THE PROMOTION OF RESPONSIBLE TRAWL FISHING PRACTICES IN SOUTHEAST ASIA: A SUMMARY ON THE INTRODUCTION OF JUVENILE AND TRASH EXCLUDER DEVICES (JTEDs)

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ABSTRACT

The Training Department of the Southeast Asian Fisheries Development Center has completed a wide range of experimental fishing trials on the use of Juvenile and Trash Excluder Devices (JTEDs) over recent years. These trials have investigated the effectiveness of the rigid sorting grid, rectangular window and semi-curved window JTEDs in releasing juveniles of commercially important fish species and trash fish from demersal fish trawling operations.

Experimentation began in Thai waters adjacent to the Provinces of Chumpon and Prachuap Kirikhan in 1998. This initial work led to the identification of the rigid sorting grid device as an effective tool in the exclusion of juvenile and trash fish from fish trawls. Further experimentation focusing on the effects of grid spacing on the performance of this JTED was completed in Brunei Darussalam and Vietnam during 2000 and 2001.

In September 2001, the rigid sorting grid JTED was the subject of experimental fishing trials in Malaysian waters. This work focused on the effects of grid spacing and day/night influences on JTED performance, highlighting that a grid spacing of 1.2 cm is highly effective in reducing capture of juveniles and trash fish in fishing areas adjacent to the Malaysian Peninsular. JTED performance was also generally greater during day-time fishing trials.

More recently, the Training Department has completed trials in the waters of Indonesia and the Philippines. In 2002, results from Indonesia suggested that the rigid sorting grid device with the 4 cm spaced sorting grid achieves the highest releasing rates of juvenile and trash fish in the Arafura Sea region of Eastern Indonesia. In 2003, investigations completed in the Philippines highlighted that the rigid sorting grid device with a grid spacing greater than 1 cm is generally more effective in the exclusion of juvenile and trash fish than the rectangular and semi-curved window JTEDs.

During 2004, demonstrations and experiments on the use of JTEDs will be completed in Myanmar and Cambodia to provide a complete coverage of relevant SEAFDEC Member countries. Researchers are confident that the above mentioned activities have been effective in developing regional understanding of the use of JTEDs. All work has been completed in close collaboration with the fisheries departments of the Member countries involved in the project. This has been effective in building capacity for regional governments and fisheries personnel to be responsive to the needs of fishers as they move toward the development of more sustainable fish trawl practices.

INTRODUCTION

The incidental catch of juvenile and trash fish is an acknowledged adjunct to fisheries management. Its recent development into a major fisheries management issue can be attributed to an increasing demand for fisheries resources and a growing recognition of the need to ensure that fisheries are conducted in a sustainable manner.

Once considered mostly as a nuisance, the catch of juvenile and trash fish are now recognized as having a detrimental impact on the fecundity of fisheries systems. Similarly, the economic value of the catch of juveniles of commercially important fish species are now viewed as being considerably lower than those for the same species at sizes more suited to market forces.

In the development of sustainable fisheries, reducing the incidental catch of juvenile and trash fish is a key priority. In response to this, in 1998 the Training Department (TD) of the Southeast Asian Fisheries Development Center (SEAFDEC) initiated research and development activities that were aimed at providing a technical foundation for the adoption of Juvenile and Trash Excluder Devices (JTEDs) in regional trawl fisheries.

At first, two JTED types were developed for installation into the upper part of the codend. One device used a rectangular shaped window, whilst the other a semi-curved window. The frames of both were constructed using stainless steel frames of 80 by 100 cm., with "soft" vertical separator gratings made from 8 mm. polyethylene rope.

The general effectiveness of these JTED types was tested during at-sea fishing trials and demonstrations. The designs have since been modified in response to more detailed testing of how JTED efficacy is influenced by factors including the separator spacing, "soft" versus "hard" separator gratings, and the use of square mesh in the codend as opposed to diamond mesh. Investigations into the effect of trawl tow speed, catch loading and hydrodynamic drag on the deformation of trawl netting and the ultimate performance of JTEDs, has provided TD researchers with an insight into the operational considerations required to maximize the exclusion of juvenile and trash fish from trawl fishing gear.

