STUDIES ON THE MASS NESTING (ARRIBADA) OF PACIFIC RIDLEY TURTLES, *LEPIDOCHELYS OLIVACEA* IN BHITARKANIKA WILDLIFE SANCTUARY, ORISSA, INDIA

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Introduction

Mass nesting or arribada (a Spanish term meaning-arrival) of sea turtles take place in Orissa coast between the mouth of the Maipura river and Gahirmatha of Bhitarkanika Wildlife Sanctuary in Cuttack District of Orissa. The place is popularly known as Gahirmatha beach, which is about 35 km long stretch and it is the largest sea turtle (*Lepidochelys olivacea*) rookery in the whole world (Bustard, 1974, 1976).

Nesting of turtles at Gahirmatha occurs throughout the year with a variation on a number of solitary nesting ridley from one to one hundred. Mass nesting or arribada (more than 1000 turtles visit for nesting in a particular night on a stretch of less than 10 km of sea beach) usually occurs twice in a nesting season during the period late December to April.

Past History

The mass nesting of Pacific Ridley turtles have been taking place since long past at Gahirmatha beach. Before and after the Kanika Zamindary time, there has been large scale exploitation of turtle eggs. The eggs of sea turtles were allowed to be collected in Bhitarkanika on a royalty of Rs. 15 per boat load. A nominal amount of about Rs. 360 per annum was obtained as revenue by this process. Actual egg number legally exported are difficult to ascertain but royalty payments were based on boat loads. An estimated 5-15 lakh eggs were legally exported annually before 1974 (Kanungo, 1976).

Poaching of live turtles in the offshore during the period of mating (October to December) and at the time of nesting (late December to April) were also rampant. The poachers come to Gahirmatha coast for poaching of live sea turtles from sea with help of nylon nets and powerful trawlers. Following Bustard's (FAO, 1975) recommendation, the Orissa Forest Department took very prompt action for (i) protection of turtle eggs at the nesting beach and turtles, both onshore and offshore, and (ii) conducting research on population of nesting female turtles, nest/nesting and associated behaviours. During 1975-76 turtle nesting season, for the first time, an enumeration was carried out at Gahirmatha beach and it was assessed that over 1.5 lakh female turtles visited the beach for nesting and egg laying.

Present Status

The Pacific ridley sea turtles have been included in the Schedule-1 of the

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Wildlife (Protection) Act, 1972. It is classified as endangered species in the IUCN Red Data Book. It is also included in the Appendix-1 of the CITES (Convention of International Trade in Endangered Species of Wild Fauna and Flora) regulations.

The Wildlife Wing of the State Forest Department has completely banned the sale of eggs from the beach and rigid protection measures have been taken to protect the turtles both on the beach and offshore.

Gahirmatha rookery and arribada

Studies on arribada made during the last one decade at Gahirmatha rookery reveals that on an average 2.5 lakh nesting female turtles (range 2.0 to 6.5 lakh) visit the beach for nesting and egg laying.

Occurrence of arribada : Arribada usually occurs twice in a nesting season during the period late December to April. The first arribada is usually very big as compared to the second arribada and also subsequent mini arribadas during the month of April and May. It is interesting to note that immediately following an arribada the number of nesting female turtles abruptly decline and for about a week practically no turtles emerge to lay eggs.

Cause for occurrence of arribada : The possible cause of occurrence of arribada is still a mystery. It has been observed that occurrence of arribada is known to be corelated with the phases of moon and usually takes place 2 or 3 days before and after the moon enters its last quarter. Observations made during last couple of years at Gahirmatha rookery strongly suggest that the arribada usually takes place coinciding with one or two days after the neap tidal days along with increasing tide.

Emergence of ridley turtles for nesting, whether sporadic or in mass tend to corelate with a strong onshore wind. At Gahirmatha such a corelation could only be found with turtles nesting sporadically or when groups of a few hundred individuals nested on a particular night. However, the arribada at the Gahirmatha beach usually takes place coinciding with or immediately following late seasonal rains associated with strong or moderate winds. In the subsequent nights, wind action appears to have no role after formation of any arribada.

