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Conservation of Green Turtle (*Chelonia mydas)* at Daran Beach, Jiwani, Balochistan

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Abstract.- The green turtle *(Chelonia mydas)* is a large marine turtle belonging to the family Cheloniidae, class Reptilia. 'Sandy beach' of Jiwani is one of the most important nesting beaches for the green turtle in Pakistan. WWF – Pakistan monitored the green turtle population along the Jiwani coast between 1999 and 2008. A total of 2,731 nests were protected, from which 91,936 hatchlings emerged out and were released into the sea. This paper gives the details on the annual nesting population and emerging hatchlings.

Key words: Marine turtle, endangered species, Makran coast, North Arabian Sea, turtle conservation.

INTRODUCTION

Pakistan's coastline covers a 1,050 km long stretch starting from Sir Creek (Indian Border) to Jiwani near the Iranian Border, out of which approximately 800 km is in Balochistan (www.wildlifeofpakistan.com/introductiontoPakistan/coastlineofPakistan.htm). The Balochistan coastline is further divided into two districts Lasbela and Makran. The green turtles *(Chelonia mydas)* nest on Ormara beach, Pasni, Astola Island and Jiwani on the Makran coast in Balochistan. The beaches of Jiwani form part of the Makran coast, which provides important habitat for several globally important species including the green turtle. The green turtle is the main turtle species that nests at Jiwani beach; the Olive Ridley (*Lepidochelys olivacea*) occasionally nests there. The marine turtles are categorized as endangered in the IUCN Red List (2008). All species of marine turtles have been declared legally protected under Balochistan Wildlife Protection Act 1975. Jiwani Coastal Wetland is one of the designated Ramsar sites (Wetland of International Importance) of Pakistan.

Green turtles are black – brown or greenish – yellow in colour. They grow from 100 to 150 cm and weigh from 110 to 200 kg. They are distinguished from other marine turtles, because they have a single pair of prefrontal scutes on the head, located in front of their eyes (Firdous, 2003).

Groombridge (1987a,b, 1988, 1989) conducted preliminary surveys along the coast. Firdous (1988, 2001), Ghalib and Zaidi (1976) concentrated their work along the Karachi coast. Arshad *et al.* (2002) made only a preliminary assessment of marine turtles in Jiwani area. This paper provides the first detailed study on the nesting population of green turtles on Daran Beach of Jiwani.

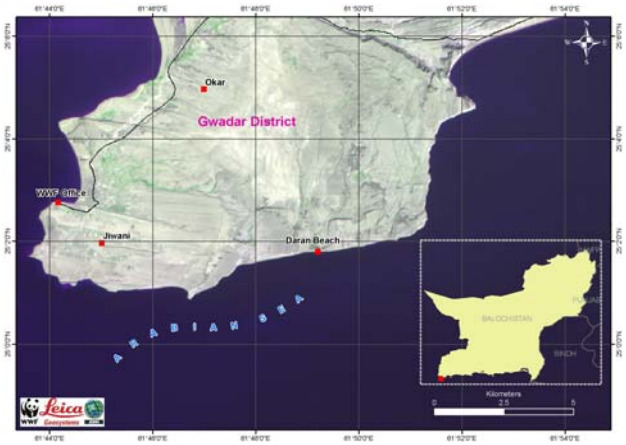

Fig. 1. Location of Daran Beach Jiwani in Balochistan, Pakistan.

Studies were undertaken on Daran beaches, located at a distance of 15 km south-east of Jiwani town. Marine turtles nest in Daran (N 25°02.592, E 061°49.109) (Fig. 1). The area is divided into five regions, from east to west, and is separated by cliffs: Daran Taak, Shaheed Taak, Jangan Taak, Deedlo

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Taak and Charlo. Green turtles nest on the sandy beach at the foot of the cliff. Each part extends for around 1.5 to 2 km (Fig. 2). The cliff is 1 – 2 meter high in the west and rises up to 30 – 40 meters in the east. The beach at the foot of the cliff is sandy and gently sloping. Daran village is the only settlement in the area.

