THE RELATION SHIP BETWEEN SHRIMP TRAWL FISHING GROUNDS AND ADULT FEMALE GREEN TURTLES IN THE GULF OF THAILAND

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ABSTRACT

We tracked adult female green turtles using Argos platform transmitter terminals (PTTs) in the Gulf of Thailand in 2000 and 2001. Their migration paths were divided into three groups. One was to stay around the nesting sites. The other two groups were to migrate eastward and southward. We examined the relationship between their migration paths and the distribution of shrimp trawl fishing grounds. The migration paths appear to overlap with the trawl fishing grounds. However, they never overlap with the fishing grounds and were not overtaken by fishing gears when they migrate off shore since Thai government prohibits commercial fishing within 3,000 m off the coast lines to protect natural resources including sea turtles since 1972 and the migrate speed of the turtles were the same as that of the fishing vessels.

INTRODUCTION

Some sea turtles are incidentally caught by trawl nets. That is the problem of bycatch. The bycatch of sea turtles was caused when the turtle migration paths overlapped with the fishing grounds. Therefore it is necessary to investigate the relationship between the fishing grounds and the migration paths of sea turtles to avoid the bycatch.

Shrimp fisheries are mainly operates in the coastal areas during nighttime in Thailand. They usually operate three kinds of nets, trawl nets, pulling nets, and gill nets. These fishing gears are used to catch shrimps embedded and feeding on the muddy sand bottoms in the shallow waters. During the operations, the trawl nets are used at the level of less than one meter above the sea grounds. The pushing nets and the gillnets are operated near the mangrove areas where the depth of water are ranging from five to seven meters and the quality of the water in the mouth are high turbidity (Martin et al. 2000). In Thailand, the trawl nets occupied the largest amounts in marine fisheries (Fig.1). However there were few reports to catch sea turtles incidentally in Thailand.

In this background, we clarified the relationship between shrimp trawl fishing grounds and the migration paths of green turtles in the Gulf of Thailand.

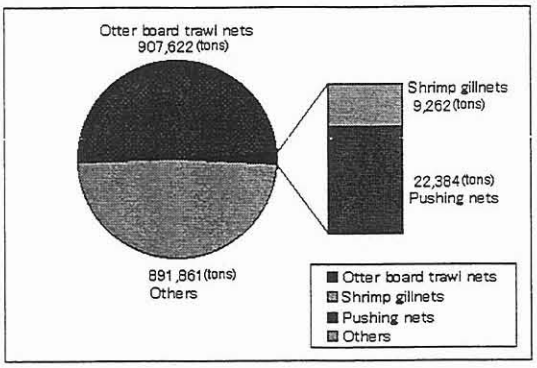

Figure 1. Catch (tons) of marine fishery by types of fishing gears for shrimps in the Gulf of Thailand in 1997. (Fisheries Statistics of Thailand, DOF of Thailand)

MATERIALS AND METHODS

In this study, we used some reports of monitoring surveys of the trawl fishing grounds in the Gulf of Thailand by the Department of Fisheries of Thailand. The Marine Fisheries Division, Department of Fisheries of Thailand has been monitoring distribution abundance and species of shrimps by trawl nets in the Gulf of Thailand since 1967. In the surveys of the reports, otter-board trawl nets were used as a standard fishing gear. The surveys had been conducted in nighttime by a grid sampling method for two-hour trawling with two-knot speed.

We adopted Argos tracking system to investigate the migration paths of sea turtles. In 2000 and 2001, eleven adult female green turtles *Chelonia mydas* were equipped with Argos platform transmitter terminals (PTTs) with epoxy glues on their carapaces (Tab. 1). We used two types of PTTs: ST-18 (Telonics Inc., USA) and Kiwisat101 (Sirtrack Ltd., NZ). All the turtles with the PTTs were released from Khram Island in Chonburi Province (Fig.2).

Table 1. Information of PTTs-attached green turtles (*Chelonia mydas*) from the Gulf of Thailand, between 2000 and 2001.

Turtle Number	PTT	ID number	Body size (cm)	Weight (kg)	Released Date	Time	Location
GT1-2000	ST-18	16724	91x104	125	18/5/00	11:20	Khram Is.
GT2-2000	ST-18	28532	89x100	130	29/6/00	11:05	Khram Is.
GT3-2000	ST-18	28534	85x98	115	29/6/00	10:40	Khram Is.
GT4-2000	Kiwisat 101	16723	86x98	110	12/9/00	21:30	Khram Is.
GT5-2001	Kiwisat 101	09786	81.4x95.7	80	8/8/01	12:37	Khram Is.
GT6-2001	Kiwisat 101	09787	70.7x88.9	94	10/8/01	10:15	Khram Is.
GT7-2001	Kiwisat 101	09785	89.7x95.8	86	10/8/01	10:20	Khram Is.
GT8-2001	Kiwisat 101	09804	90x98.5	100	10/8/01	10:35	Khram Is.
GT9-2001	Kiwisat 101	09788	75.5x81	69	15/8/01	10:35	Khram Is.
GT10-2001	Kiwisat 101	17682	85x95	100	3/9/01	24:00	Khram Is.

