

Nesting Strategy in the Green Turtle, *Chelonia Mydas*, during High and Low Nesting Peaks at Ras Al-Hadd, Oman

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Abstract. The nesting beaches at Ras Al-Hadd Reserve, Oman, are one of the largest in the world for the green turtles. The green turtles nest year round. This study was conducted during 2006-2007 nesting peaks. Based on the number of turtles visiting the beach to lay their eggs, nesting activities are divided into two annual peaks. During high peak (June-October) hundreds of turtles visit the beach to lay their eggs nightly. During low peak (November-May) on the average, 10-20 turtles visit the beach to lay their eggs. In this study, a comprehensive study was conducted during three months selected from each peak. During high peak, there is an increase in food supplies along the shoreline, such as algae and sea grasses. This condition is mainly caused by the wet monsoon winds from the sea bringing organic and inorganic essential nutrients for the growth of the grasses and algae. During low peak, the reverse condition occurs with the decrease of food supplies and with drying winds blowing from the north. Nest digging during high peak is easier than low peak because of the wet sand making nest collapse less frequent. Based on these ecological conditions, the green turtles may have adapted a behavioral preference to nesting during high peak. This behavioral nesting activity confirms the fact that most of the green turtles nest at the Reserve when the ecological conditions are ideal.

Keywords: Nesting, green turtles, high and low nesting peaks.

1. Introduction

Nesting behavior, reproduction and ecology of the sea turtles have been described for different species at different regions of the world [1]-[4]. At Ras Al-Hadd, Alkindi *et al.*, [5] described the nesting behavior of the green turtles during high and low nesting peaks. In the present study, a comparative survey of low and high nesting peaks was compared during two successive years (2006-2007). During June 2007, the cyclone Guno struck the nesting beaches of the Ras Al-Hadd and caused little damage to the nesting beaches. The objective of this study is to compare the nesting population during both years including high and low nesting peaks. In addition, nesting population in 2007 was compared to nesting population 2006 to analyze the effect of cyclone Guno.

2. Materials and Methods

2.1. Study Area

Ras Al-Hadd, reserve is located where the Gulf of Oman and the Oman Sea meet between 22o 32'N and 59o 45'E and 22 o 14'N and 59o 48'E. The coast line extends from Ras Al-Hadd to Ras ArRu-ays in the south and is characterized by moderate to high energy wave action, and is mostly sheltered by rocky hills. Approximately 20 beaches make up the Reserve. Most of these beaches are protected by rocky hills and are considered ideal nesting grounds for the green turtles.

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2.2. Sample Collection

The Reserve rangers gathered data on the number of nesting turtles every night and also the number of nesting tracks were counted during early morning to obtain the number of nesting turtles visiting the beach. The data is gathered daily and the records were kept in the reserve office in the Ministry of Environment and Climate Affairs since 1990. In addition, data on the tag recapture program were gathered daily. During the course of this project we were fully involved in counting the fresh tracks and the complete and incomplete nests. There are two nesting periods, high peak from June-October and low peak nesting is from November to May. Three months of each peak were selected for this study (June to August for the high peak and February to April for low peak).

A study area was selected 100 x 50 m to examine the total number of nesting turtles which come to shore each night. The total number of the fresh tracks during each nesting night represented the number of turtles using the beaches to lay their eggs. However, not all the turtles were successful in completing their nesting process. During nest digging there was a frequent nest collapse especially during the last phase of digging when the nest became wider, taking the shape of a goblet. During this phase the nest collapse was frequent because of insufficient moisture in the sand. Consequently, the turtles moved to another area to try to dig a new nest. The digging process was repeated 2-5 times [5]. Failing to build a nest after several trials, the turtles returned to the sea, but came back and tried again frequently. The turtles which were successful were counted and compared to the total number of fresh tracks. Fresh tracks were counted early in the morning. The total of initial tracks on the beach and the total of successful nests was recorded.

3. Results

The total number and the percentages of the turtle tracks on the nesting beaches, as well as the actual number of turtles that laid their eggs successfully, were compared during low nesting period (November-May) and high nesting period (June-October) for the combined years of 2006 and 2007 (Figs 1-2). In addition, the number of recaptured turtles (based on the tag-recapture program at Ras Al-Hadd) was also recorded. The number of dead and stray turtles was counted. The effect of cyclone Guno in June 2007, which caused some damage to the nesting beaches, was related to the nesting condition on the beach which changed the sand topography temporarily, without causing any effect on the nesting density during the high peak. During low peak, the number of the total track and percentage of turtles that actually laid their eggs was (1419, 63.5%) in 2006 compared to (1045, 76.5% in 2007) (Figs. 3-4). During high peak, the total track number was (15579, 56.9%) in 2006 and (21264, 52.7%) in 2007 (Figs. 3-4). Based on these data, the total track number and percentage of turtles that laid their eggs was significantly higher during high peak over low peak ($p < 0.001$). However, the percentage of the turtles which laid their eggs showed close similarity in both years for the low peak (Fig. 3). Gonu did not inflict harm on the nesting population during the high peak. The total number of turtles using the beach was higher in 2007 than 2006 (Fig. 3). In general, the ratio of the successful turtles laying their eggs at low peak was higher during the high peak (Fig. 4). The total number of dead and stray turtles during the low peak was (16, 16 and 19, 0 in 2006 and 2007), respectively, while during high peak, the total was (46, 509 and 13, 89 in 2006 and 2007), respectively. Although, the number of stray turtles was high in 2006, most of these turtles were rescued by the rangers. Total recaptures during the six month period in 2006 was 105 compared to 41 in 2007.

