BIOLOGY OF THE OLIVE RIDLEYS OF GAHIRMATHA, ORISSA, INDIA

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Gahirmatha in Cuttack district of Orissa, which extends from Ekakulanasi/Maipura river mouth to Barunei muhana, Hansua river mouth (Behera, 1989; Dash and Kar, 1990) has become an important area in turtle research since its discovery (Bustard, 1974). Out of the two to three million olive ridley (*Lepidochelys olivacea*) turtles in the world at present, nearly half visit the Gahirmatha coast each year for breeding and nesting purposes. Consequently, it has earned the distinction of being the largest rookery for the nesting of this species. There are two spectacular arribadas each year from January to mid April. The huge biomass of adult male and female turtles, millions of eggs laid by them and the resulting hatchlings play an important role in controlling the ecology of the area during the period.

During mid seventies, the entire 35 km of Gahirmatha beach was used for nesting purposes (Kar, 1980). During the nesting season in the past, the forest department of Orissa was issuing licenses for the collection of eggs containing roughly between 35,000 to 100,000 eggs and this was stopped when the surrounding area of Bhitarakanika was declared as a wild life sanctuary in April 1975.

Organized turtle fishery also existed in the past in Orissa and other parts of Bay of Bengal. In Orissa, fishermen used to capture adults at sea during the peak mating and nesting seasons which were regularly transported to Calcutta and Howrah markets (Dash and Kar, 1987).

The olive ridley has been placed in Schedule I of the Indian Wildlife (Protection) Act, 1972. At present complete protection has been given to the nesting females and their eggs. The drowning of the turtles at Gahirmatha during breeding season due to the movement of mechanized boats (trawlers, gill nets) has become a major threat at present. More than 1600 such vessels operate near the Gahirmatha rookery from fishing bases such as Dhamara, Talchua and Paradeep. Each year a large number of adult turtles die due to this reason. The Government of Orissa has proposed four more fishing jetties around Gahirmatha area; Talchua, Jamboo, Kharnasi and Tantiapal from which thousands of mechanized boats will operate from the area and compound the problem many fold. Talchua jetty has already created much concern among the environmentalists world over which is under construction only 10 kms away from Gahirmatha in the north-east direction.In addition, the Ekakulanasi area got separated from the main land Ekakula (local names of Gahirmatha) at the northern most end in a cyclone in May 1989. Now nesting is restricted to this Ekakulanasi island,the area of which is changing year to year due to erosional and depositional forces. The area of this island is insufficient to house the entire nesting population of Gahirmatha. As a result, a large number of eggs are being destroyed each year due to subsequent nesting activities. This is now a major threat for the survival of this population.

METHODS

We have monitored the nesting biology and related aspects of olive ridley turtles at Gahirmatha since 1984. The present paper describes some of the important aspects.

RESULTS AND DISCUSSION

NESTING PROFILE

The annual nesting at Gahirmatha occurs in two arribadas. The first batch of mass nesting occurs during late December to mid February and the second one during March to early April. In the first batch

about 80% and in the second batch the rest 20% nest (Sahoo and Mohanty-Hejmadi, 1994). Apart from this, sporadic nesting takes place throughout the year around Gahirmatha (Dash and Kar, 1990; Mohanty-Hejmadi, 1993). The second mass nesting coincides with the hatching of the eggs of first mass nesting which takes about 50 to 60 days after the first mass nesting (Behera, 1989). About 80% male hatchlings are produced from the eggs of first mass nesting at Gahirmatha which develops in relatively lower ambient temperatures (January-March) and about 90% of female hatchlings are produced from the eggs laid in second mass nesting which develop during the warmer months of April and May (Mohanty-Hejmadi, 1993).

A detailed profile of nesting records of olive ridley turtles at Gahirmatha for the last 10 years is presented in Table 1. During these years the number of nesting individuals increased. The record number of 805,000 turtles nested in 1992. In 1985 a total of 286,000 turtles nested in three arribadas. In 1986, there was no first mass nesting and only 50,000 turtles nested during second mass nesting. During 1988, there was no mass nesting at all and sporadic nesting of few individuals occurred. Though 206,000 individuals nested in 1990, there was no second mass nesting. The nesting population has maintained a constancy (more than 600,000) from 1991 onwards. From this it appears that the Gahirmatha population has attained a stability as the number of nesting emergences is concerned.

