Discussion

Preliminary results indicate that the northern Sinai is the most important region of the Egyptian Mediterranean coast with respect to marine turtle nesting; in comparison, nesting activity in the delta and western regions is negligible. The next two years' survey results, which will concentrate on the Northern Sinai region, should reveal the relative importance of this area with respect to the other satellite rookeries in neighboring countries such as Israel, Syria, Libya and Tunisia. A conservation plan to safeguard turtles utilizing the northern Sinai region as nesting grounds will involve an intensive survey of the region and the establishment of a hatching area within Zaranik Biosphere Reserve, on Lake Bardawil, vulnerable nests can then be transplanted to this protected site. This will also provide the scientific team with the opportunity to collect fundamental information about turtles nesting in Egypt, such as hatching success rates, nest temperatures, incubation period, length of nesting season etc.

Acknowledgments

This project has been financially supported by a grant from the British government administered through the *Darwin Initiative for the Survival of Species* program. Many thanks to the Egyptian survey team, Mohamed Mahmond Methwally and Yousri Mahmoud Mohamed Ahmed, for their invaluable help with the fieldwork. Appreciation is also extended to Mr. Mohamed I. M. Ibrahim and the staff of the EEAA office in Cairo for their help with obtaining permits etc. We are indebted to many individuals and organizations which have helped with this project, including; Anna Baker of the British Council; Peter Hayward of the National Oil Spill Contingency Plan; the Regional Activity Centre for Specially Protected Areas (SPA/RAC) of the Mediterranean Action Plan (MAP); Shell Egypt; WSPA and Amoco Egypt. Special appreciation is reserved for Mr. James Kennedy and all at ENI/Agip Egypt for their very generous support of this project.

Agonies and Ecstacies of 25 Years of Sea Turtle Research and Conservation In India

Priyambada Mohanty-Hejmadi

Department of Zoology, Utkal University, Bhubaneswar 751004, INDIA

India as well as Pakistan has a long history of trade in turtle products. Between 1963 and 1974, India exported 102,022 kg of sea turtle products valued at roughly $100,880. The products included sea turtle meat, oil and tortoise shell. The domestic trade was substantial especially for the olive ridleys nesting in Orissa. Even up to 1970's it is estimated that 50,000 to 75,000 mature adults were harvested primarily for meat and secondarily for skin and oil from the Orissan coast mainly for the Calcutta market (Biswas, 1982; Dash and Kar, 1990). Similarly eggs were collected in large numbers from Gahirmatha rookery and other important nesting areas in Orissa for human consumption and as a supplement for feed of domestic animals (Dash and Kar, 1990). Prior to 1975, from Gahirmatha alone, a nominal egg tax (anda kara) was collected for a boat load of eggs containing about 35,000 to 1,00,000 eggs depending on the size of the boat (Dash and Kar, 1990). The estimated legal take in the 1974-1975 season was 800,000 eggs (FAO 1975- see Kar and Bhaskar, 1982).

Up to the 1970's our knowledge on the sea turtles that visited the coasts of India remained limited. However, the endangered status of the sea turtles led to a spurt of activity and therefore, we have considerable data on the activities of the sea turtles that visit the coasts for nesting. Unfortunately, our knowledge of their habits, migratory routes and activities of both the hatchlings and the adults after they leave the coast, remain negligible.

Altogether five species representing each of the five genera are known from the Indian seas. These include the leatherback (*Dermochelys coriacea*), the green (*Chelonia mydas*), the hawksbill (*Eretmochelys imbricata*), the loggerhead (*Caretta caretta*) and the olive ridley (*Lepidochelys olivacea*). Sea turtles have been recorded from the eastern and western coasts, as well as the neighboring islands in the Indian Ocean (Kar and Bhaskar, 1982).

Long term research and conservation efforts have been taken up in two states, in Tamil Nadu (Silas and Rajagopalan, 1984; Rajagopalan, 1989) and in Orissa mainly by the wildlife wing of the State. Unfortunately, research and conservation activities have been concentrated in Orissa since the 1990's making it difficult to determine the status of sea turtles at a National level.

Since 1997, a high-powered committee under the chairmanship of Honourable Chief Minister of Orissa, has been reviewing and formulating plans for conservation. Recently, the Ministry of Environment and Forests, Government of India, has set up an expert committee. A status survey, building of database and implementation of TED regulations etc. are envisaged through this committee.