Since 1998, TD has completed numerous experimental fishing trials on the release of juveniles and trash fish from trawl fishing gear through the use of JTEDs in Southeast Asian waters. Work has been completed in the national waters off Brunei Darussalam, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. During 2004, TD will conduct similar demonstrations and experiments on JTEDs in Myanmar and Cambodia to provide a more complete coverage of relevant SEAFDEC member countries.

This article intends to provide a summary of the results of the demonstrations and experimental work completed to date. More detailed information may be obtained from the "Study on Juvenile and Trash Excluder Devices" report series published by the SEAFDEC Training Department in 2004.

The Study on Juvenile and Trash Excluder Devices (JTEDs) in Thailand

Experiments on the use of Juvenile and Trash Excluder Devices began in Thailand on a cooperative basis with the Thai Department of Fisheries. A series of experiments on JTEDs in fish trawling operations were completed during two separate cruises. The first cruise took place from 1st to 12th June 1998 in the waters off Chumpon province, and the second cruise was conducted in the waters off Prachub Kirikan Province from 28th September to 9th October 1998. The vessel, M.V. PRAMONG 1, was used for both cruises and series of experiments.

Two JTED types were used in these experiments. These were the Rectangular Shaped Window and the Semi-Curved Window JTEDs. The Rectangular Shaped Window devices were constructed using 13mm. diameter stainless steel rod to form rectangular frames of 80 cm by 100cm. The devices were designed to have four different vertical escape opening sizes of 8, 12, 16 and 24 cm. were tested in the experiments. The frames of the Semi-Curved Window device were constructed of the same material and were of the same size as those for the Rectangular Shaped Window Devices. These devices with four different vertical escape openings of 4, 6, 8 and 12 cm. were tested in the experiments. Cover nets to collect the fish that escaped through the devices during experimentation were constructed. The cover for the Rectangular

Shaped Window device was as a small sac like structure, while that for the Semi-Curved Window device was a cylindrical structure.

The Rectangular Shaped Window JTEDs were tested during the first cruise off Chumphon Province. Each device using each escape opening size was tested 9 times, except for the 2 cm. device which because of at-sea constraints was only tested 8 times. The Semi-Curved Window JTED was tested during the second cruise at Prachub Kirikan Province. Each experimental fishing trial for the JTEDs was completed between 07.00 and 17.00 hrs. Each trial consisted of 1 hr. tows at speeds of 2 to 3 knots. The trials took place in water depths of 15 to 25 m. the percentage of release levels of commercial species, Cephalopod and trash fish were recorded for each JTED type.

At Chumphon provice, the percentage of release from the Rectangular Shaped Window JTED with the 8, 12, 16 and 24 cm. vertical grid space openings was 37.39, 59.52, 35.38 and 32.94 respectively for commercial species and 5.19, 18.93, 19.25 and 6.09 respectively for trash fish. (Fig. 1)

At Prachub Kirikan province, the percentage of release from the Semi-Curved Window JTED with the 4, 6, 8 and 12 cm escape openings was 8.95, 5.17, 12.42 and 10.78 respectively for trash fish, and 29.09, 36.01, 33.04 and 32.99 respectively the juveniles of commercial species. (Fig. 2)

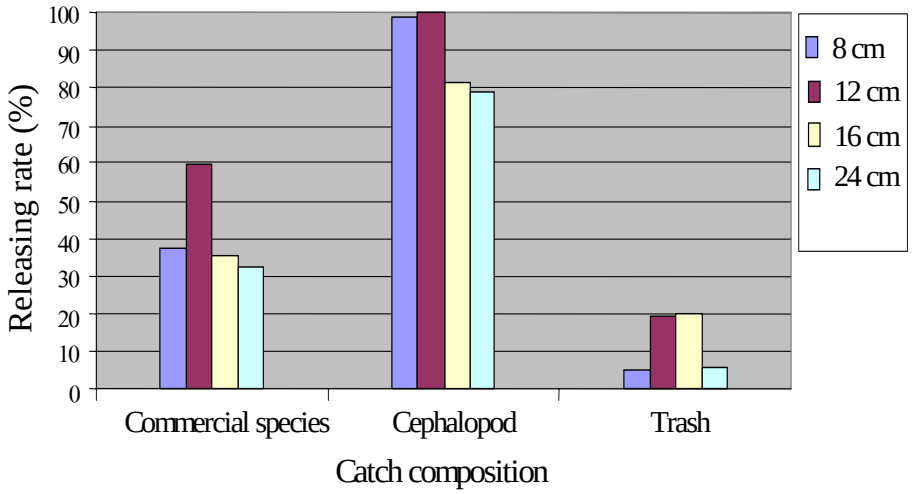

Figure 1. Percentage of releasing of each species by rectangular shaped window JTED