MATERIALS AND METHODS

WWF–Pakistan initiated the marine turtle conservation project in this area in 1999. The project succeeded in developing the interest towards turtle conservation within the local community of Daran village. The capacity building aspect of the project gave the local community the ability to manage the nesting population through training courses in turtle identification, turtle nesting processes and in the transfer of eggs to a hatchery.

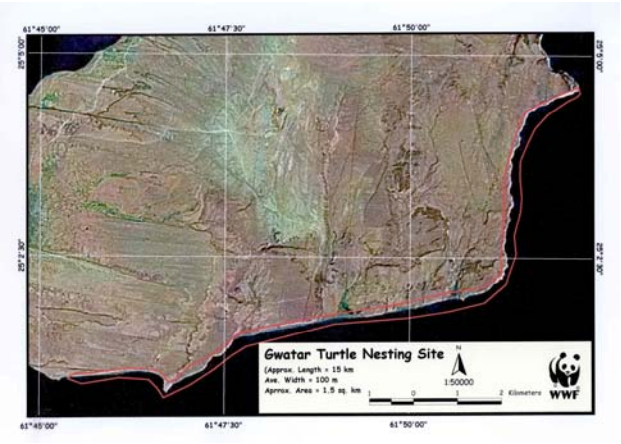

Fig. 2. Turtle nesting site in Jiwani, Balochistan, Pakistan.

Daily monitoring at night throughout the year was undertaken by a team consisting of two members patrolling a 1.5 km stretch of Daran taak beach in Jiwani between 1999 and 2008. Observations were made during the night until shortly before sunrise. The local community also assisted in the collection of data. Data were collected on nesting individuals and on individuals returning without laying eggs. Sometime 'false crawls', which are marks left in the sand by turtles that have attempted to nest or went back to sea without nesting were recorded. Working in teams of two, the team patrolled the nesting beach at least twice nightly. Crawl marks were recorded on the beach throughout the year and this indicates that the turtles visit the beach even when they do not nest.

All the nests on Daran beach were protected in natural conditions by putting a wire mesh cage over the nest without shifting or disturbing the eggs. Each protected nest was given a number and displayed the particular number on the nest for identification.

Table I.- Green turtle population (1999 – 2008) at Daran Beach, Jiwani.

Year	Nests protected	Hatchlings released	Returned with out nesting
1999	75	2,925	-
2000	287	8,837	-
2001	314	12,384	-
2002	311	8,736	-
2003	420	16,976	-
2004	293	10,281	-
2005	284	10,279	-
2006	312	5,455	1,512
2007	247	7,119	773
2008	208	8,784	485
Total	**2,751**	**91,776**	**2,770**
***Mean±SD**	**275±89**	**9,178±3,818**	**923±530**

*Rounded values; §§ Data recorded from 2006 – 2008 only.

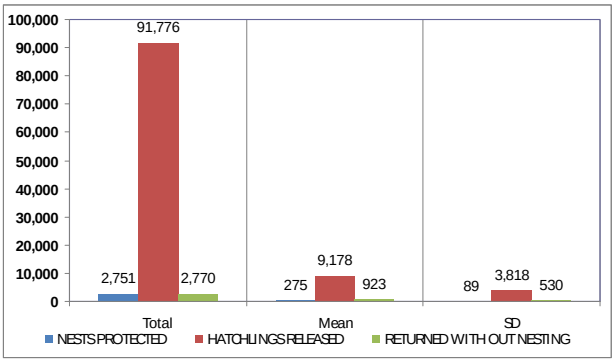

Fig. 3. Total number of turtle nests protected, hatchlings released and those returned without nesting during 1999-2008 on Jiwani, Balochistan, Pakistan.