Considerable data is available on the breeding and nesting habits of the olive ridleys (Dash and Kar, 1990; Mohanty-Hejmadi, 1992; Mohanty-Hejmadi and Sahoo, 1994; Pandav *et al*., 1994). Unfortunately, there has been no mass nesting two years in a row (1997,1998) at Gahirmatha and the mortality is substantial. This year there is a good congregation of turtles at the three mass nesting sites (Gahirmatha, Devi and Rushikulya estuaries) but no mass nesting yet. The mortality in the core area of Gahirmatha sanctuary has been reduced due to the protection enforced through the wild life wing, coast guards and Indian navy; however, the mortality is high south of the sanctuaries due primarily to the non-implementation of the Marine Fisheries Regulation Act (OMFRA) by the fisheries department.

A long-term tagging program was initiated in 1978 and there has been recovery of two from Sri Lanka (Kar, 1992; Pandav and Choudhury, 1998). Unfortunately, a proposed satellite-tagging program did not materialize in 1997 as the required permission was granted after the season.

The highlights of sea turtle conservation program include the protection given to sea turtles through the Wildlife Protection Act of 1972, the declaration of Bhitarkanika Wildlife Sanctuary in 1974 which included turtle nesting areas, the ban on collection of eggs in 1975, the systematic data collection on nesting turtles, the international letter campaign to the then Prime Minister, the late Indira Gandhi, resulting in better protection of the Gahirmatha area, and the discovery of the second and third mass nesting sites at Devi (Kar, 1982) and Rushikulya (Pandav and Choudhury, 1994) estuaries. Good mass nesting from 1990 to 1996 was indicative of the success of the conservation efforts. Association of Universities (Utkal and Sambalpur) and Institutes (Central Marine Fisheries and Research Institute, Madras and Wildlife Institute of India, Dehradun) have intensified the research activities.

It is also heartening to note that a TED program was facilitated by Dr. Pamela Plotkin and myself in 1994. A training-cum-demonstration workshop on TEDs was held at Paradeep, Orissa in November 1996 followed by one at Cochin in Kerala State. Project Swaraj is the primary agency for the manufacture of "Georgia Jumper" TED'S. Orissa Fisheries department has notified making TEDs compulsory for renewal of licenses for trawlers, but it is yet to be implemented. Government of India has provided money to the wildlife wing, Orissa; for fabrication of TEDs. Two workshops were held by the wildlife wing recently at Paradeep and Dhamra for training and installation of TEDs with trawler owners and fishermen.

Considerable data is available on the developmental biology namely on development, temperature dependent sex determination, karyotype and calcium mobilization etc. of the olive ridleys of Gahirmatha (compiled by Mohanty-Hejmadi, 1993; Sahoo *et al.*, 1996,1998).

Periodic seminars and workshops have helped focus on different aspects of conservation. Noteworthy are the two international seminars, one in 1996 in Mombasa under the auspices of New England Aquarium, USA and another in Bhubaneswar under the auspices of IUCN, CMS, NOAA, etc., on Indian Ocean populations. A very active press and media are continuously highlighting the mortality and lapses in protection. Awareness programs by wildlife wing, Orissa and several NGOs have intensified in the last two years.

The declaration of Gahirmatha Wildlife (marine) Sanctuary has provided added protection to the area. A total of 197 fishing vessels were seized in 1998 and out of the 38 seized in 1999, 21 are trawlers and 17 are gill netters. This enforcement has led to the reduction of mortality at Gahirmatha to 1653 as opposed to 3544 last year.

The construction of Tachua jetty which was much in the news a few years back was not fully commissioned as envisaged in the original plan after a long court case (World Wide Fund for Nature vs. Orissa Government).

At the moment the threats to sea turtles in India include fishing by trawlers and gill netters in coastal waters, lighting in ports, jetties, industries and coastal development activities, damage by predators and disturbances by local people. Increase in fishing related mortality and no arribada in two successive years (1997,1998) are matters of great concern at present. The great question is whether all the efforts that are being made can save the spectacular arribadas to see in the next millenium.

Table 1. Yearly totals of olive ridleys at Gahirmatha. (Courtesy wildlife division, Government of Orissa).