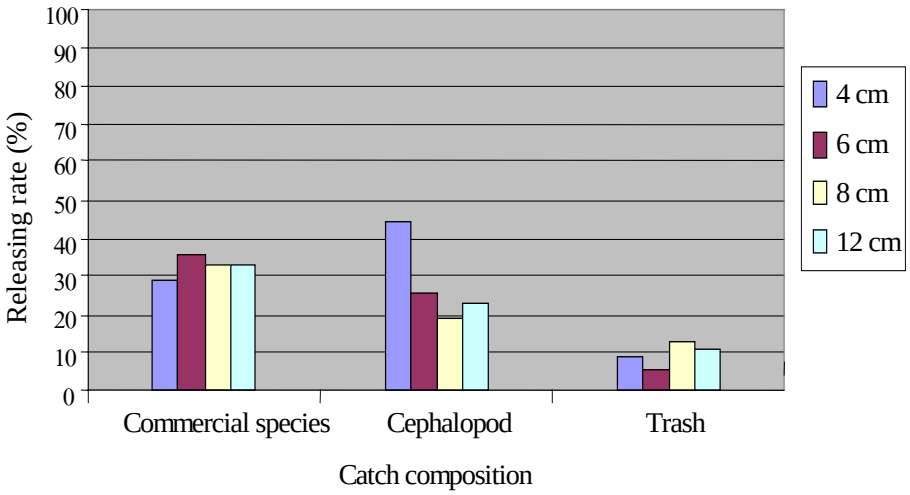

Figure 2. Percentage of releasing of each species by semi-curve JTED.

The Study on Juvenile and Trash Excluder Devices (JTEDs) in Brunei Darussalam

A second series of experiments on the use of Juvenile and Trash Excluder Devices was conducted in Brunei Darussalam in cooperation with the Fisheries Department of the Ministry of Industry and Primary Resources, Brunei Darussalam. These experiments were completed between 20th to 28th September 2000 in the waters off Maura Town. The vessel used for these experiments was the M.V. Tenggili.

In this series of experiments in Brunei waters, the JTED type used was of the rigid sorting grid design. The sorting grids were galvanized steel rod and consisted of three joined sections. Two separate grids with a fixed spacing of 3 cm. were connected in a steel frame covered with polyethylene netting, the main function of which was to guide escaping fish away from the trawl net and to keep the system balanced during operation. The angle of attack of the first grid was 45^0. This grid was kept in a steady position by wing chains attached to the grid in the aft position.

Each fishing trial of the JTED was completed between 07.00 and 17.00 hrs. Each trial consisted of 1 hr tows at a speed of 2.5 to 4 knots and took place in water depths of 19 to 32 m. 15 trials were completed for both the sorting grid and covered codend trawl.

In this series of trials, the release of threadfin bream (*Nemipterus sp.*) was a key area of investigation. It was assumed that threadfin bream with a standard length of less than 13 cm was a juvenile. During the trials with the sorting grid JTED it was observed that approximately 83 percent of the juveniles remained in the codend. In the case of the covered codend experiments, approximately 39 percent of the total catch of juveniles in the inner codend and its cover remained in the inner codend.

The vessel MV. Achoja 1 carried out the second experiments between 27th and 31st July 2003 in the northern part of Brunei Darussalam waters at a towing speed 2.5 - 3.3 knots. By taking half an hour for each trawling, each type of JTED was operated six times in daytime and four times at night using the rigid sorting grid with a bar spacing of 1 cm, 2cm and 3cm. The semi-curved and rectangular shaped window JTEDs were operated in daytime only, six times each, but two more special half hour operations were conducted using the rigid sorting grid JTED with a bar space of 1cm. The total number of operations were forty-four. There were three types of JTED with five differences used in these experiments; semi-curved, rectangular shaped window and the rigid sorting grid with a single bar spacing of 1, 2, and 3 cm in each.

