

Title	INTERNATIONAL CONSERVATION AND MANAGEMENT OF STRADDLING STOCKS INCLUDING SEA TURTLES
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Citation	Proceedings of the 3rd Workshop on SEASTAR2000 (2002): 83-86
Issue Date	2002
URL	http://hdl.handle.net/2433/44164
Right	
Type	Conference Paper
Textversion	publisher

INTERNATIONAL CONSERVATION AND MANAGEMENT OF STRADDLING STOCKS INCLUDING SEA TURTLES

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ABSTRACT

Wildlife including sea turtles in the ASEAN countries has faced the extinction due to rapid economic development of human being. We have started to study to clarify the ecology of green turtles in Gulf of Thailand and Andaman Sea to prevent their extinction. Satellite tracking of the sea turtles indicates that the turtles migrate from Thai waters to other countries' waters including Brunei, Cambodia, India, Indonesia, Myanmar, Malaysia, and Vietnam. It is very important to install Turtle Excluder Devices (TEDs) and to analyze the relationship between turtle's habitats and human activities to avoid the incidental catch by fishing gears. In addition, it is also important to share the information on sea turtle ecology among the countries using computers.

INTRODUCTION

Sea turtle populations have been decreasing rapidly (CMS, 2001). Although the main reasons of the decrease were due to the destruction of the seashore environment by the construction of recreational facilities, the incidental catch of the sea turtles was also the very serious problem. In 1997, the U.S. government notified the ASEAN countries not to import shrimps caught by trawlers, without TEDs. In this background, our research was to design the conservation and management of the sea turtles applicable to the ASEAN countries. The results of the satellite tracking and data logger studies from 2000 to 2002 were reviewed in this paper.

MATERIALS AND METHODS

We conducted a tracking study of nesting female green turtles in 2000 and 2001. Argos Satellite transmitters (KiwiSat 101 and Telonics ST18) were attached on to the carapace of female green turtles that nested at Khram Island in Gulf of Thailand and Huyong Island in Andaman Sea. In 2002, to elucidate the further aspects of female green turtle's behavior, we developed brand-new data

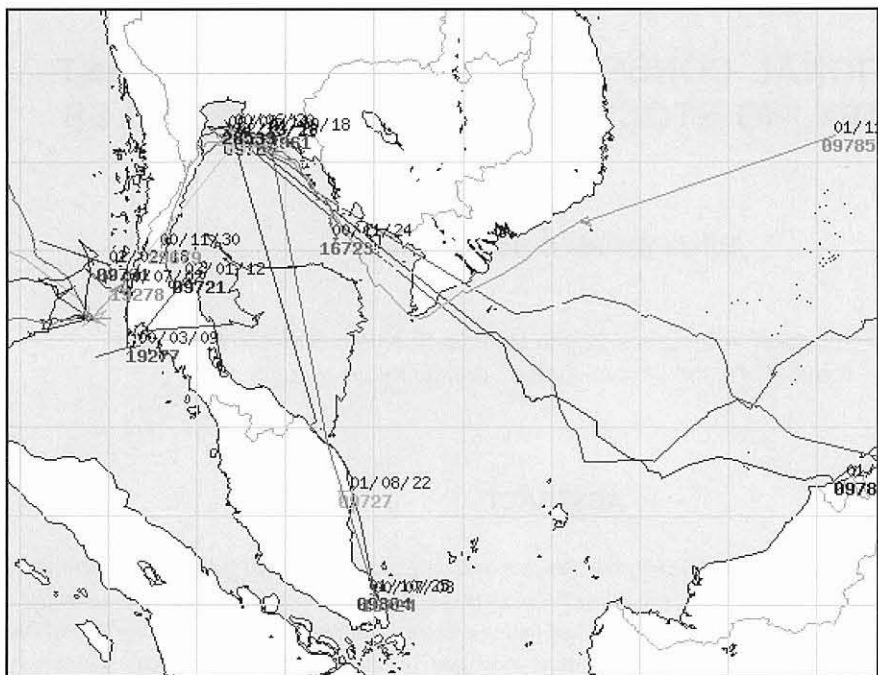
loggers in 2002. One of the new loggers was a Magneto-resistance acceleration logger (MR-logger) to record a heading direction and dive angle. The other was a CCD-logger to take pictures which turtles looked under water. We attached these loggers on the carapace of a female green turtle that nested at the Huyong Island. It was unfortunate that we had no recovery of the data loggers yet.

RESULTS & DISCUSSION

Gulf of Thailand

Ten female green turtles were tracked using a satellite system after their nesting at Khram Island in the Gulf of Thailand in 2000 and 2001. One female was tracked only during the nesting period. The other one female was tracked both during the nesting and after the nesting period. Eight females were tracked during after the nesting period.

During the nesting period, two females migrated around the Khram Island. After the nesting period, two



*Fig.1
Migration routes of
female green turtles
in the Gulf of
Thailand and
Andaman Sea.*

female migrated southwestward and reached the western coast of Thailand and the other seven female migrated southeastward along the coastal line. Some females lingered near the coastal line for about one week on the way of their migration. It was suggested that they foraged sea grass during the period because all recognized sea grass beds were located near the coast (Shiba et al., 2002). Finally, seven females traveled to the South China Sea. So, most females equipped satellite transmitter straddled South East Asian countries waters, for example - Thailand, Cambodia, Vietnam, Malaysia and Brunei.

