Reproductive biology of green turtle at Ko Khram Island, Chonburi Province, Thailand.

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Abstract

Survey on green sea turtle nesting at Ko Khram Island, Chonburi Province was undertaken by using electronic microchip tag during the nesting season of 1994-2000. Some green turtles returned ashore to nest on the same beach up to 5 times with inter-nesting interval of mostly 10-12 days. Nesting cycle in between breeding season shows a remigration of 2-5 years periodicity. The nesting females average 97.6 cm in curved carapace length and grow slowly at a mean rate of 0.36 cm per year. No trend of growth increasing in yearly mean carapace length for green turtles nesting during 1986-2000 was examined. The results seem that the nesting female population may have the recruitment for each year, otherwise the trend of size average in many years should be increase into a consistency of growth. However, the number of egg collection in last over 10 years at Ko Khram Island showed a little decline. More information of tag return, including the turtle recapture from feeding ground, are entirely needed in order to determine and estimate the population of sea turtle in the future.

Key words : green turtle, reproductive biology

Introduction

Ko Khram Island, Chonburi Province (12° 42' N, 100° 47' E) is one of the biggest nesting sites of sea turtle in the Gulf of Thailand. There are only two species reported nesting, green turtle *Chelonia mydas* and hawksbill turtle *Eretmochelys imbricata*. Due to the habitat protection program of sea turtle in Thailand since 1956 the activities of sea turtle conservation on Ko Khram Island have been undertaken. (Penyapol, 1957; Phasuk, 1992; Monanunsap and Charuchinda, 1994; Charuchinda and Monanunsap, 1998). The nesting beaches in this area have long been protected by the Royal Thai Navy and the Department of Fisheries. The purposes of this study were to summarize on the nesting cycle and reproductive biology of green sea turtle nesting at Ko Khram Island and determine the trend population of female turtle in order to provide further information on sea turtle conservation.

Materials and Methods

The long-term tagging on female green turtle at Ko Khram Island, a 12-km^2 Island located in the inner gulf of Thailand was carried out during nesting season (April-August) between 1994 and 2000. Passive integrated transponders (PITs) tagging technique have been conducted by using electronic microchip injection to under-skin layer on base of left front flipper of the female. The handle scanner is always used to identify the number of PITs tag within distance closed to 3-5 inches. Flipper tag or gum cement with a plate number was also attached to each female for external search tagging. Nesting behavior and egg clutch of the turtles was directly observed. The location and time of nesting was recorded. Th turtles were measured for carapace length and width in both curved and straight-line. If convenient, the body was weighed by hand balance. Growth of turtle was measured from the carapace length and time each between first and last found of the season. Linear regression of the body weight and carapace length was performed on log-transformed data to test fit in the model : $\log W = b \log L + \log a$, where a is the Y intercept and b is the slope

Results

Nesting cycle

A hundred and thirteen female green turtles were tagged with microchip tags during nesting season at Ko Khram Island in 1994-2000. Table 1 shows the periodicity of tagged female remigration back to the same areas both inter-nesting period and between breeding season. Some females could return to nest for up to 5 times in the same year of nesting season. The inter-nesting interval was found mostly in 10-12 days with a long interval of 8-51 days. For the data of remigration in between nesting season, there were only ten green females seen again on the nesting beach in last 3-years period (1998-2000). The remigration interval of turtles ranged between 2-5 years : 2 years for 2 females, 3 years for 4 females, 4 years for 2 females and 5 years for 2 females. (Table 1)

Table 1. Nesting records of green turtle at Khram Island, Chonburi in 1994-2000.