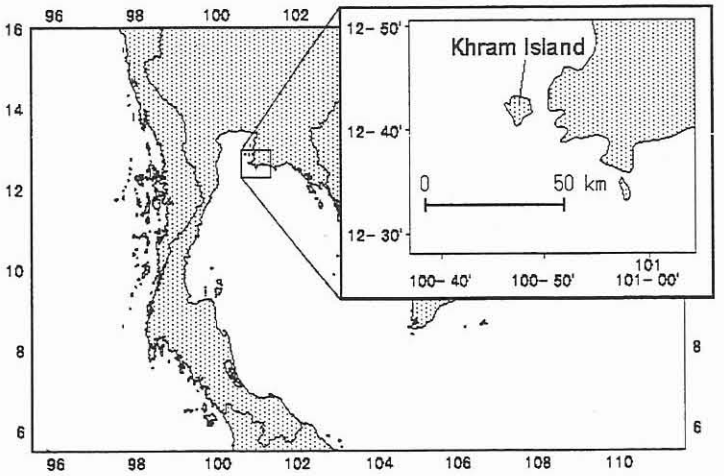

Figure 2. The turtle releasing point, Khram Island.

RESULTS

The horizontal distribution of the catch per unit effort (CPUE) of the shrimp trawls was shown in Fig.3. Almost all the shrimp trawls were operated within 100 km off coastal lines. In 1996, the highest CPUE grounds were distributed in the head of the Gulf and in the southwestern part of the Gulf. The vertical distribution of the CPUE was shown in Fig.4. The shrimp trawls were operated ranging from 12 to 45 m depth. They were operated mainly around 20 m depth.

In the Gulf of Thailand, sea grass beds developed coastal areas. The model of the sea grass bed in the Gulf of Thailand was shown in Fig.5. The sea grass beds were located ranging from - 3 m to 8 m vertically. On the other hand, they were ranging less than 500 m from the coastal line horizontally.

Migration paths of the adult female green turtles in the Gulf of Thailand were shown in Fig.6. We can classify the migration paths as three categories; 1) they stayed near their nesting sites around the release points (GT2-2000, GT6-2000, and GT10-2001), 2) they migrated along the eastern coastal areas (GT3-2000, GT4-2001, GT5-2001, GT7-2001, and GT11-2001), 3) they migrated southward (GT1-2000 and GT8-2001).

DISCUSSION

The PTT tracking showed that some turtles seemed to stay in the coastal areas to forage sea grass. The migration paths appear to overlap with the trawl fishing grounds. However, they never overlap with the fishing grounds since Thai government prohibits commercial fishing within 3000 m off the coast lines to protect natural resources including sea turtles since 1972. In addition, sea grass beds where the turtles feed develop less than only 500 m. It is clear that the turtles have few chances to meet shrimp trawl gears when they feed in the sea grass beds.

The next is to consider when the turtles migrate through the fishing grounds off shores. The minimum migration speed was easily calculated from each position estimated by Argos PTTs (Sakamoto et al. 2000). In the Gulf of Thailand, the turtles migrate to the southward or eastward at a speed of 50 km a day. On the other hand, the operating speeds of the shrimp trawl vessels were at around two knots equal to about 44.4 km a day. That is the both speeds were almost the same. Therefore, the shrimp trawl vessels were not able to overtake the turtles during fishing operation.

We concluded that it is very rare to bycatch adult female green turtles by shrimp trawl in the Gulf of Thailand. However, we have to consider the other case such as the bycatch of male green turtles, young turtles, and the other species.

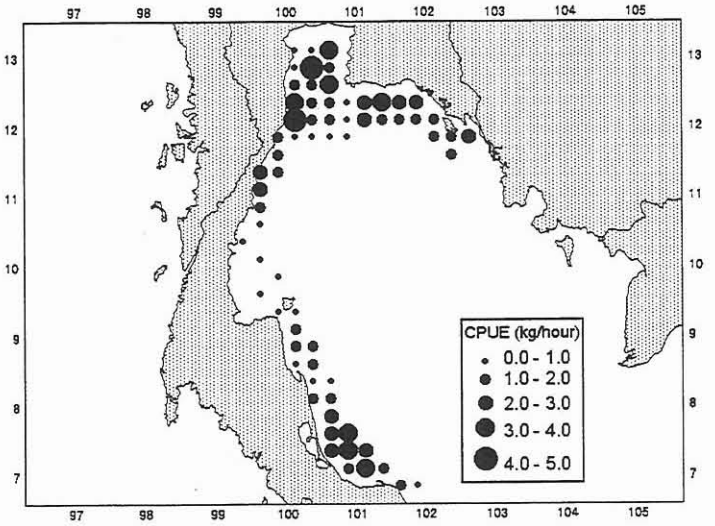

Figure 3. The horizontal distribution of the shrimp CPUE (kg/hour) in the Gulf of Thailand 1996.

