

EXPERIMENTS ON THE USE OF TURTLE EXCLUDER DEVICES (TEDs) IN MALAYSIAN WATERS

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Abstract

Trawl experiments deploying a research vessel and two chartered fishermen's boats were conducted to study the suitability of different types of Turtle Excluder Devices attached to the local shrimp trawl nets. A total of 23 hauls from R.V. Kerapu 1 and 24 hauls from chartered boats were made during the study in Zone A, i.e area from shore line to 5 nautical miles). The catches were classified into three different groups namely: shrimp, fish and trash fish to observe the effect of TEDs on catch rates. Two types of TTFD (Thai Turtle Free Device with slight modification) were tested namely: small TED (80cm X 80 cm) and medium TED (80cm X 100cm). The TEDs angle for research vessel and fishermen's boat were 45° and 55° respectively. The TEDs was designed in such a way to escape the marine turtle while at the same time maintaining the catch. The result showed that, TEDs prevented marine turtles from being trapped in the net but did not effect the catch of fish and shrimp. The average total escape rates by weight of the small and middle size of TEDs in research vessel were found to be 2.3% and 5.25% for day time operation and 0.01% and 4.67% during the night time operation respectively. The escape rates of small and medium size of TEDs in fishermen's boat were 6.53% and 4.05% for day time and 3.34% and 7.7% during night operation respectively. However, the result of the study showed that the use of TEDs did not reduce the catch rate of shrimp. Therefore the small and medium size of TEDs were found to be suitable for the use by Malaysian fishermen.

1. INTRODUCTION

Various type of fishing gears are used to harvest shrimps in Malaysia. The most popular gear is shrimp trawl net which has been used in Peninsular Malaysia since 1966. The use of this gear has been spreaded to all part of the country due to its efficiency in catching shrimp. In 1994, trawl net landed about 587,928 tonnes of fishes and shrimps which is equivalent to 55% of the total marine landing. Penaeid shrimp contributed 8% of the landing composition. The shrimp net is mostly operated by vessel below 40 GRT in zone B (5 - 12 nm from shoreline). The bulk of shrimps was landed

from Peninsular Malaysia (71, 505 tonnes), Sarawak (16,084 tonnes) and Sabah/ Labuan (14,159 tonnes). (Annual Fisheries Statistic, 1994)

Since the U.S shrimp import embargo that went into effect on 1 May 1996 , stipulated a condition that the methods used in shrimp capture by harvesting countries should inflict no harm to marine turtles. One of the methods practiced during the last few years by U.S shrimp trawlers is to equip their fishing gears with a device called the Turtle Excluder Device (TED). This hard device has a grid panel which deflects marine turtles through an opening in the net.

Four species of marine turtles have been recorded in Malaysian waters namely leatherback turtle, green turtle, hawksbill turtle and olive ridley turtle. Leatherback turtles have been found in Rantau Abang, Tg. Sura and Paka in State of Terengganu. The green turtles are common in Terengganu and a small number in the State of Kedah, Perak and Johor. The hawksbill turtle have been found in Terengganu, Malacca and Johor and Olive riddle in Terengganu , Johor and Perak. The most popular landing site for green turtle in Perak is Segari Beach (Kamarrudin I. and Rahman K., 1996)

To comply with the condition set by the U.S shrimp import embargo the SEAFDEC Council requested Marine Fishery Resources Development and Management Department (MFRDMD) in Kuala Terengganu and Training Department (TD) in Bangkok to jointly conduct a series of experiments in Thailand and Malaysia, to test the efficiency of various TEDs and of trawls equipped with the device.

The objectives of the experiments were:

- a) to compare the escape rates of catches of shrimp trawl nets fitted with two types of TEDs with different angle in the day and night time
- b) to compare the catch composition of shrimp trawl nets with and without TEDs installation
- c) to study the turtle releasing efficiency of TEDs.

2. MATERIALS AND METHODS

2.1 Study area

The study was conducted in Pulau Pangkor waters Perak, Malaysia. (Fig. 1) from 17th to the 25th of February 1997.