The experiment found that the catch per unit effort (CPUE) of the trawl net in Brunei Darussalam was 283.27 kg/hr/haul, with about 54% in daytime and 46% at night. The release rates from each type of JTED from the catches in the cover net and cod-end found that the rigid sorting grid with a bar space 1 cm has the least releasing rate at 30.38 %, whereas a bar spacing of 2 and 3 cm have about 77.67% and 86.29%, respectively. The release rate of the semi-curved JTED and rectangular shaped window JTED are 42.03% and 12.77%, respectively. The release rates of the rigid sorting grid JTED show that a bar space of 1,2,3 cm can release juveniles and small fish at 30.5%, 81.05%, 85.74% in daytime and 30.14%, 72.59%, 87.12% at night. (Fig. 3)

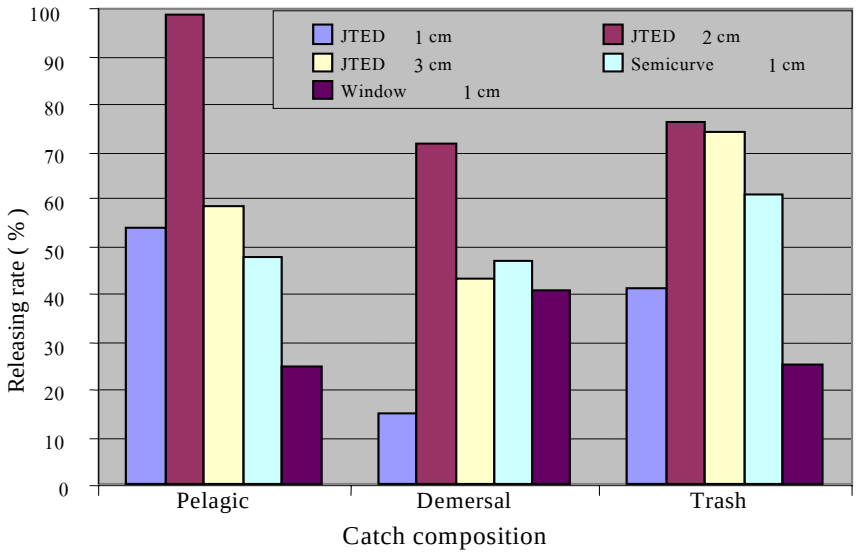

Figure 3. Release percentage of each group by each type of JTED.

The Study on Juvenile and Trash Excluder Devices (JTEDs) in Vietnam

A third series of experiments on the use of Juvenile and Trash Excluder Devices was conducted in Vietnam in cooperation with the Department of Fisheries, Vietnam. These experiments were in the waters of the Gulf of Token, Vietnam.

The rigid sorting grid type JTED was the subject of this series of fishing trials. Trials were conducted using this device type with grid spacings of 2, 3 and 4 cm. Each experimental fishing trial was completed between 07.00 and 17.00 hrs. Each trial consisted of a 1-hr. tow at a speed of approximately 2 knots. Each trial took place in water depths of 19 to 32 m. A total of 21 trials were completed, representing a total of 7 tows for each of the three grid spaces employed.

In this series of trials, the release of *Saurida undosquamis* was the key area of investigation. It was assumed that *Saurida undosquamis* with a standard length of less than 13 cm was a juvenile in this species. The average percentage of release of this species through the JTED with grid spacings of 2, 3 and 4 cm was 50, 25 and 17.5 respectively. Percentage release rates for each grid spacing were analyzed for specific groups of fish, namely pelagic, demersal, trash and miscellaneous species. The greatest release rates were observed for pelagic species. (Fig. 4)