The hatchlings emerging from the nests were released into the sea on the same beach. The number

of hatchlings emerging from a marked nest was recorded. The hatchlings were transferred into a bucket and released at the edge of water at night so as to avoid predators, like dogs, jackals and gulls. The feral dogs and jackals dig up the nests for food. The gulls pick the hatchlings emerging from the nest or on way to water. The eggs that failed to hatch were counted and buried in the sand.

RESULTS AND DISCUSSION

Nesting species

Prior to this research program, little was known of the species and magnitude of nesting of marine turtles in Jiwani. Since then it has been observed that mainly green turtles nest on the Jiwani beach. Based on the observations made over a period of time, nesting population and the numbers of hatchlings released from 1999 to 2008 is given in Table I and Figure 3. The year 2003 can be said to be the most successful year in terms of hatchlings as 16,976 numbers were released that year. The monthly data on number of nesting turtles and numbers returned without nesting (non-nesting population), as well as numbers of hatchlings released in 2006 – 2008 is given in Table II and Figure 4.

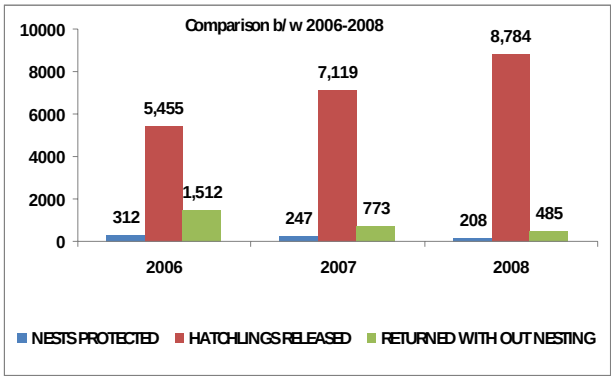

Fig. 4. Comparison of the data on number of turtle nests protected, hatchlings released and those returned without nesting between 2006, 2007 and 2008.

Nesting period

Green turtles nest throughout the year on Karachi coast, Pakistan, with peak during September (Firdous, 2001). They also nest in Bioko, West Africa between November and March (Castroviejo *et al.*, 1994); in Surinam from February to July with peak in April and May (Schulz, 1975) and in Thameela Island in Myanmar, all year round (Lwin, 2009). Green turtles nest on Daran beach during August and March with a peak between August and November.

False crawls of female turtles at Daran beach were observed most of the year. As Table II shows, during the nesting season turtles do emerge from the sea and return without nesting, but it is assumed that they re-emerge for nesting after some interval. This may be due to their satisfaction and confirmation that the place is safe for nesting. Sometimes, when they feel any disturbance, they return to sea without nesting.

In the year 2006 female turtle started emerging on beach as false crawls were seen as early as May but started nesting in August, and hatchlings continued to emerge till March 2007. Similar behavior was noted in 2007 and 2008 but the hatchlings continued to come out till the month of June next year.

The results in Table I also show an alarming situation in the year 2006 when 1,512 green turtles came to the shore but went back without nesting. Prior to 2006 there is no data available on marine turtle population which came to the shore each year and returned to sea without nesting.

Clutch size

The clutch size varies between 78 – 120 eggs per nest.

Incubation period

There was a lot of variation between the duration of incubation, with hatchlings emerging after 55 to 104 days. Excessive rain in 2007 – 2008 resulted in extension of incubation period and hatchlings emerged from most of the nests in nearly 100 days.

The incubation period depended upon the temperature (Broderick *et al.*, 2000). The incubation period is significantly shorter at higher temperature. Incubation temperature is also known to vary depending on the location of the nest on the beach. The nest located close to the high tide mark has a lower temperature and takes more time to hatch. It