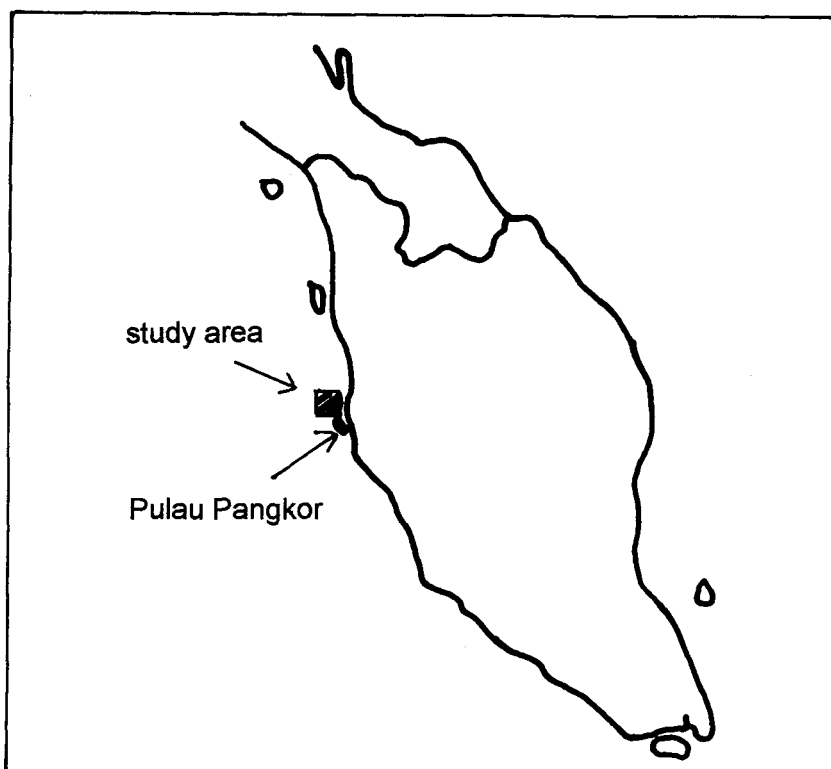


Fig. 1. The map shows the area where the TED study was conducted.

2.2 Research vessel and shrimp trawl nets

The experiments were carried out on one research vessel namely R.V Kerapu 1, a 42 GRT (263 h.p) wooden stern trawl and on two fishermen's shrimp trawlers 39.2 GRT (260 h.p) for day time operation and 19 GRT (160 h.p) for night operation.

Fig. 1. The map shows the area where the TED study was conducted.

Fig. 2 shows two sizes of shrimp trawl nets (2 seam type) that were used during the study. The small net was approximately 32.8 m long with 18 m ground rope and the big net was 37.17 m long with 23.92 m ground rope.