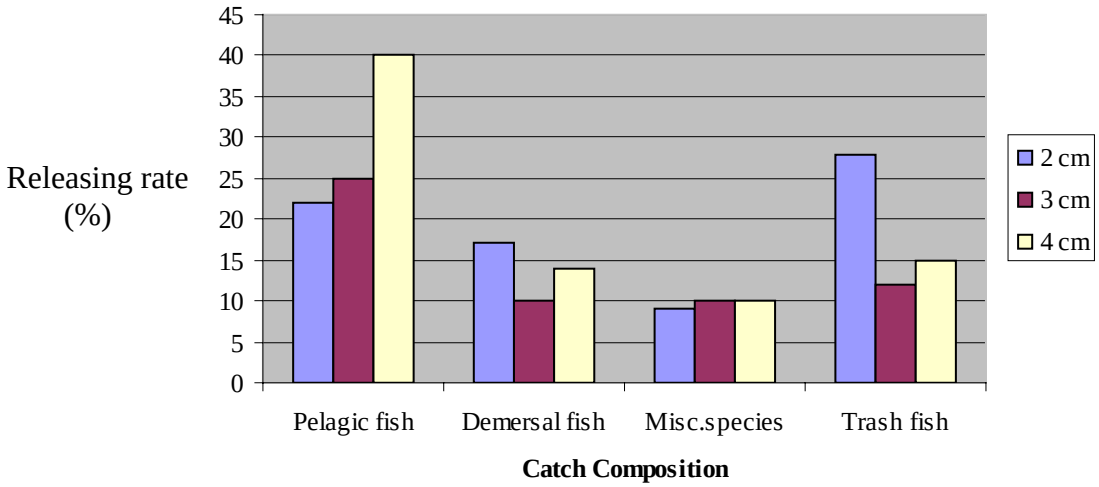

Figure 4. Percentages of the release of each species by sorting grid JTEDs.

The Study on Juvenile and Trash Excluder Devices (JTEDs) in Malaysia

A fourth series of experiments on the use of Juvenile and Trash Excluder Devices was conducted in Malaysia from 12th to 15th September 2001 in cooperation with the Department of Fisheries, Malaysia. These experiments were completed in the waters off Alor Setar, in the Kedah State of Malaysia.

The rigid sorting grid type JTED was used in this series of experimental fishing trials and the bar spacing used were 1.2 and 2 cm. The trials were conducted during both day and night. Each trial consisted of a 1 hr. tow at a speed of approximately 2 knots in water depths of 20 to 28 m. A total of 12 trials were completed.

The CPUE of the day-time fishing trials ranged between 27.52 and 48.93 kg/hr, while the range in CPUE during the nighttime trials was between 31.69 and 35.11 kg/hr. The percentage contribution of trash fish, pelagic species and cephalopods to the catches was generally higher during the daytime. In contrast, catches of demersal species during the night trials were approximately 3 times higher than those of the daytime. The time of day also influenced the catch of small shrimp, which were only retained during nighttime trials. Larger shrimp were observed in catches made during both the daytime and night trials.

The total average percentage release of fish through the rigid sorting grids with spacings of 1.2 and 2 cm. was observed to be approximately 35 and 73 respectively. Highest release levels were observed for trash fish. The percentage release of fish from this group was approximately 70 and 87 for the 1.2 and 2 cm. sorting grids respectively. Approximately 63 percent of the pelagic fish and 44 percent of shrimp were released through the 2 cm sorting grid. Blue swimming crab (*Portunus pelagicus*) contributed approximately 2.5 percent of the total catch by weight, however, none of this catch was observed to escape through the sorting grid. (Fig. 5)

Approximately 40 percent of the short mackerel (*Rastrelliger brachysoma*) catch were released through the 2cm. sorting grid. No release of this species was observed through the 1.2 cm. sorting grid. The 1.2 cm. spaced grid shows a high efficiency in catching medium and larger sized (> 120 mm.) specimens of this species both during day and nighttime operations.

The 1.2 cm. spaced sorting grid was highly effective in selecting the larger sized (>110 mm) threadfin bream (*Nemipterus* sp.) and in releasing smaller fishes of the species during daytime operations. However, during the nighttime trials, approximately 45 percent of the smaller sized fishes of this species caught were retained in the codend.

Large shrimp, like the *Penaeus merguiensis* and *Penaeus semisulcatus*, caught during the trials varied in length between 100 and 200 mm. Approximately 5 percent of the total large shrimp caught during the trials were observed to be able to escape through the 1.2 cm. spaced sorting grid. Where the 2 cm. spaced sorting grid was used, some large shrimp of approximately 190 mm. in length were seen to escape.