Year	Emerging females (in 100,000=1 lakh)	Dead turtles
1978-79	2.30	-
1979-80	1.30	-
1980-81	2.00	-
1981-82	2.00	-
1982-83	0.176	512
1983-84	6.193	2634
1984-85	4.684	3418
1985-86	2.918	5436
1986-87	0.500	2404
1987-88	6.360	3348
1988-89	0.010	2576
1989-90	3.150	2429
1990-91	2.070	1210
1991-92	6.590	1119
1992-93	3.840	1356
1993-94	6.874	4846
1994-95	6.945	4377
1995-96	3.395	1244
1996-97	2.900	3634
1997-98	0.001 (lll)	5322
1998-99	0.0006 (64)	3791

Acknowledgements

I would like to record my thanks to Mr. S. K. Patnaik, the chief wildlife warden, Government of Orissa for providing me with much of the information that is included in here. I would also like to thank the David and Lucile Packard Foundation for helping make this all possible.

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The Current Situation of the Leatherback Population on the Pacific Coast of Mexico and Central America, Abundance and Distribution of the Nestings: an Update

Laura Sarti[1,4], Scott Eckert[2], Peter Dutton[3], Ana Barragán[4] and Ninel García[4]

[1]Instituto Nacional de la Pesca-SEMARNAP *[2]Hubbs-Sea World Research Institute*

[3]NOAA-NMFS Southwest Fisheries Science Center *[4]Facultad de Ciencias, UNAM*

In the early 80's, Mexico was considered one of the most important countries for the nesting of the leatherback turtle. Three main nesting beaches were known along the Pacific Coast of Mexico: Chacahua, Oaxaca, (Márquez, *et al.* 1976) Tierra Colorada, Guerrero and Mexiquillo, Michoacán. (Márquez, *et al*. 1981, Pritchard, 1982) In these areas, up to 100% of the clutches were poached by local people, therefore activities for the protection of eggs and evaluation of the nesting population were implemented. Unfortunately, these protection activities haven't existed continuously for all the beaches; only Mexiquillo has a complete database of nesting females and hatchling production since 1982.

In the mid-80's, 500 leatherback nests per night were still recorded during peak season, representing around 5,000 nestings in a season for each one of the three main beaches (Pritchard, 1982). In the early 90's, a drastic decline in the number of nestings and females was observed, showing less than 100 nestings (Sarti *et al*. 1993), which represented barely over one dozen females nesting for each one of these beaches. For this reason, in 1994 a program was started to evaluate the population along the Pacific coast of Mexico. The priorities of this program were to assess the possible causes of the decline, to learn the actual status of the population in Mexico and to propose strategies to stop the decline and eventually recover the population. The principal methods used in the program have been the count of bodypits made by the nesting females, the evaluation of clutches and tag-recapture of nesting females using monel and PIT tags, as well as aerial surveys along the Mexican Pacific coast, from Tijuana to Puerto Madero, Chiapas, with ground verification at each key beach.

The estimation of the total number of nestings in this area was obtained from aerial survey data and beach work. Three sources of error have been considered (Sarti *et al.* 1996):

E1=error due to track and bodypit aging

E2=error due to the difficulty of observation from the air

E3=error caused by doing the survey prior to the end of the season (nestings that haven't occurred yet)

The results of the surveys from the past seasons for the Pacific coast of Mexico, including total count corrected for the error factors, and the estimated number of females are shown in **Table 1**.

Table 1. Total leatherback nestings counted and total of females estimated to nest along the Mexican Pacific coast per season. *Value corrected for E1 and E2 only. **Number of females only includes tagged females at the key beaches.

Season	Nestings	Females	Reference
1995-1996	5,354	1,093	Sarti, *et al.* 1996
1996-1997	1,097	236	Sarti *et al.* 1997
1997-1998	1,596	250	Sarti *et al.* 1998
1998-1999*	799*	67**	This paper

For the last 2 seasons, along the Mexican Pacific coast we have counted around 1,000 nestings, representing slightly more than 200 nesting females. The total value for the 95-96 season is similar to the one reported for Mexiquillo, in only 4 km of beach in 1986. The rest of the seasons have counts equivalent to only one fifth of the nestings recorded for a single beach in the mid-80's. The results of this research have shown a drastic and worrisome