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Sea Turtles of Pakistan

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Two species of marine turtles occur in Pakistan—the olive ridley turtle and the green turtle (Minton 1966, Salm 1976). These turtles are known to nest at Hawksbay–Sandspit, a 20-km beach on the Karachi coast in Sindh (Minton 1966, Ghalib and Zaidi 1976). Kabraji and Firdous (1984) estimated that 6,000 green turtles, and about 200 olive ridley turtles, nest in Hawksbay–Sandspit per year. Groombridge and Luxmoore (1989) suggested that the number of green turtles may be between 2,000–3,000, and Asrar (1999) reports a dramatic decline in olive ridley nesting at this site between 1980–97, with an average of less than 10 nests per season in the last five years of monitoring.

Although nesting has been reported earlier from the Balochistan coast (c.f. Groombridge et al 1988), recent surveys confirmed the presence of marine turtle nesting in this region (Groombridge et al 1988, Groombridge 1989). An aerial survey of the Balochistan coast revealed three major nesting sites (Groombridge 1989), which may support mostly green turtle nesting sites, like the Karachi coast. These are currently listed as Ramsar sites and include the Ormara turtle beaches, Astola (Haft Talar) Island (a small, uninhabited island about six kilometres in length, about 25 km south of the desert coast of southern Balochistan), and Jiwani coastal wetland (Qureshi 2001a,b,c). Situated at the edge of Gawater Bay, this site runs along the entire coast and is fed by the largest river in Balochistan, the Dasht (Qureshi 2001b). Since olive ridleys prefer nesting in river mouths, this may prove to be a good nesting site.

Turtles have generally not been killed for religious reasons (Hatt 1957, Shockley 1949). However, eggs may have been dug up by inquisitive children in populated areas (Burton 1918). At the end of the last century, large numbers of eggs were sold in the Karachi area, and meat may also have been consumed (Murray 1884). Generally, however, turtles are venerated and hence are not consumed; they are released when accidentally trapped in fishing nets (Moazzam 1998).

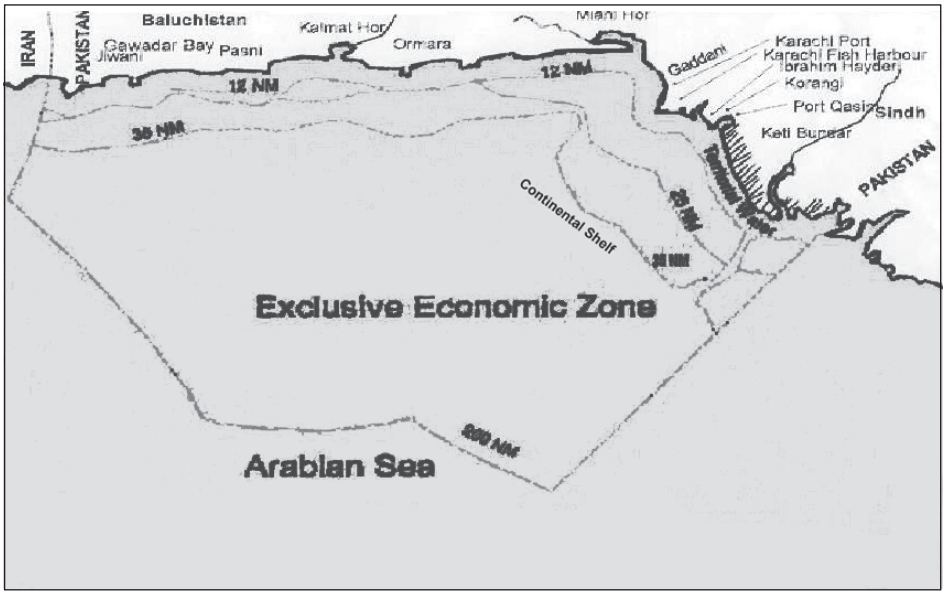

Figure 1. Coastal area of Pakistan featuring its Exclusive Economic Zone.