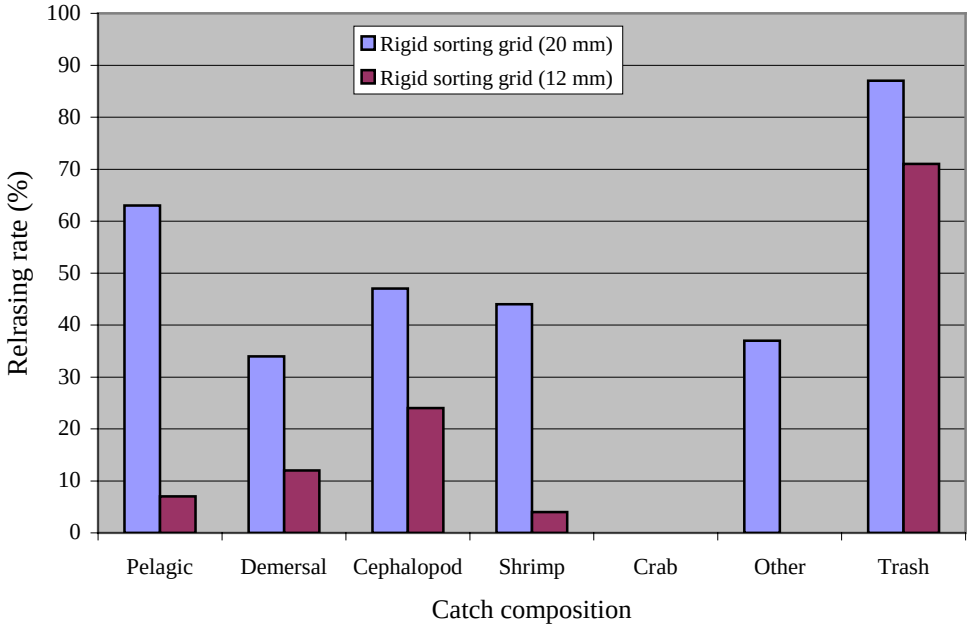

Figure 5. Percentage release of each species by sorting grid JTEDs.

The Study on Juvenile and Trash Excluder Devices (JTEDs) in Indonesia

A fifth series of experiments were completed in August 2002 on the use of Juvenile and Trash Excluder Devices in Indonesia in cooperation with the Department of Marine Affairs and Fisheries, Indonesia. These experiments were conducted using double rigged trawls on a commercial trawler in the Arafura Sea of Eastern Indonesia.

A total of eight trials were completed. Four trials involved the rigid sorting grid JTED with a 4 cm. spaced sorting grid, two involved the rectangular shaped window, while the remaining two involved the semi-curved window design. Each trial consisted of a 1 hr. tow at a tow speed of 2.5 to 4 knots in water depths between 29 and 39 m.

The rigid sorting grid device with the 4 cm. bar spaced sorting grid was observed to achieve the highest release rates. Approximately 79 percent of the total catch was observed to release through this device. Both the rectangular shaped window and semi-curved window devices achieved 25 percent release levels.

Releasing rate for pelagic species ranged between 49 to 97 percent. On average, the rigid sorting grid, the semi-curved window and the rectangular window devices released 97, 53 and 49 percent of pelagic fish respectively. (Fig. 6)

