large size of fish could escape.

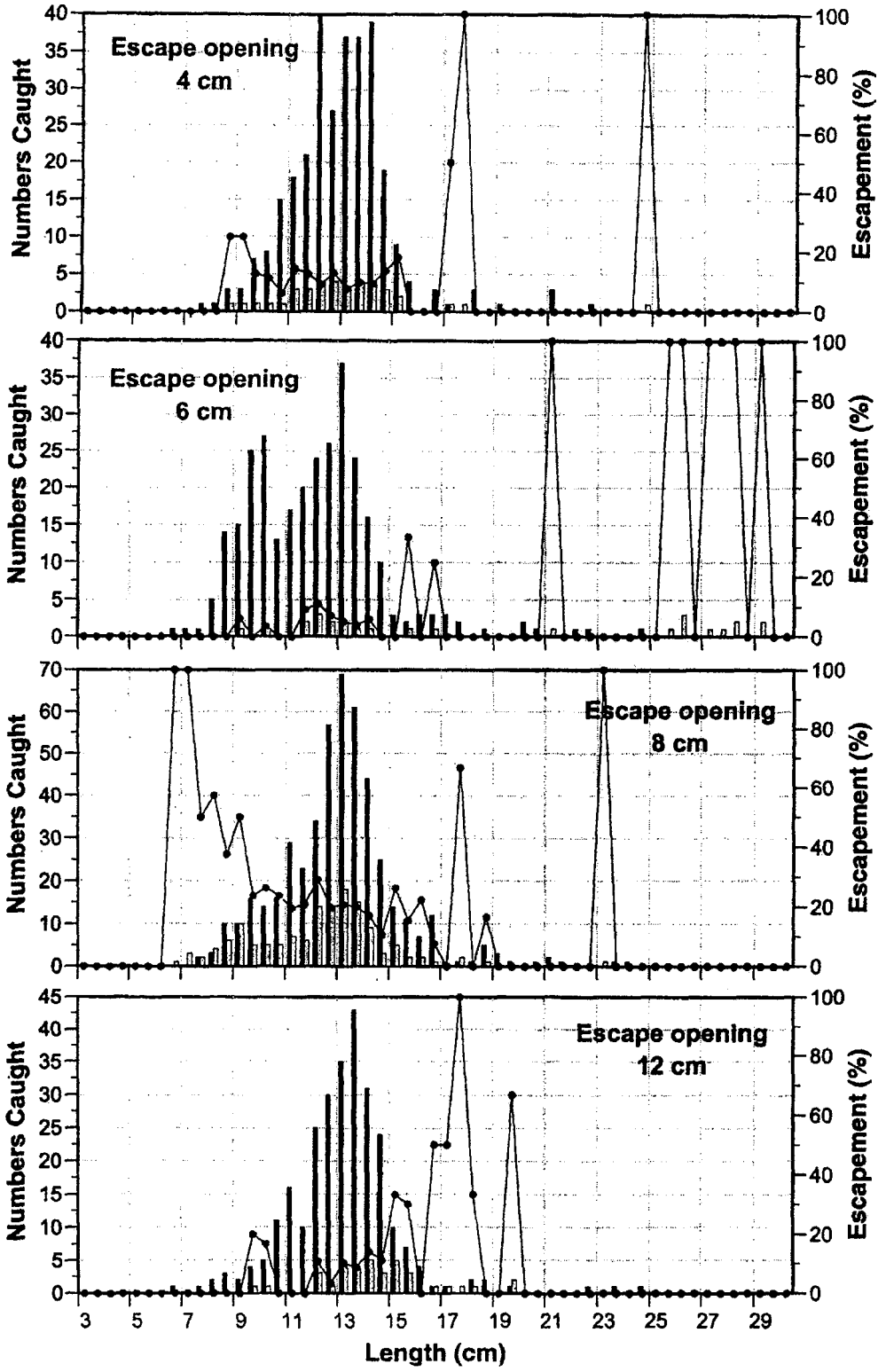

Fig. 8c. Length compositions of Threadfin bream in codends (dark bar) and cover net (white bar) and estimated escapement at length (line), Prachub kirikan area.