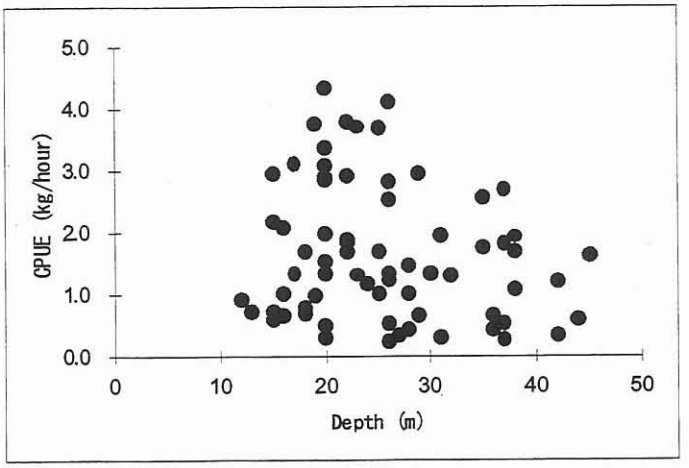

Figure 4. The vertical distribution of the shrimp distribution in the Gulf of Thailand 1996. The vertical axis means the CPUE (kg/hour) of each investigated point. The horizontal axis means the depth.

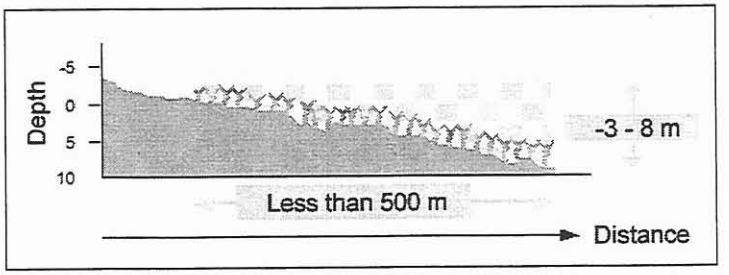

Figure 5. A model of the sea grass bed in the Gulf of Thailand. The vertical axis means the depth. In this axis "0" means lowest water level. The horizontal axis means the distance from coastal lines.

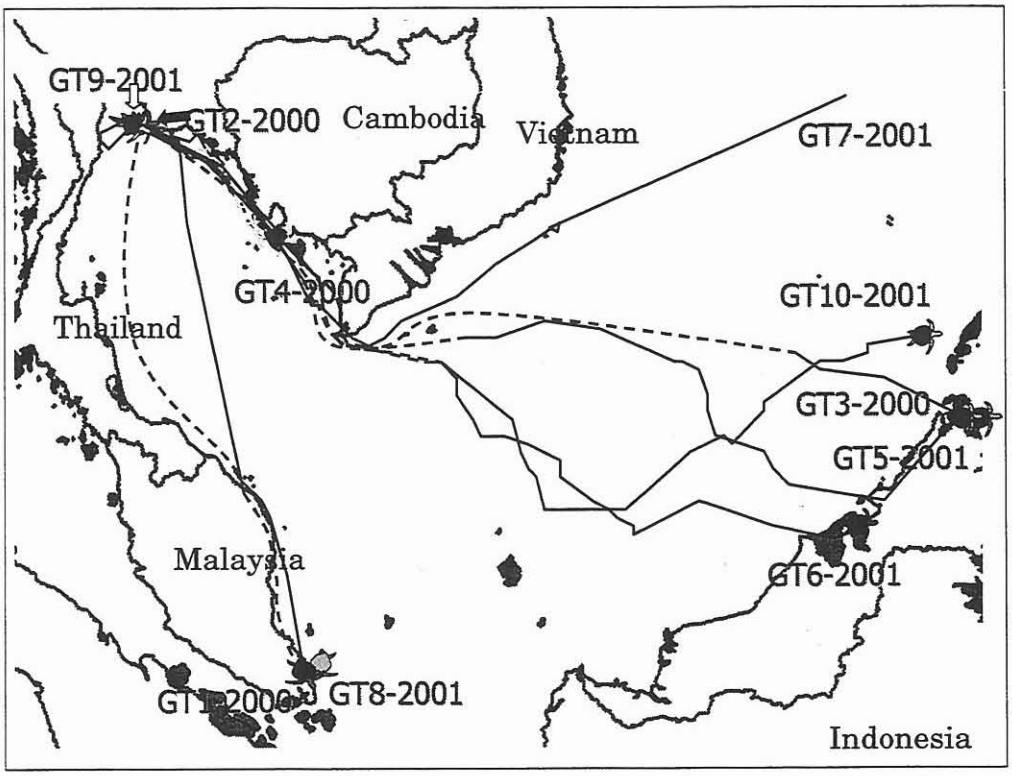

Figure 6. Migration paths of adult female green turtles in the Gulf of Thailand.

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