Year	No.of female tagged	No.of tagged female back in between season	No. of female returned to nest again in the same year of season in each times					Inter-nesting interval (days)	Between season interval (years)
			1	2	3	4	5		
1994	11	-	9	1		1		9 - 16	-
1995	25	-	12	5	6	1	1	8 - 12	-
1996	16	-	11	3	2			8 - 12	-
1997	21	-	7	8	4	2		9 - 20	-
1998	13	2	13	1	1			10 - 28	2 - 3
1999	15	6	6	5	4	2	4	10 - 48	2 - 5
2000	12	2	5	3	4	2		10 - 51	3
Total	113	10	63	26	21	8	5	8 - 51	2 - 5

Size and growth of nesting female

Body size of nesting females at Ko Khram Island measured in 1994-2000 was summarized in Table 2. The carapace lengths of green females were between 78.5-104.5 cm in straight-line and 85-109 cm in curved-line. Correlation between the length in straight-line against to the curved-line was very high. The straight length was about 93.5% of the curved carapace length. Range of body weight of female found between 74-140 kg with averaged of 101.7 kg (N=36). The relation between curved carapace length and body weight calculated in term of log value is the equator of log W = 2.9349 log L - 3.8272. Mean clutch size of Ko Khram green female was 98.9. Increase in curved carapace length (cm/yr) was very little. From the remigration of nesting female between breeding season the mean growth rate was 0.36 cm/yr with the range of 0-0.66 cm/yr.

Table 2. Body size and egg fecundity of green turtle nesting at Khram Island, Chonburi Province during 1994-2000.

	N	Mean	Standard Deviation	Range
Carapace length in Straight-line (cm)	117	91.5	5.08	78.5 - 104.5
Carapace length in curved-line (cm)	71	97.6	5.15	85 - 109
Growth rate in the curved length (cm/yr)	9	0.36	0.18	0 - 0.66
Body weight (kg)	36	101.7	15.4	74 - 140
Clutch size in nest (eggs)	142	98.9	21.7	32 - 161

Ko Khram Island green females comparing to the other nesting areas, such as Sarawak of Malaysia or Costa Rica in Caribbean Sea, were almost the same size of carapace length. The Sarawak green averaged in 95 cm in curved carapace length and 105 eggs in clutch. The Costa Rica female was 100 cm in mean length and 110 eggs in average and growth rate was ranged in 0.3-0.4 cm/yr (Hendrickson, 1958; Carr and Goodman, 1970; Phasuk, 1992).