However, large numbers of turtles (in the thousands) were killed in Balochistan and their flippers exported for the leather trade in Japan (~5,000 kg each year from 1976–78) (see Frazier 1980). The Sindh Wildlife Protection Ordinance (1972) and the Sindh Wildlife Protection Act (1993) have been effective in Sindh, but have not prevented killing of marine turtles in Balochistan (Frazier 1980, Qureshi 2001a) In Balochistan, marine turtle eggs are also dug up by Arabs and Balochis, since it is widely believed that turtle eggs act as an aphrodisiac (Qureshi 2001b). Also, some local herders feed the turtles eggs to their cattle, saying that it increases the milk producing potential of camels and goats (Qureshi 2001b).

The Sindh wildlife department has been working on conservation of green turtles and olive ridleys for over two decades at Hawksbay and Sandspit (Kabraji and Firdous 1984). The project, initiated by the WWF in 1979, and subsequently executed by the Government of Sindh with extremely limited funds, has been made possible only by the commitment of the limited project staff. Project activities have focussed on protection of eggs and hatchlings, and monitoring of the population status of the turtles.

In the period 1979–96, project staff protected 1.5 million green turtle eggs and 77,000 olive ridley turtle eggs, releasing 859,000 green turtle hatchlings and 21,000 olive ridley hatchlings (c.f. Stevens 1998). The programme has also tagged more than 1,000 olive ridleys and green turtles. A green turtle tagged in September 1989 was recovered from Bhaidar Island, Gujarat in May 1990 (Firdous 1991), and a green turtle tagged in December 1995 was recovered off the south-central coast of Eritrea in December 1996 (Asrar 1998).

Marine turtles face multiple threats today. Egg depredation is a major threat and incidental catch in fishing craft may also pose a threat to these reptiles. Turtles have died due to oil

pollution from vessels, as was observed in a Ramsar survey in 1999–2000 along the coast of Balochistan, especially in Gwadar beach where dead juveniles were covered with trawler furnace oil (Zoological Survey team, pers. comm.). In Sindh, the beaches are under the control of the Karachi Port Trust. With the development of port facilities, economic activities in the area have increased manifold. Increased population has contributed to the pressure on the coastal ecosystem. Despite conservation efforts, it is estimated that hatching success is low, owing to the limited number of hatcheries and abundant depredation of eggs by feral dogs in the area. Hatchlings are also disoriented by street and traffic lights and are killed when they move towards the bright lights of the main road. This chapter provides a review of the research conducted by the Sindh wildlife department.

Review of Data

NESTING SEASON

Green turtle nesting and hatching take place all through the year, with peak nesting in November and peak hatching in October. Though the greatest number of green turtles nest in November, this is just before winter—when high tides, rain and low temperatures are common—and a great number of eggs perish in the conditions. Thus, it is the eggs laid in August, September and October which stand the greatest chance of survival as they incubate in ideal conditions of temperature and humidity; these eggs hatch in September, October and November (Kabraji and Firdous 1984).

Unlike the green turtle, the olive ridley shows a distinct nesting season and is only seen in the waters and on the beaches during these months. Nesting coincides with the monsoon period, starting in June and ending post-monsoon, in October. Hatching follows predictably, starting in August (for eggs laid in June and July) and ends in December (for eggs laid in September and October). Peak nesting is observed in August, while peak hatching occurs in September. Although the total number of olive ridleys observed is far lower than the green turtles, during their nesting season (which overlaps that of green turtles), on certain nights, they outnumber green turtles on the beach.

MORPHOMETRICS

The size and weight of adults, sub-adults, juveniles and hatchlings of green and olive ridley turtles are summarised in Tables 1 and 2. All size and weight of adults refers to females, as no live adult male was encountered. A few dead male green turtles have been found, but in such a state of decomposition as to make accurate measuring impossible. A dead male leatherback turtle was stranded in Karachi in 1988 (Firdous 1989). Green turtles with carapace length of less than 80 cm were recorded nesting. The average number of eggs per clutch observed for green turtles over four years is 88 (range 9–173).