It is interesting to know that there was no mass nesting (arribada) during 1981-82, 1987-88 and sporadic nesting in 1985-86 (only 0.08 lakh) nesting season. This indicates that unlike other reptiles (Kar, 1981) such as crocodiles and lizards, there is a 'halt' in the reproductive cycle of turtles within certain time gap. This 'lost year' mystery of sea turtles is still under investigation.

Biology of Pacific ridely turtles

This species of Sea turtle, out of seven living marine species of turtles (Olive ridley or Pacific ridley turtle, Leather Back, Hawks Bill, Green turtle, Logger Head, Kemps ridley and Flat Back turtles) is known to nest sporadically all along the Indian coast starting from the Gulf of Kutch in the West to Kanyakumari in South and then along the east-coast upto Sundarbans. Nesting has also been reported from Andaman and Nicobar Islands and other secluded islands in the sea. Gahirmatha beach of Cuttack District in Orissa coast is known as the largest know nesting beach/ground (rookery). These turtles are supposed to be the resident of Pacific Ocean but no detailed information is available about it. No other species of

marine turtles, except Olive ridleys have been observed nesting at Gahirmatha beach but during March 1984 one adult dead Leather Back turtle (*Dermochelys coriacea*) was recovered from Shortt's island (very close to beach). Again in the night of 20.2.86 a sub-adult Hawks Bill turtle (*Eretmochelys imbricata*) was seen crawling on the beach along with the Pacific ridleys during the mass nesting (Kar, 1986).

Courtship and Mating : Courtship and mating usually takes place in the shallow coastal waters off Gahirmatha coast during the period from October to December with the peak usually during the month of November. During this period large number of copulatory pairs can be seen floating in the shallow coastal waters very close to nesting beach.

Nesting : Nesting of ridley sea turtles in Gahirmatha beach takes place throughout the year. But mass nesting a unique phenomenon found only in case of ridleys takes place two to three times in a year. An average of 115 minutes was taken by mother turtles, from emergence from the sea to its final return after nesting, during which an average of 30 m was covered for one way journey. Emergence of turtles starts at about 8 P.M. and by 7 A.M. the following day, all nesting comes to an end. An average of 9.00 hours is used, every night for nesting activity equally divided during spring (high tide) and ebb-tide period. The nesting activity has no co-relation with the tide timings but hourly computation of emergence shows a clear inclination in favour of ebb-tide period.

Clutch size : Ridley sea turtles produce large number of eggs upto about 180 but average clutch size is 110. Eggs are deposited in the flask shaped egg pit in layers but the arrangement of eggs is not regular. The eggs are leathery, whitish in colour about the size of a ping-pong ball. The egg size ranged from 34.0 mm to 42.0 mm with maximum 37 to 38 mm class. The egg weight ranged from 21 gm to 52 gm. The maximum number being in 28-32 gm weight class.

Incubation period : Development of the embryos takes place in its natural way beneath the sand. It is seen that, during incubation period, first 5-10 cm of the top layer of the sand is affected by atmospheric fluctuation in temperature, whereas the rest 30-40 cm in the bottom layers of eggs have remote chance of being affected due to temperature fluctuation outside. The average incubation period is about 55 days.

Hatchlings and hatching success : There is no parenatal care. The hatchling turtles emerge by breaking the egg shell with the help of egg tooth after 50 to 60 days of incubation period. Emergence of hatchlings was noted between 1800 hours to 0600 hours i.e. from sunset to sunrise and the peak emergence within 2100 to 2400 hours. A comparison between first and second mass nesting shows that the clutch size during 2nd mass nesting was smaller by 15 eggs and incubation period was smaller by 10 days. The former can be explained as diversion of more energy towards physiological maintenance of body temperature from excessive heat during second mass nesting period. The decrease in incubation period is also due to increase in temperature. Another significant finding appears to be higher percentage of infertile eggs during second mass nesting (30%). Similarly with higher temperature, the hatching success has reduced by 32% and the incidence of still born and damaged embryos increase by 8.0%. The average

length and weight of the hatchlings is 35 mm and 20 gm respectively at the time of hatching.