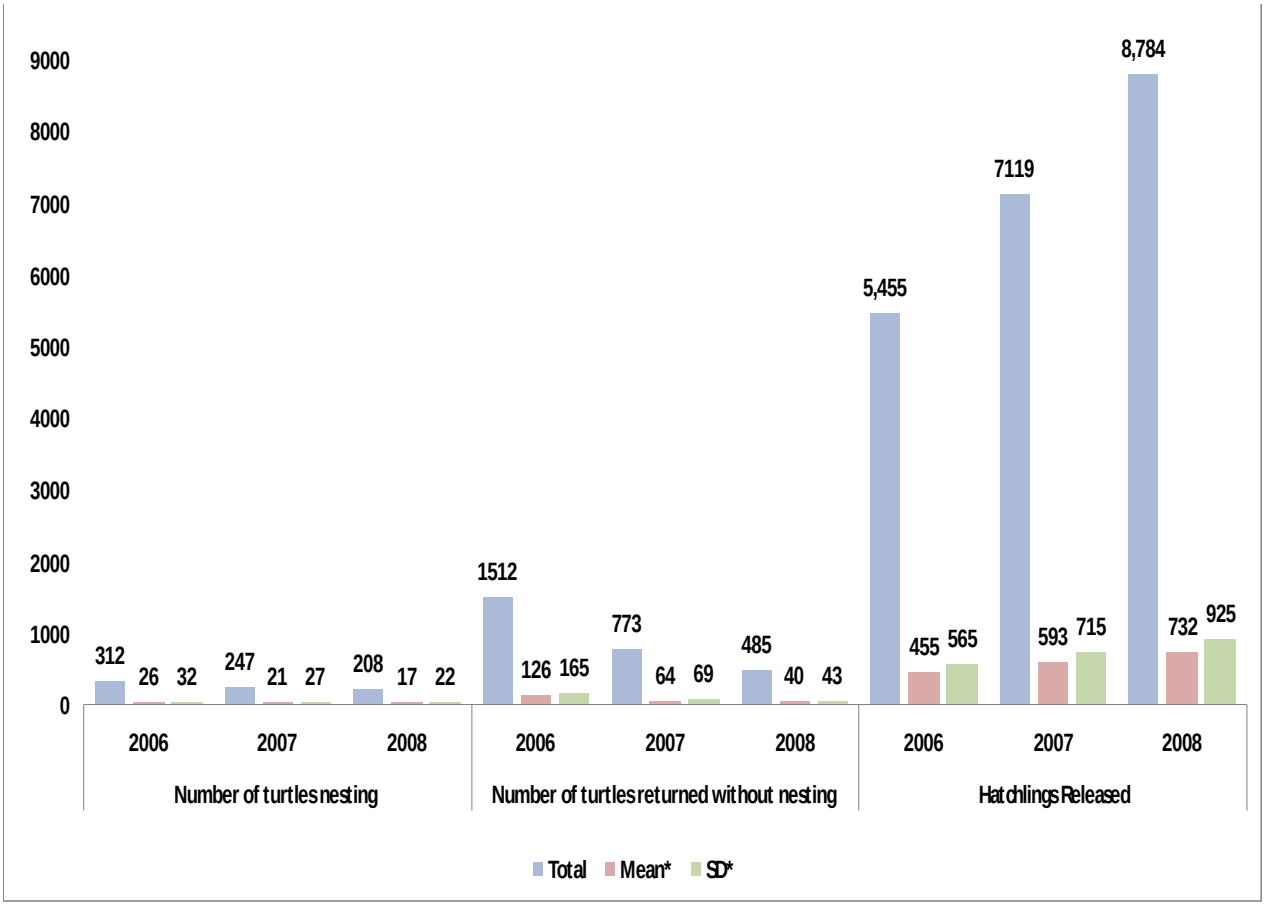

Fig. 5. Numbers of turtles nesting, number of turtles returned without nesting and hatchlings released during 2006, 2007 and 2008 at Daran Beach, Jiwani, Balochistan, Pakistan.

Table II.- Number of green turtles at Daran Beach, Jiwani during 2006-2008.