JTEDs Selectivity

An analysis of the length compositions of overall commercial fish species, **by numbers,** for fish trawl net attached with the rectangular shape JTEDs and the semi-curve JTEDs are shown in the Fig. 9 and 10, respectively. Many commercial fish species size less than 13 cm are assumed to be juvenile and young stages, therefore from the catch results of trawl with the rectangular shape JTEDs show that about 74% of the total commercial fishes ranged from 7.0 – 13.0 cm., or they were juvenile and young fishes (see Fig. 9). Less than 5% of these juvenile and young commercial fishes could escape through the JTEDs. In addition, about 25% of the total catch were assumed to be adult fishes which ranged from 13.0-27.5 cm, about 3% of the total adult fishes could also escape through the JTEDs opening.

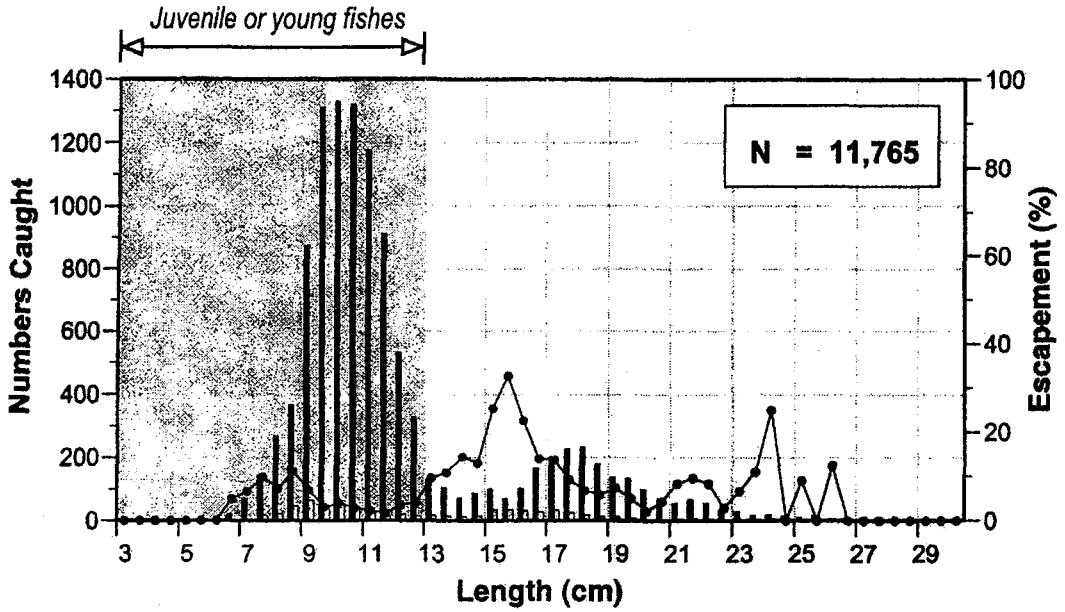

Fig. 9. Length compositions of all commercialfish species, by numbers, in codends (dark bar) and cover net (white bar) of fish trawl net attached with the Rectangular shape JTEDs and estimated escapement at length (line), Chumporn area.

Figure 10 show the results of the length compositions of all commercial fishes caught by trawl net attached with the Semi-curve JTEDs. It was found that about 51% of the total catch fishes were ranged from 7.0 – 13.0 cm. (juvenile and young fishes) and about 49% of that were ranged form 13.5 – 30.0 cm. (adult fishes). About 37% of the juvenile and young fishes, while about 19% of adult fishes could escape through the JTED opening.

Consideration for the results of commercial fishes caught by trawl net attached with different types of JTEDs, namely Rectangular shape and Semi-curve shapes can be concluded in term of percentage of escape that the last type of JTEDs should be better than the former one. It clearly shows that the percentage of escape of juvenile commercial fishes of trawl net attached with the Semi-curve JTED is 7 times higher than the Rectangular shaped one.