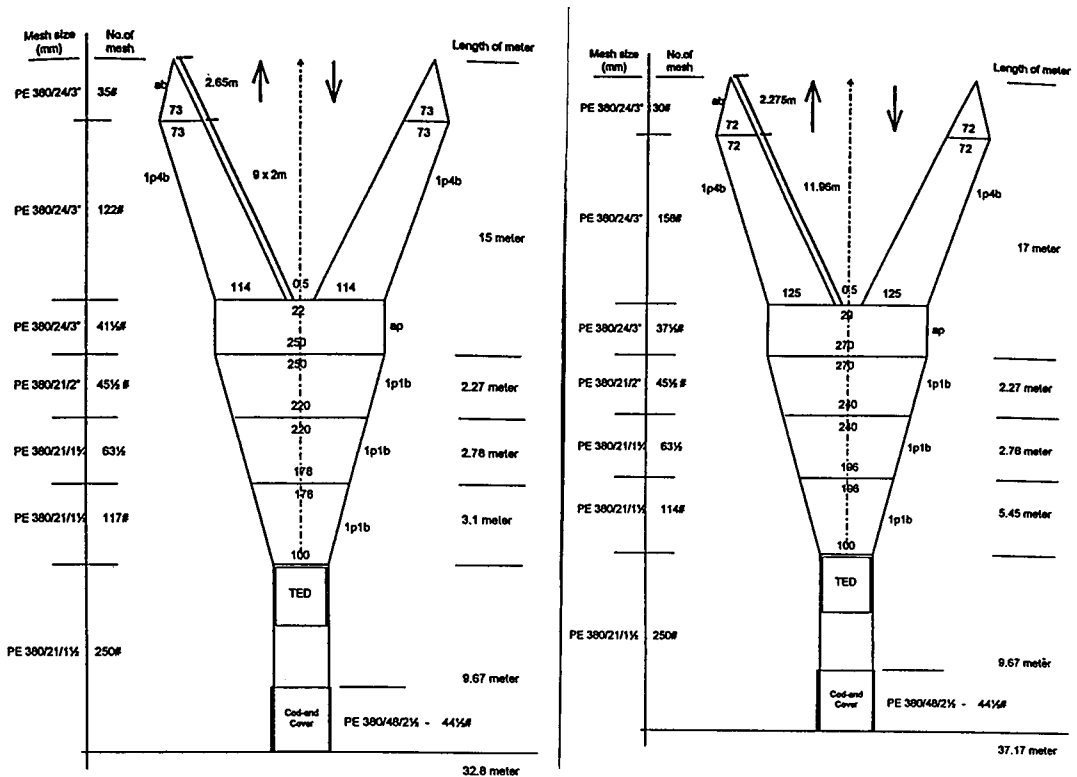


Fig. 2. The design of shrimp trawl net used by research vessel and chartered fishermen boat

2.3 Turtle Excluder Devices (TEDs)

Fig. 3 shows two sizes of TEDs namely; small medium. Small and medium size TEDs are a circular measuring 80cm high by 80cm wide and an oval frame measuring 100cm by 80cm, respectively. The outer ring of frame is solid steel rod of 1.4 cm diameter. The space between deflector bars is 9 cm and between deflector bars and frame is 7.5 cm (Bundit *et. al.*, 1997)

2.4 Trawling operation

The TEDs (small and medium) were assembled into the shrimp trawl nets at a location of 10 m from the end of codend. In order to quantify the escape rate, a two meter cover net was attached to an exit hole located on top side of the net in front of the TED. The TED angle for R.V Kerapu 1 and fisherman boat were 45° and 55° , respectively.

Operational period being one hour for each haul and a total of 3 hauls for day and night covering the same track were made respectively. The trawling speed was maintained between 2.5 to 3.0 knots. The first haul is for control followed by TED net with exit hole cover net and TED net exit hole without cover. For the third haul, exit hole cover net were took out in order to study the real operation of shrimp trawl net fitted with TEDs. A study were completed 15 hauls for control, 16 hauls for TED net with exit hole cover net and 16 hauls for TED net exit hole without cover.

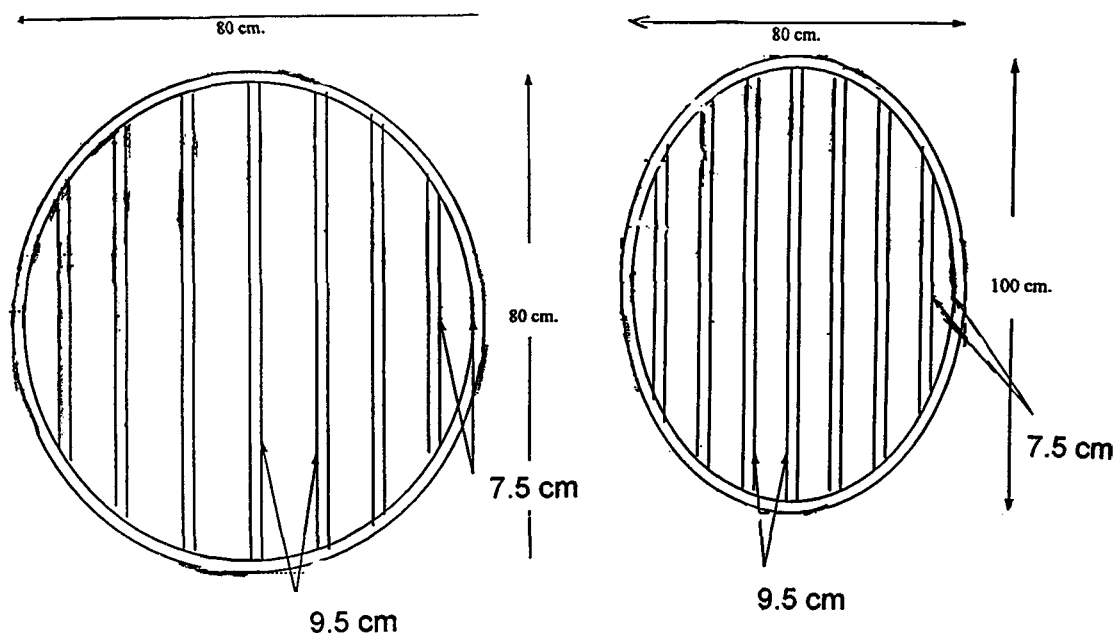


Fig. 3. The design of small TED (left) and medium TED (right) used in this study.