One of the serious threats to sea turtles is an incidental catch by shrimp trawls. A technological solution to separate turtles from shrimp trawl nets has been available since early 1980s. A Turtle Excluder Device (TED) incorporates a trap door in the trawl just before allowing sea turtles to escape from the nets (Siedel and McVea, 1982). The TED probably helps to decrease the mortality of the adult turtles and increases the breeding rate. It is suggested that threat of sea turtles is also lowness of survival rates of juveniles and hatchlings. Almost all the past conservation programs, for example - egg management and release hatchlings, were concentrated to increase the survival rate of juveniles and hatchlings (Crowder et al., 1994). Crowder et al. (1994) reported that the TED is more effective than the past conservation programs. But it is said that the TED is not so effective as conservation program in Gulf of Thailand because the

habitats of the green turtles differ from the shrimp trawl fishing grounds both vertically and horizontally (Shiba et al., 2002). The result indicates that it could be difficult for the countries to agree to a simple conservation policy as the environment surrounding sea turtles were different among the countries.

ANDAMAN SEA

Eight female green turtles were also tracked using the Argos system after their nesting also at Huyong Island of Similan Islands in the Andaman Sea in 2000 and 2001. During the nesting period, seven females migrated around the nesting site. One female migrated to Ra Island located about 90 km northeast from the Huyong Island, and returned to the Huyong Island for the next nesting after staying around the Ra Island about one week. In the Ascension Island which is a major nesting ground in the Atlantic Ocean, it is suggested that the optimum strategy of the females during an internesting period is the minimization of their cost of transport because there is little or no food available for herbivorous green turtles (Hays et al., 2001). Considering the relationship between cost and benefit, a female green turtle may be foraging during the internesting period, if a feeding ground was situated near the nesting ground. The benefits obtained by foraging could overcome the traveling cost of a migration to a feeding ground. In fact, the female spent for seven days

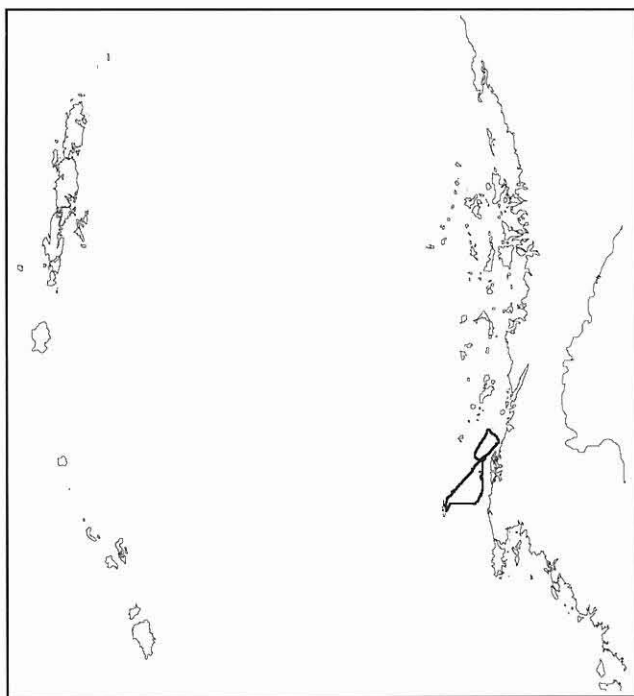


Fig. 2
Migration route of female green turtle nested in Huyong Island during inter-nesting period. The female migrated between Huyong Island and coast of Ra Island.

at the Ra Island during the nesting period for 13 days. There are sea grass beds around Ra Island. This fact could also support our hypothesis (Poovachiranon, unpublished). We could say that the Ra Island is safe place which allows a turtle to avoid predators. But it cannot explain the reason why the other turtles stayed around their nesting grounds.

After the nesting period, six females moved almost straight from nesting grounds to the Andaman Islands, India. It indicates that the turtles could make their cost of transport minimum. Coasts of the Andaman Islands seemed to be feeding grounds of the females because they stayed there for a long time and their migration speed decreased when they arrived around the coastal area. One female, which stayed around Ra Island during the nesting period, returned to the Ra Island and stayed there again until the signals from transmitter were stopped.



Fig. 3 Female green turtle equipped with MR-logger and CCD logger. Unfortunately we had no recovery of the data loggers yet.

The results of satellite tracking of sea turtles in the Gulf of Thailand and Andaman Sea showed that they migrated around many countries' waters, for example - Brunei, Cambodia, India, Indonesia, Myanmar, Malaysia, Thailand and Vietnam. The sustainable conservation and management will be realized based on the socioeconomic, cultural and scientific studies. In addition, we have to share the information effectively among the countries and open the information to peoples. Recent computer technologies can be one of the fastest methods to enhance cross-cultural communication.

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