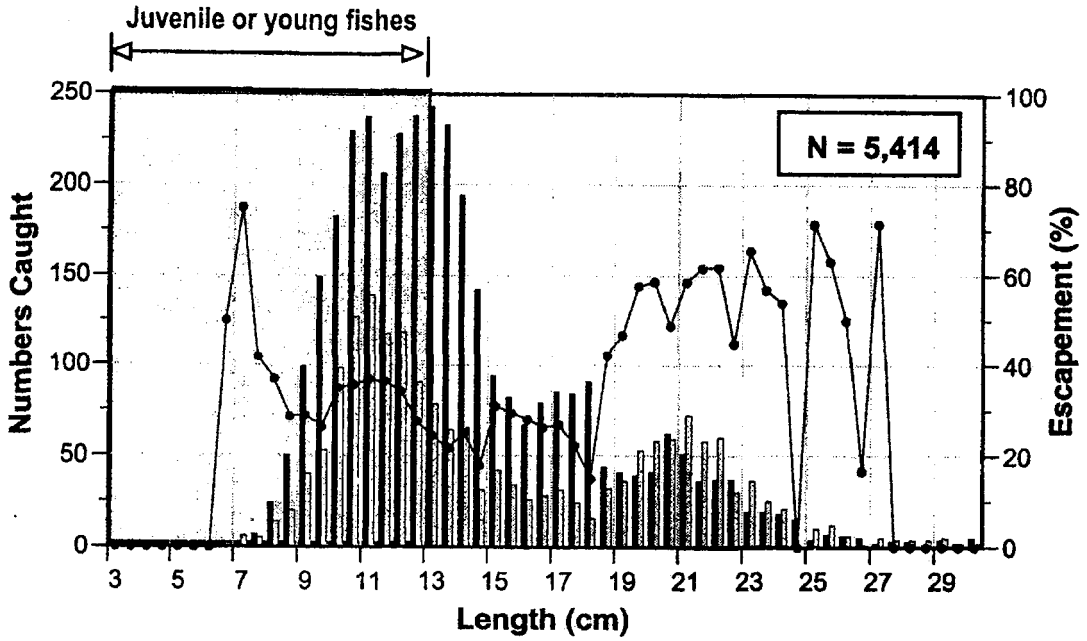

Fig. 10. Length compositions of all economicl species, by numbers, in codends (dark bar) and cover net (white bar) of fish trawl net attached with the Semi-curve JTEDs and estimated escapement at length (line), Prachub kirikan area.

Figure 11 shows the length compositions of all trash fishes, by numbers, of trawl net attached with the Semi-curve JTEDs. About 50% of trash fishes were released through the JTEDs opening.

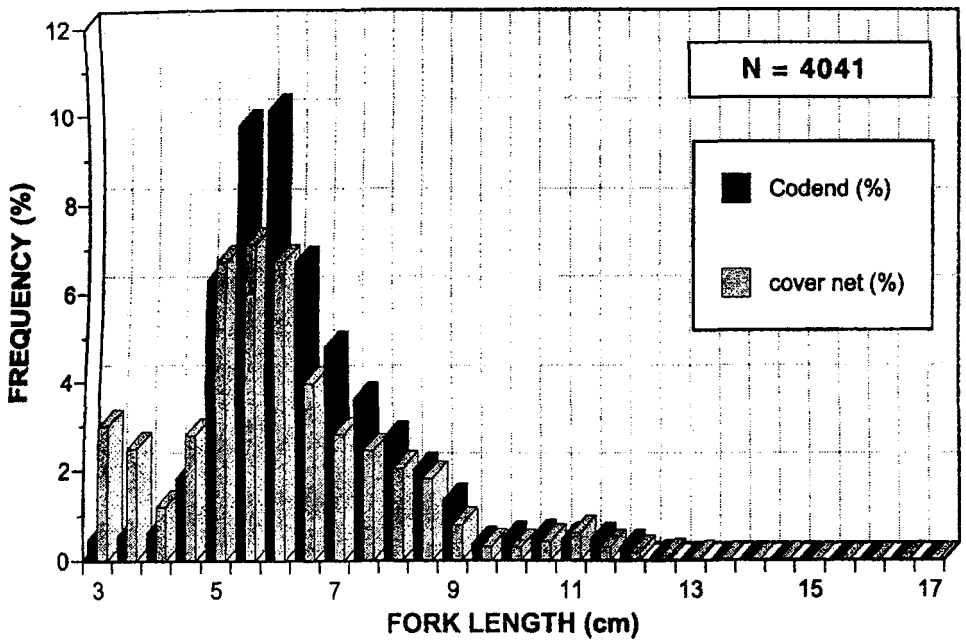

Fig. 11. Length compositions of all trash fishes, by numbers, in codends (dark bar) and cover net (white bar) of fish trawl net attached with the Semi-curve JTEDs and estimated escapement at length (line), Prachub kirikan area.

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