2.5 Personnel involved

The staff of the Resource Exploration Unit, Research Vessel Operation Unit and Fishing Gear Unit, MFRDMD and personnel from Resource Section, Fisheries Research Institute, Penang were directly involved in this study. One researcher from SEAFDEC Training Department, Bangkok also participated in the study.

2.6 Data Analysis

The catch data by weight in kilogram collected from the codend and the cover net in each haul were analyzed for the rate of escape in percent as the following equation:

$$\text{Rate of escape} = \frac{A \times 100}{(A + B)}$$

where: A = the catch by weight in the cover net
B = the catch by weight in the codend

The mean values of the rate of each type of TEDs were computed and compared to that of the control net (without TEDs).

3. RESULTS AND DISCUSSION

The results from Table 1 indicate that, the escape rates of medium TED were higher than small TED for day and night time operations for research vessel. Budit *et al.*, (1997) reported that the average escape rates of TTFD (Thai Turtle Free Device) were 1.8% and 1.04% for day and night time operation, respectively. However the average of total catch for that experiments were only 7.54 kg and 9.62 kg for day and night time operation respectively.

Types of TEDs	Day-time operation (kg/hr)			Night time operation (kg/hr)		
	Codend	Cover net	Escape rate %	Codend	Cover net	Escape rate %
Small	86.25	2.04	2.3	12.83	0.002	0.01
Medium	24.16	1.34	5.25	69.63	3.41	4.67

Table 1. The average total catch rates (kg/hr) in the codend and cover net and the escape rate for each type of TED in the day and night operation for research vessel.

There were not much differences in terms of escape rates for fish in the day and night time for both TEDs as shown in Table 2 and 3. None of commercial shrimp escaped during the operation.

Types of TEDs	Codend (kg/hr)				Cover net (kg/hr)			
	Shrimp	Fish	Trash	Total	Shrimp	Fish	Trash	Total
Small	0.56	17.19	68.5	86.25	0	0.13	1.91	2.04
Medium	1.15	13.51	9.5	24.16	0	0.17	1.17	1.34

Table 2. The average catch rates (kg/hr) of each group in the codend and cover net in day time operation for research vessel.

Types of TED	Codend (kg/hr)				Cover net (kg/hr)			
	Shrimp	Fish	Trash	Total	Shrimp	Fish	Trash	Total
Small	0.13	6.58	5.85	12.83	0	0	0.002	0.002
Medium	2.65	15.48	51.5	69.63	0.06*	0.25	3.1	3.41

* Not a commercial size

Table 3. The average catch rates (kg/hr) of each group in the codend and cover net in night time operation for research vessel.

Results from Table 4 indicate that an average escape rate of small and medium TEDs were 6.53 % and 4.05% for day time and 3.34 % and 7.7 % during night time, respectively.

Types of TEDs	Day-time operation (kg/hr)			Night time operation (kg/hr)		
	Cod end	Cover net	Escape rate %	Cod end	Cover net	Escape rate %
Small	68.96	4.82	6.53	85.38	2.95	3.34
Medium	58.73	2.48	4.05	36.24	3.03	7.7

Table 4. The average total catch rates (kg/hr) in the codend and cover net and the escape rate for each type of TEDs in day and night time for fishermen's boat.

However the escape rates for fish of small and medium TEDs were 1.11 kg and 2.1 kg for day time operation and 1.13 kg and 1.82 kg night time operation, respectively (Table 5 and Table 6) None of commercial shrimp were escaped out of the TEDs during the operations.

Types of TED	Cod end (kg/hr)				Cover net (kg/hr)			
	Shrimp	Fish	Trash	Total	Shrimp	Fish	Trash	Total
Small	0.9	18.56	49.5	68.96	0.06*	1.11	3.56	4.82
Medium	0.48	13.25	45.0	58.73	0	2.1	0.38	2.48

* Not a commercial size

Table 5. The average catch rates (kg/hr) of each group in the cod end and cover net in day time operation for fishermen's boat.