BEACH PROFILE

Biotic factors such as predation on eggs and hatchlings and interspecific competition among the nesting females are more important than purely geological characteristics in determining worldwide nesting patterns of sea turtles (Mortimer, 1982). Remoteness of most of the nesting grounds for which they are relatively free from predators, including Gahirmatha, has vanished in recent years due to human encroachment and the subsequent disturbances and exploitations. During 1982 nesting season the mass nesting area shrank from the entire 35 kms to 10 kms coastline from Habalikhati to Ekakulanasi (Kar, 1982) and in 1989 only to 2 kms at Nasi end in the north ward direction. From 1990 onwards nesting is restricted to Ekakulanasi island. This island is relatively free from predators except for the birds. During 1990 and 1991 seasons, the Ekakulanasi rookery had an area of 0.338 sq kms in which 210,000 turtles could nest successfully considering the body pit area (average carapace length x average carapace width = 5626 sq cms) as the minimum required area for the development of a nest. A total of 206,000 and 610,000 turtles nested during the above two seasons, respectively. The random nesting by subsequent emergences damaged a large number of nests. In 1991, this loss was 74% (Table 2). In 1992, the rookery had an area of 0.416 sq kms giving enough space for 260,000 individuals for successful nesting during which a total of 805,000 turtles nested resulting in 52% destruction of nests (Table 1 & 2). During 1993 nesting season the area was reduced to 0.271 sq kms where only 85,000 turtles could nest successfully (Table 2). In the season, 665,000 individuals nested out of which about 87% nests were destroyed. For the 1994 season, the area has increased to 0.494 sq km. In addition to the destruction of nests by tidal/wave inundation and predation, a high percentage of nests are destroyed each year due to subsequent nesting emergences of the turtles. Thus the separation of Ekakulanasi from the mainland has made the Gahirmatha population endangered as the nesting ground is insufficient to support the nesting activities of such a large population.

CONCLUSION

At Gahirmatha, although trade in turtles and eggs is not there any more, considerable number of turtles are dying due to fishing activities in this area. Even then, if one considers the number of nesting turtles from year to year, it is reasonable to say that the population nesting at Gahirmatha has not been adversely affected by these activities. However, one of the major concerns for the population is the drastic geographic change in the main nesting area of Gahirmatha which is now cut off from the main land since 1989. This area is extremely prone to cyclonic storms and inundation. In addition, considerable number of eggs are destroyed by overlapping nesting activities of the turtles due to restriction of space. It is necessary to assess these aspects now so that alternative arrangements can be made for mass transfer and incubation of eggs in appropriate places.

ACKNOWLEDGMENTS

The authors are thankful to the authorities of Forest Department, Govt. of Orissa; Director and staff of Regional Research Laboratory, Bhubaneswar for their help in various aspects of this work.

LITERATURE CITED

Behera, M. 1989. Ontogenic development with special reference to sex differentiation in the olive ridley turtle, *Lepidochelys olivacea* (Eschscholtz), Ph D Thesis, Utkal Univ., Orissa, India.

Bustard,H.R. 1976. World's largest sea turtle rookery. Tiger Paper : 3.

Dash, M.C. and C.S. Kar. 1987. In : Conservation and Management of sea turtle resources in Orissa coast. Proc. of the 7th Annual Session of Academy of Environmental Biology, 303-316.

Dash, M.C and C.S. Kar. 1990. The Turtle Paradise Gahirmatha, Interprint, New Delhi, India.

Kar, C.S. 1980. The Gahirmatha turtle rookery along the coast of Orissa, India. Marine Turtle Newsletter 15: 283.

Kar, C.S. 1982. The Gahirmatha sea turtle rookery, Orissa, Makara, 3(1): 20-23.

Mohanty-Hejmadi, P. 1993. A study of ecology, breeding patterns, development and karyotype patterns of the olive ridley turtle, *Lepidochelys olivacea* of Gahirmatha,Orissa, Vol.IX, Pranikee, J.of Zool. Soc. of India.

Mortimer, J. 1982. Factors influencing beach selection by nesting sea turtles. In. Bjorndal, K.A. (ed). Biology and conservation of sea turtles. Smithsonian. Washington, D.C. pp. 45-51.

Sahoo, G. and P. Mohanty-Hejmadi. 1994. Topographical changes in Gahirmatha nesting beach from 1989 to 1993. Communicated to J. of Herpetology.

Table 1. Nesting profile of olive ridley turtles at Gahirmatha in the last 10 years.

Nesting season	Total nested	No. of mass nestings
1984	400,000	TWO
1985	286,000	THREE
1986	50,000	ONE, NO FIRST
1987	600,000	TWO
1988	NO MASS NESTING	
1989	318,000	TWO
1990	200,000	ONE, NO SECOND
1991	610,000	TWO
1992	805,000	TWO
1993	665,000	TWO
1994	451,000	IN FIRST

Table 2. Profile of Ekakulanasi rookery.

Nesting season	Average area(sq kms)	Carrying capacity of the available	Percent destruction
1990	0.338	210,000	00
1991	0.338	210,000	74
1992	0.416	260,000	52
1993	0.271	85,000	87
1994	0.494	*	*

* Only first mass nesting completed.