FORAGING

Kabraji and Firdous (1984) carried out opportunistic studies of the food and feeding habits of marine turtles. Dead turtles found washed up on the shore were dissected and the stomach contents examined to determine diet. Seaweed growing along the rocky parts of the shoreline and washed up on the sandy beaches was collected and identified. Gut contents included phytoplankton (*Dinophysis miles, Dinophysis* spp., *Centroceros* spp.),

helminths (only developmental stages of some species), molluscan shells (broken), crabs (broken pieces), and red algae (found in the mouth). Potential turtle food found along the rocky coves and beaches of Hawksbay and Sandspit were *Caulerpa* spp. (green algae), *Sargassum* spp. (brown algae), *Gracilaria* spp. and *Geliduim* spp. (red algae), crustaceans, sponges, jellyfish and molluscs. Divers have reported seeing green turtles grazing on seaweed off rocks. Such reports coupled with the evidence of gut contents strongly suggest that suitable feeding grounds exist along the coast.

Table 1. Measurement of green turtles (1982–83).

	Sample size	Length (cm)		Width (cm)	
		Average	Range	Average	Range
Adult (curved carapace)	198	99.95	85–122.5	87.22	80–106
Adult (straight carapace)	166	92.99	63–107.5	71.8	54–97.5
Juvenile and sub-adults (curved carapace)	5	38.12	32–56.3	34.0	29–48
Hatchling (curved carapace)	82	5.75	4.5–6.5	4.94	4–5.7
Egg (circumference)	72	15.22	13–16.5		
Egg (diameter)	72	4.84	4.1–5.3		

(Source: Kabraji and Firdous 1984)

Table 2. Weight of green turtles (1982–83).

	Sample size	Average	Range
Adult	5	117.9	83.3–135
Juvenile	1	3	
Hatchling	82	0.027	0.02–0.03
Egg	72	0.053	0.03–0.07

(Source: Kabraji and Firdous 1984)

Table 3. Measurement of olive ridley turtles (1982–83).

	Sample size	Length (cm)		Width (cm)	
		Average	Range	Average	Range
Adult (curved carapace)	5	69.7	52.5–80	70.2	55–82.5
Adult (straight carapace)	2	65	60–70	63.5	60–67
Hatchling (curved carapace)	11	4.2	4–4.4	4.0	3.9–4.2
Egg (circumference)	15	12.9	12.5–13		
Egg (diameter)	15	4.1	4–4.1		

(Source: Kabraji and Firdous 1984)

Table 4. Weight of olive ridley turtles (1982–83).

	Sample size	Average	Range
Hatchling	11	0.016	0.02–0.03
Egg	72	0.053	0.03–0.04

(Source: Kabraji and Firdous 1984)

Threats

Human activities have affected the survival of marine turtles since prehistoric people first hunted turtles and gathered their eggs. More recently, marine turtle populations have come under additional threats as a result of human activities not directed at the turtles—particularly from habitat degradation, pollution and marine debris, and incidental capture in fisheries (Firdous 1988).

Habitat degradation is an ongoing threat to the survival of marine turtles. The rate of development of marine turtle nesting beaches for human use is increasing rapidly throughout Pakistan. Nesting beaches can be completely destroyed by such development due to the removal of sand for construction, erection of seawalls, artificial beachfront lighting that disorients hatchlings, and vehicular and foot traffic that compacts the sand and crushes hatchlings beneath the surface.

In some areas of Pakistan, direct take of marine turtles has increased as a result of higher human population levels, more efficient capture techniques, or the breakdown of cultural restrictions.

Incidental capture of marine turtles in fisheries is considered by many to be the greatest single threat to the survival of marine turtles today. The shrimp trawl net used in Pakistan was designed in 1958, when shrimping was introduced for the first time in Pakistan, and no change in the design of the shrimp trawl net has been made since. Wooden trawlers of about 15-m length are used for shrimp fishing; no mechanical devices are used on these shrimp trawlers and the deployment and retrieval of nets is manual (Stevens 1998). The crew consists of about 8–16 fishermen and the duration of trawl operation is about 30–60 minutes depending upon the catch rate. In addition to target species, i.e. shrimp, a variety of fish and invertebrates are caught as bycatch.