Types of TED	Cod end (kg)				Cover net (kg)			
	Shrimp	Fish	Trash	Total	Shrimp	Fish	Trash	Total
Small	1.96	35.67	47.75	85.38	0.08*	1.13	1.14	2.95
Medium	1.16	20.32	14.76	36.24	0.0075	1.82	1.21	3.03

Table 6. The average catch rate (kg/hr) of each group in the cod end and cover net in night time operation for fishermen's boat.

On overall, the catch rates and percentage of catch rates for all types of catches by trawls with TEDs were found to be similar with catches by trawls without TED for research vessel and fishermen's boat (Table 7.). The use of TEDs resulted in a small reduction on the catch of fish and trash fish but not for shrimps. This shows that some fish and trash escaped through the exit hole either during trawling or hauling operation.

During the 2nd days of the study a matured hawksbill turtle measuring 70.0 cm curve carapace length was observed in the cover net. This proved that turtles within this size range are capable to escape through the exit hole. The size of exit hole opening is 70 cm long and 32 cm width.

5. CONCLUSION

The result of this study showed that TEDs can prevent marine turtles from being trapped in the nets without much effect on catch of shrimp and fish.

6. ACKNOWLEDGEMENT

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TED	Boats	Day time										Night time									
		Control					TED					Control					TED				
		Shrimp	Fish	Trash	Total		Shrimp	Fish	Trash	Total		Shrimp	Fish	Trash	Total	S	Fish	Trash	Total		
S	F.man	0.62 <i>(0.8)</i>	29.2 <i>(38.7)</i>	45.56 <i>(60.5)</i>	75.49 <i>(100)</i>	0.92 <i>(1.2)</i>	24.99 <i>(33.6)</i>	48.5 <i>(65.2)</i>	74.41 <i>(100)</i>		4.47 <i>(4.6)</i>	47.04 <i>(48.8)</i>	44.9 <i>(46.6)</i>	96.41 <i>(100)</i>	2.41 <i>(4.1)</i>	42.07 <i>(71.3)</i>	14.53 <i>(24.6)</i>	59.01 <i>(100)</i>			
S	R.V	0.45 <i>(0.5)</i>	28.62 <i>(32)</i>	60.4 <i>(67.5)</i>	89.47 <i>(100)</i>	2.32 <i>(4.8)</i>	9.9 <i>(20.3)</i>	36.5 <i>(74.9)</i>	48.72 <i>(100)</i>		1.4 <i>(3.7)</i>	13.9 <i>(36.3)</i>	23.0 <i>(60.0)</i>	38.3 <i>(100)</i>	0.042 <i>(0.1)</i>	2.37 <i>(7.9)</i>	27.75 <i>(92)</i>	30.2 <i>(100)</i>			
M	F.man	0.95 <i>(1.5)</i>	20.02 <i>(31.5)</i>	42.5 <i>(67)</i>	63.47 <i>(100)</i>	0.4 <i>(0.9)</i>	18.76 <i>(44.8)</i>	22.75 <i>(54.3)</i>	41.91 <i>(100)</i>		5.01 <i>(6.3)</i>	24.8 <i>(31.4)</i>	49.25 <i>(62.3)</i>	79.06 <i>(100)</i>	1.95 <i>(1.6)</i>	40.74 <i>(34.5)</i>	75.5 <i>(63.9)</i>	118.2 <i>(100)</i>			
M	R.V	1.09 <i>(5.8)</i>	5.45 <i>(29.4)</i>	12.05 <i>(64.8)</i>	18.59 <i>(100)</i>	4.97 <i>(11.3)</i>	15.08 <i>(34.2)</i>	24.0 <i>(54.5)</i>	44.05 <i>(100)</i>		0.819 <i>(2.4)</i>	13.18 <i>(38.2)</i>	20.5 <i>(59.4)</i>	34.5 <i>(100)</i>	0.32 <i>(0.4)</i>	26.72 <i>(30.3)</i>	61.0 <i>(69.3)</i>	88.14 <i>(100)</i>			

Table 7. Comparison of catch rates in kg/hr and percentage (*in italic*) by types of catches between control and real operations nets fitted with TED (without cover net)

7. REFERENCES

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