Damage of nests / eggs by predators : It has been observed that more than 80% damage to the nests/eggs occur by hyaena, jackal and wild pigs and less than 20% damage occur by ferral dogs, particularly during the day time. It has further been observed that maximum damage by wild predators occur from the areas adjacent to mangrove forest other than *Casuarina* forest.

Predation on hatchlings : Hatching takes place in the night and it is the tendency of the newly born hatchlings to enter into the sea before sunrise. If by chance they do not reach the sea before the morning, they fall prey to a number of avian predators such as jungle crows, gulls, kites, eagles and storks.

Tag recovery

15,000 monel metal tags was received from FAO/UNDP in three installments of 5000 each with engraving 'Reward return Chief Wildlife Warden, Orissa'. During 1980, 1981 and 1983 nesting seasons 5000 turtles per season were tagged at Gahirmatha. The percentage of tag recovery worked out to be about 1.5% of total tagging in each mass nesting.

Death of Turtles in the Sea

During the nesting season, a number of turtle carcases were recovered at Gahirmatha beach every year which include 35% males and 65% females. Percentage of males carcases was found to be highest during November and progressively decreased during subsequent months. Similarly percentage of females was lowest during November and gradually increases upto March.

Attempts were made to analyse the cause of death during the period from October to May. External examinations and autopsy conducted over 1000 carcases revealed that about 20% were without any apparent external injuries, 10% with head injuries 65% with internal haemmorage and the rest 5% were with injuries at unspecified places. The first category appear to have died due to shock when confronted with fishing nets or sudden confrontation with high speed vessels. The second categegory refer to the turtles which were still alive after getting stuck to the nets and could have been freed for survival but were beaten to death as the fishermen were not much concerned with the turtles. The third category of turtles which probably struggled hard to survive but were asphyxiated to death due to drowning. The fourth categegory refer to other injuries caused by the propellers of trawlers or ships.

Presence of dead turtles on the nesting beach has no adverse effect on mass nesting of turtles or incubation of eggs as well as hatching success of eggs. However, at Gahirmatha the erosion and subsequent deposition of sand helps in washing the beach and freeing it from various bacteria, fungi, organic detritus etc. and keeps the beach ready for next season's arribada.

Conclusion

There is much speculation on ecology and biology of Pacific Ridley turtles such as choice of nesting beach, seasonal migration, foraging grounds, migratory route and above all, the 'lost year' mystery. Remote sensing and telemetry studies would be most helpful to know where and how far olive ridley turtles move between peak mating and the first and subsequent mass nesting periods at the Gahirmatha beach of

Orissa coast. Tagging programme initiated at the Gahirmatha rookery with assistance from GOI/FAO/UNDP should continue so as to achieve a total saturation of tagging programme for sea turtle population and to monitor/asses the population structure and trend and also to know their migration pattern.

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SUMMARY

Gahirmatha beach in Bhitarkanika Wildlife Sanctuary is known to be the largest Sea turtle rookery in the whole world. Minimum 2.0 lakh to maximum 6.5 lakh sea turtles visit the beach annually for nesting and egg laying. Studies on ecology and biology of sea turtles have been taken up since over a decade and this paper gives an overview of the 'arribada' in Orissa coast.

भितर कणिका वन्य प्राणी अभ्यारण्य, उड़ीसा में समूह नीड़ बनाने वाले प्रशान्त रिड्ले कछुए *लेपिडोचेलिस ओलिवेसिया* विषयक अध्ययन

सुधाकर कार

सारांश

भितर कणिका वन्य प्राणी अभ्यारण का गहिरमाथा सिकता तट पूरे विश्व में समुद्री कछुओं की सबसे बड़ी संघस्थली के रूप में विख्यात है। न्यूनतम 2 लाख से लगाकर अधिकतम 6.5 लाख तक समुद्री कछुए नीड़ बनाने और अंडे देने इस सिकता तट पर आते हैं। पिछले एक दशक से अधिक समय से इन समुद्री कछुओं की पारिस्थिकी और जैविकी के अध्ययन किए जा रहे हैं और इस अभिपत्र में उड़ीसा के सागर तट में बने संघ नीड़ का परिदृश्य प्रस्तुत किया गया है।

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