The Marine Fisheries Department started a programme of analysing shrimp bycatch, which indicated preponderance of juveniles of food fishes, small fishes and invertebrates. The study indicated that adult and juvenile turtles were not represented in bycatch. A survey was conducted by the same department in 1997 in which 146 fishermen were interviewed to derive the frequency of turtle entrapment in shrimp trawl nets. The interviewees said that turtles were very rarely entrapped in shrimp trawl nets, and that in almost all cases where turtles were accidentally caught, they were released immediately.

Marine Turtle Conservation Plan

Marine turtle conservation was initiated in Pakistan in 1979 following a survey and recommendations by R Salm (Ministry of Commerce and Industry, Muscat). A marine turtle conservation project was established by the Sindh wildlife department funded initially by the WWF (International). Since then, the project has developed into a major marine turtle conservation programme—involving legislative protection for nesting marine turtles, public education and a large-scale hatchery programme. The main problems for marine turtle nesting in this area is destruction of nests and eggs by feral dogs, collection of eggs by people, and the disturbance of nesting females and disruption of nesting habitat from the adjacent city of Karachi.

A hatchery was developed to protect eggs and hatchlings and in recent years has released upto 30,000 hatchlings each season. Hatching success in the hatchery averages about 40 per cent and is quite variable (Firdous 1988).

This project has the dual aim of implementing a programme for the management of marine turtle populations nesting on the coast of Pakistan, and providing a foundation for development of a comprehensive Coastal Zone Management Plan. This project will continue its studies on marine turtle populations in Pakistan, develop a cadre of trained and motivated personnel to continue work, and provide the foundation (in terms of infrastructure, information and staff resources) for a wider long-term Coastal Zone Management Plan for Pakistan. Work at the Karachi green turtle nesting beach will be improved and given increased financial security. Work at the turtle beaches in Balochistan will be expanded and intensified. The Karachi marine turtle population is threatened by accelerating urban development, while the Balochistan population has been affected by many years of heavy exploitation. The conservation status of these populations will be evaluated, monitored and necessary management measures promoted within the context of a national strategy. Efforts will be made to place marine turtle conservation in Pakistan in a regional perspective, by developing contact with other states around the northern Indian Ocean, within the migratory range of these populations, and facilitating staff exchange and training opportunities.

Clearly, from a national and regional biodiversity and species conservation perspective, there exists a compelling need to work towards the development of a marine turtle conservation programme. Basic information concerning turtle habitats, population dynamics, and human interaction is incomplete, particularly along the Balochistan coast. Obtaining this information is a fundamental prerequisite to the conservation of marine turtle populations and in particular to determining management priorities for the conservation of critical habitats. Once a comprehensive scientific study is carried out, there will be greater scope for increasing awareness, education, and capacity building on marine turtle conservation among local communities and other stakeholders.

It is also essential to have adequately trained people involved in marine turtle management. In addition to marine turtle biologists and government officials, there are now non government organisations, local community groups, and students groups from local schools and universities undertaking various aspects of marine turtle management. Some of the programmes selected by these groups include maintaining hatcheries, ecotourism programmes, conservation education, community participation and tagging programmes. All of these programmes have the potential of adversely affecting local populations of marine turtles if not conducted properly. The proposed training programmes will provide these groups with biological and technical information on the biology, conservation and management of marine turtles, while catering to the specific information needs of each group.

Acknowledgements

The development of a country report requires coordinated effort on the part of many people. We would like to thank Shamsul Haq Memon, secretary, Forest and Wildlife for

his technical and moral support throughout this process. We are very grateful to Aban Marker Kabraji, regional director, IUCN for her generosity in sharing her experiences and reports with us. We are especially grateful to Fehmida Firdous Asrar, Sindh forest and wildlife department in sharing her notes and reports. Our thanks to Ali Raza Rizvi, head, Sindh Programme for his support in completing this report. We all acknowledge the effort of Lincoln Daniel, Coastal Ecosystem Unit, IUCN who compiled an excellent marine turtle report.

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