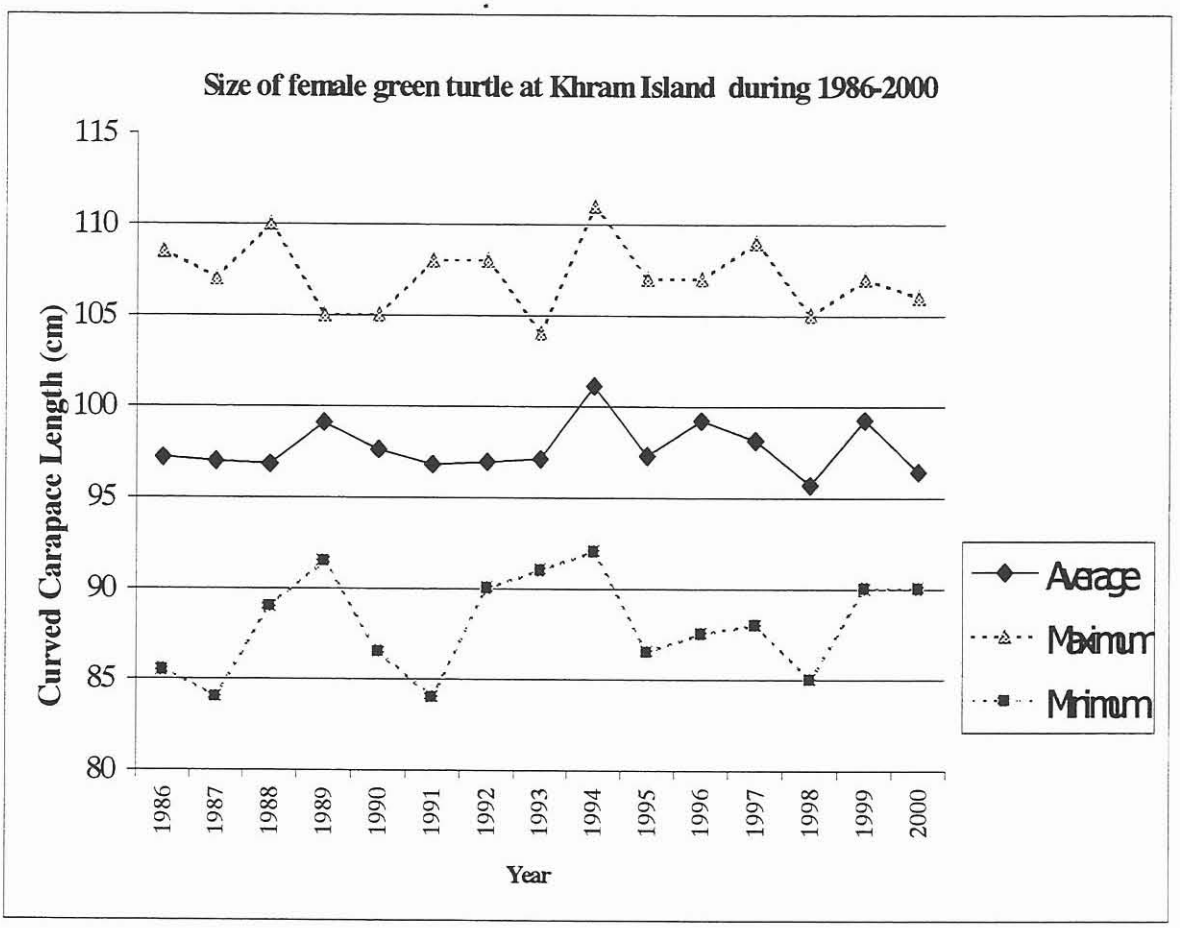
Trend estimation of nesting female

The record of female nesting in Ko Khram Island during 1983-2000 showed that number of nesting females seem to be decreasing. The high peak of yearly nests found in 1986 and 1988. (Table 3) The number of females each year may be estimated by using the basic knowledge of nesting cycle and the number of eggs found in the nesting site. During last 5 years (1995-1999) the number of eggs was found less than 300 nests a year and the number of clutch for one female during the same season could be not less than 3 times. It mean that Ko Khram green females are not more than 100 individuals each year. If the nesting cycle between season is 3-years period the total number of nesting turtle should be less than 300 females.

Table 3. Records of egg collection and incubation of green turtle found in Khram Island, Chonburi Province during 1983-2000. (until August for year 2000)

Year	No. of nests found	No of eggs found	No of eggs incubated	% of eggs incubation from all found
1983	365	31,381	5,328	16.98 %
1984	496	38,774	6,244	16.10 %
1985	380	31,009	3,365	10.85 %
1986	933	80,335	12,725	15.84 %
1987	251	21,677	3,093	14.27 %
1988	904	83,742	7,290	8.70 %
1989	289	24,593	2,600	10.57 %
1990	259	25,043	3,392	13.54 %
1991	411	38,534	5,366	13.92 %
1992	295	28,970	14,651	50.57 %
1993	478	43,460	25,766	59.29 %
1994	215	24,070	24,070	100 %
1995	238	23,558	23,558	100 %
1996	223	22,124	22,124	100 %
1997	257	25,089	25,089	100 %
1998	235	21,978	21,978	100 %
1999	292	28,836	28,836	100 %
2000	134	12,735	12,735	100 %
Mean	369.7	33,661.6	13,789	40.97 %

The mean carapace length of nesting females each year may be determined for the trend of the new turtle recruited in the nesting site. Figure 1 shows data of carapace length of green females recorded at Ko Khram during 1986-2000. The mean length of females now has remained the same as that for the last over ten years. It mean that there may some recruitment occurred in this area, otherwise the mean length should be a little increase tending to the growth rate of females. However, The number of eggs found is also the important indicated for the female population in this area. In order to determine population of sea turtle, more information of tag returns and the reproductive output of nesting site is therefore needed for estimation on the number of sea turtles.



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