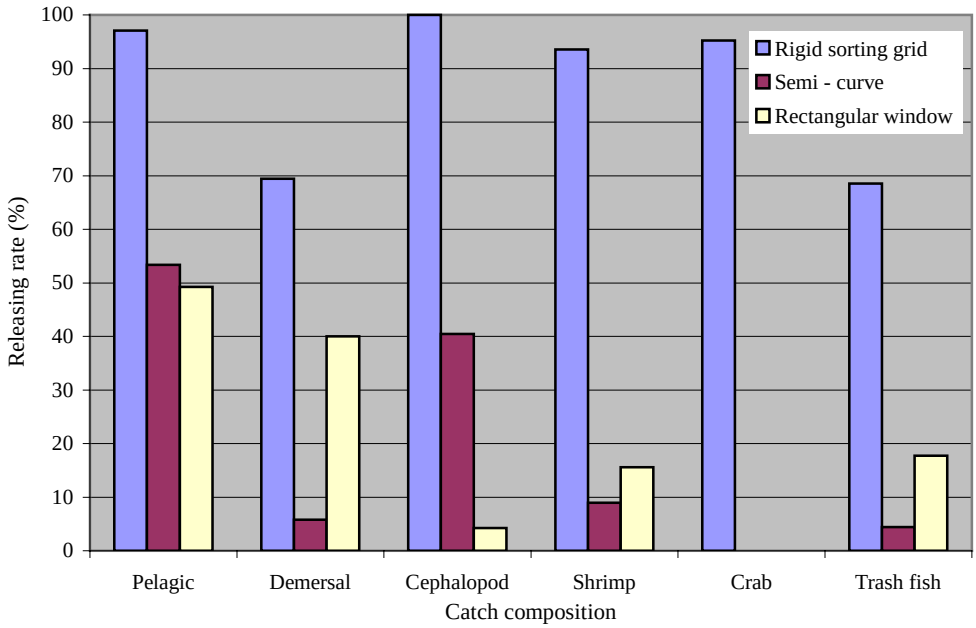

Figure 6. Percentage of release of each species by each type of JTEDs.

The Study on Juvenile and Trash Excluder Devices (JTEDs) in the Philippines

The sixth series of experiments on the use of Juvenile and Trash Excluder Devices was conducted in the Philippines in a cooperation with the Bureau of Fisheries and Aquatic Resources of the Philippines. These experiments were completed during the period 30th April to 7th May 2003 and used two commercial fish trawlers in the Manila Bay area of the South China Sea.

The rigid sorting grid type JTED with three different grid spacings of 1, 2 and 3 cm., the rectangular window type JTED with a grid spacing of 1 cm., and the semi-curved window JTED with a grid spacing of 1 cm. were used in this series of experimental fishing trials. The trials were conducted at both day and night. Each trial consisted of 1 hr tows at speeds between 2 to 3.5 knots and was conducted in water depths of 20 to 35 m. A total of 43 trials were completed.

The results of the trials indicate that the CPUE ranged from 12 to 29 kg/hr. During the daytime, and the percentage release from the rigid sorting grid with grid spacings of 1, 2 and 3 cm. was 33, 77 and 79 respectively. The percentage release from the rectangular shaped window device was 55, while that for the semi-curved device was 45. During the night, the release level for the sorting grid with a grid spacing of 1 cm. and the semi-curved and rectangular shaped window devices were 33, 53 and 57 percent respectively. (Fig. 7)

It was identified that large size shrimp are usually retained in the codend, unless the rigid sorting grid with a grid spacing of 2 cm is employed. When this is the case, some 22 percent of the large shrimp were released. For smaller shrimp, up to 55 percent were released when any JTED is being used.

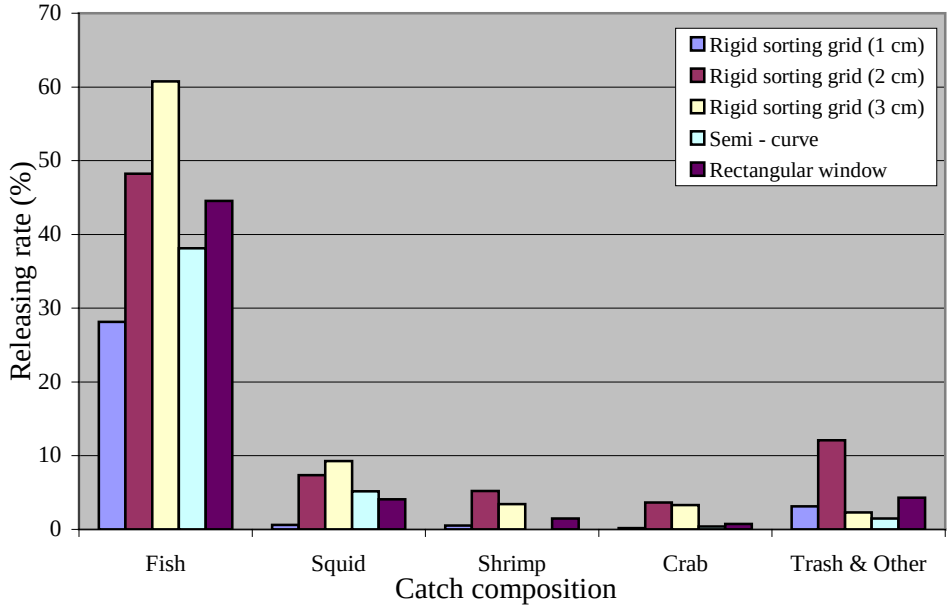

Figure 7. Percentage release of each species by JTED types.

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