Months	Number of turtles nesting			No. of turtles returned without nesting			Hatchlings released		
	2006	2007	2008	2006	2007	2008	2006	2007	2008
January	16	14	5	46	47	12	1,087	622	1,831
February	7	0	5	20	0	6	1,479	982	1,811
March	2	0	1	27	0	4	1,243	777	0
April	0	0	3	0	8	14	211	0	0
May	0	0	0	3	9	3	0	0	0
June	0	0	0	12	40	0	0	0	0
July	0	0	0	40	67	23	0	0	0
August	78	51	19	523	123	81	0	0	0
September	73	70	42	252	227	119	225	0	0
October	64	66	60	278	144	109	971	1,824	1,290
November	57	34	53	257	69	65	200	1,856	2,176
December	15	12	20	54	39	49	39	1,058	1,676
Total	**312**	**247**	**208**	**1512**	**773**	**485**	**5,455**	**7119**	**8,784**
Mean±SD*	**26±32**	**21±27**	**17±22**	**126±165**	**64±69**	**40±43**	**455±565**	**593±715**	**732±929**

(*Rounded values)

has been observed that when there is rainfall, the incubation period also increased.

The largest number of nesting took place in 2003, when 420 nests were protected and in the same year the largest number of hatchlings were released into sea *i.e.* 16,976, though there is no data available on how many turtles went back into the sea without nesting (Table I). We can assume that during that year large number of turtles came to the beach.

This is important to mention here that temperature and rains had affected the nesting and hatchlings during this period. Heavy rains smashed Jiwani in 2007 and 2008 and affected Daran beach as well and many nests were washed with part of the beach due to flow of rain water from nearby Daran taak.

The results of Table I also show an average hatchlings released per year *i.e.* 9,178 which is quite significant. The standard deviation of hatchlings released during those ten years is 3,818.

The incubation period on the Karachi coast, Pakistan is 40 – 60 days (Firdous, 2001).

Hatching success

During 1999–2008, a total of 2,751 nests were protected, from which 91,776 hatchlings emerged and were released safely into sea. The hatching success was 32%. In 2006 – 2007, some nests were damaged due to severe rain and thus there was reduction in number of hatchlings.

In the marine turtle species, studies reveal that higher temperature has been shown to produce a greater proportion of females, with cooler temperature producing more males (Broderick *et al*. 2000).

Threats

Anthropogenic

Jiwani is located at one edge of Gwatar bay and this is one of the important trade points between Iran and Pakistan. Fishermen use speed boats for fishing and same is used for transportation of goods, oil between the two countries. These speed boats have increased in numbers in last three years and hundreds of speed boats move around the sea near Jiwani (WWF–P, 2004). This is the area where turtles have been observed mating. The increase in boat navigation disturbs the turtle population. Trawlers and cargo ships which pass through offshore waters also cause problems for turtles.

It has been noted that the oil spills from the boats carrying oil from Iran is also a threat for the marine turtle. Use of plastic fishing nets is common in this area and abandoned nets can risk turtle populations of the area.

Though, the turtles are not consumed locally due to religious customs but there has been history of utilization of turtle eggs by the local people for the cure of rheumatism. They also use it as a medication for treatment of sick goats. Now that the community has been involved in the conservation of marine turtles they do not allow people to collect the eggs or damage nests.

Natural

Dogs, jackals and foxes are also common in Jiwani area. They disturb nests and prey on eggs. Ghost crabs that prey on hatchlings are abundant on Daran Beach. The threat to hatchlings starts immediately after emergence from the nests. The dogs and birds try to catch them and when they enter into water, large fishes and gulls are their predators.

Conservation status

There is no legal protection for the marine turtle habitat in Jiwani. The species is protected under Balochistan Wildlife Protection Act 1975. Brian Groombridge of World Conservation Monitoring Centre, Cambridge, U.K., conducted a marine turtle survey in September 1988, and suggested in his report to declare the area as a "Wildlife Sanctuary" for the protection of marine turtles. The recommendations of this study have not yet been adopted. WWF–Pakistan also proposed to the Government of Balochistan in 2005 for declaring the area as 'Protected' but no decision has yet been taken.

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