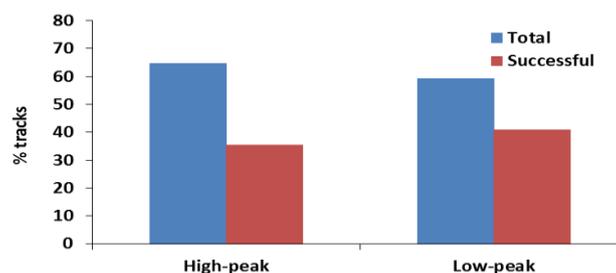


Fig. 1: Total number of turtle tracks visited the nesting study area during 2006 and 2007 for high and low peaks. Some of turtles succeeded in laying their eggs during the same night while others return to sea and tried again later. Notice the

significant number of turtle tracks during high peak compare to low peak ($p < 0.001$).

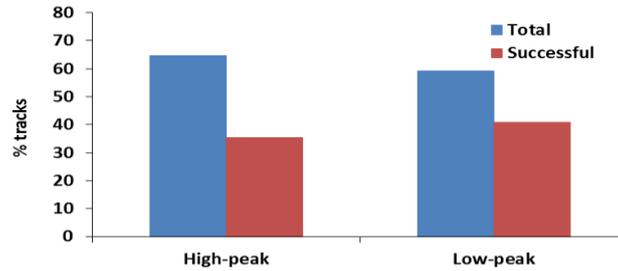


Fig. 2: Average percentages of turtles that laid their eggs in relation to the total percentages of turtles for high and low nesting peaks during 2006-2007.

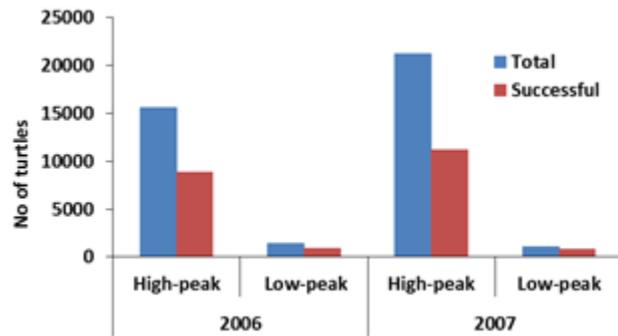


Fig. 3: Total number of turtles visiting the beach in relation to total turtles laid their eggs for both high and low peaks during 2006 and 2007.

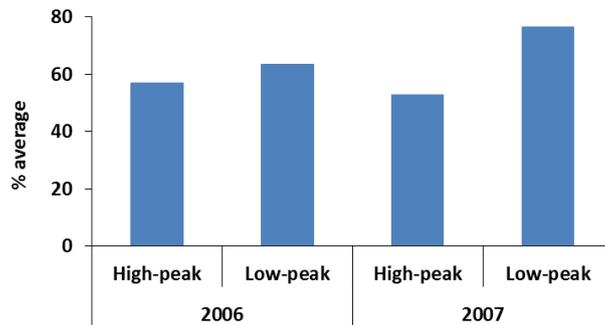


Fig. 4: Average percentages of turtles that laid their eggs during 2006-2007. The percentages were based on the total number of turtles visited the beach.

4. Discussion

At the southern sector of the Arabian peninsula, the southwest monsoon season during May-September generates clockwise water movement which causes upwelling as the water temperature fall approximately 20oC bringing moisture to the sandy nesting beaches. This causes a significant increase in nutrients which is ideal for food production such as sea grasses and algae which are the major sources of food for the green turtles at Ras Al-Hadd. During the northeast winds from the desert the reverse environmental conditions occurs and generally, the winds are dry, blowing from the desert. The decline of nutrient levels for sea grass and algae result in decrease in food production [5].

Another environmental factor which affects the nesting beaches is the dynamic of the beach structure during high and low nesting peaks. During the southwest monsoon, the sands on the tideline are carried to the next beaches making the nesting beaches generally narrower [5]. However, these changes do not affect the nesting activities.

Based on the population survey by the rangers which started in 1990, and conducted daily in the Reserve, the annual nesting turtle number fluctuates from year to year, especially as these turtles nest year round. Based on this study, the population size of the nesting turtles fluctuated during 2006-2007. This fluctuation occurs because green turtles lay their eggs every 3-4 years. Thus, the annual change in the nesting population is due to the new groups of nesting turtles using the beaches every year.

Based on 2006 and 2007 population survey, apparently cyclone Guno did not cause serious damage to the nesting beaches, and consequently the green turtle population at Ras Al Hadd did not suffer a harmful impact.

In addition, the nesting sites are backed by rocky hills on both north and south sides of the beaches, which gives the nesting turtles more protection. The stray and dead turtle counts were not unusual for this particular period, based on the government survey. Although this pilot investigation is limited to two successive years, nevertheless, the data indicate that the turtle population at Ras Al-Hadd is stable, without any significant decline, at least during the last two years. More data is needed in the future to provide detail information on the status of the green turtles at Ras Al-Hadd Reserve which is one of the most important nesting regions in the world. The significance of a large number of nesting turtles during high peak is mainly due to availability of food along the shoreline of the nesting beaches.

In summary, the population of the green turtles at Ras Al-Hadd is in a favorable status based on the population survey records conducted by the Ministry and Climate Affairs. In addition, the beaches at Ras Al-Hadd share common features that are ideal for the nesting green turtles, such as the availability of the feeding areas near the nesting beaches and the physical isolation of the beaches. The results of this study will be used to evaluate the conservation strategies for the green turtles at Ras Al-Hadd Reserve.

5. References

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