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HOW PRECISE IS NATAL HOMING - SPECULATION ON THE NESTING MIGRATIONS OF OLIVE RIDLEYS ON THE EAST COAST OF INDIA ?

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INTRODUCTION

Olive ridley sea turtles (*Lepidochelys olivacea*) nest all along the east coast of India. Most of the nesting is sporadic with three mass nesting sites at Gahirmatha, Rushikulya and Devi mouth in Orissa. Nesting migrations have been observed along the east coast on the coasts of Tamil Nadu and Andhra Pradesh. Feeding and nesting olive ridleys have also been observed in the Gulf of Mannar and off the coast of Sri Lanka. However, since there have been no studies thus far involving satellite telemetry, nor any intensive studies on the east coast apart from Orissa, little is known about the post nesting migrations or about remigrations of these turtles.

METHODS AND STUDY AREA

Tagging

Over three years, 10,000 nesting females were tagged at the three mass nesting sites in Orissa, Gahirmatha, Rushikulya and Devi mouth. At Gahirmatha, 1,500 mating pairs were captured using a locally designed fishing net and tagged. All animals were double tagged using monel tags

Molecular studies

Tissues were collected from mating pairs and nesting females in Orissa and from hatchlings at Madras, further south on the east coast of India. Microsatellite analysis was carried using the following primers - Cc7, Cm3, Cm72, Cm84 and Ei8 - on 34 samples from Orissa and Madras. Standard PCR conditions were followed (Fitzsimmons, 1995). Following amplification, polymorphism was studied by running the PCR products on 4% polyacrilamide gels on ABM prism 377 automated sequencer. Alleles were identified using Genotyper 3.0.

RESULTS

Tagging

Of 19 turtles recaptured in Sri Lanka, only two were recaptured during the non breeding or feeding period ie. 90 % of the recaptures were between December and April, which is the nesting season on the east coast of India. All, except one (13247/8) were females.

Microsatellite analysis

Two of the five alleles showed high degree of polymorphism. Cm 84 had substantial variation with 11 alleles and Ei 8 also showed variation with 12 alleles. In many instances, amplifications were found 20 bp beyond the range which were not included in the analysis.. Heterozygosity ranged from 0.09 (Cm 3) to 0.56 (Cm 84) with an average of 0.37. A pairwise comparison of individuals showed that no two individuals had the same allele complex. Heterozygosity was not different between Chennai and Orissa. Allele frequencies varied between populations, but population subdivision was not significant (Figure 2)

Table 1. Long distance recaptures of Olive ridley sea turtle (*Lepidochelys olivacea*) tagged in the coastal waters as well as in the nesting beaches in Orissa between 1996 and 1999. A total of 19 recaptures outside Orissa has been made till January 2001.

TAG NO	TAG NO	Recapture Date	Place of recapture	Tagged on	Place of tagging
Left	Right				
WG22081	WG22082	27.04.97	Kalmuna, Sri Lanka	13.03.97	Devi River mouth
WG03019		15.12.98	Poonagari, Sri Lanka	13.11.97	Gahirmatha
WR26559		Dec. 98	Ruwanthika, Nainamadama, Sri Lanka	22.03.98	Rushikulya
WR27519	WR27620	Jan. 99	Trincomalee - east coast of Sri Lanka	23.03.98	Rushikulya
# 855		Jan. 99	Chilaw, North West Sri Lanka		Gahirmatha
WR25087		15.12.99	Keelamankudi, Thoothukudi, Kanya Kumari district, Tamil Nadu	02.02.97	Rushikulya
WR30084	WR30085	31.08.99	Tamil Nadu in the Gulf of Mannar	23.03.98	Rushikulya
WG23995	WG23998	22.09.99	Kanegodala, Kottegoda, latitude N7°43' and longitude E83°35', Sri Lanka	29.03.99	Gahirmatha
WR26203	WR26204	12.01.00	Galle, Sri Lanka	22.03.98	Rushikulya
WG13247	WG13248	Jan. 2000	Nainamadama, Sri Lanka	23.12.98	Gahirmatha
WG17375	WG17376	10.01.00	Tamil Nadu, 52 km NE of Kanya Kumari, Gulf of Mannar	25.03.99	Gahirmatha
WR29834		01.02.00	Negambo, Sri Lanka	23.03.98	Rushikulya
WG19891	WG19892	07.02.00	Negambo, Sri Lanka	14.04.97	Gahirmatha
WR28131		15.01.00	Poonagari, Sri Lanka	23.03.98	Rushikulya
WG17563	WG17564	01.04.00	Poonagari, Sri Lanka	25.03.99	Gahirmatha
WG17805		15.03.00	Galle, Sri Lanka	25.03.99	Gahirmatha
WR30398	WR30399	18.03.00	Galle, Sri Lanka	12.03.99	Rushikulya
WR27677	WR27678	Jan. 2001 ?	Kalpiya, Sri Lanka	23.03.98	Rushikulya
WG15045		Jan. 2001 ?	Kalpiya, Sri Lanka	08.01.99	Gahirmatha
WR26135		Jan 2001 ?	Kanyakumari, Tamil Nadu	22.03.98	Rushikulya
WG14805		Jan 2001 ?	Kudankulam, Tamil Nadu	06.01.99	Gahirmatha

Table 2. Summary of information on five microsatellite loci for olive ridley sea turtles on the east coast of India.

Microsatellite Locus	Number of alleles	Range	Heterozygosity
Cc7	2	162-164	0.88
Cm3	4	160-166	0.38
Cm72	3	236-240	0.09
Cm84	9	326-346	0.56
Ei8	12	190-212	0.47

DISCUSSION

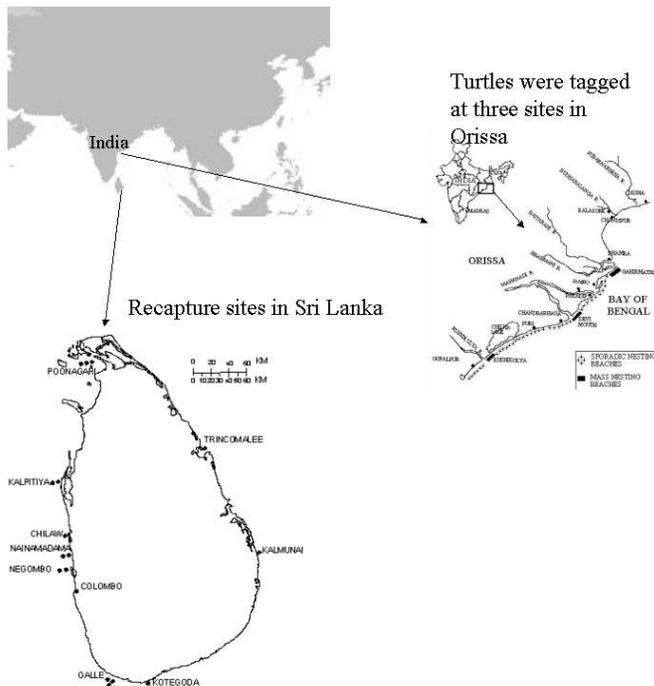
Multilocus fingerprinting, RAPD analysis did not reveal any population structure in olive ridley populations along the east coast of India (Shanker et al. 2000). Mitochondrial DNA analysis did not reveal population structure along the east coast of India (Shanker et

al. 2000) Turtles tagged in Orissa in the 1970s have been observed nesting in Madras, more than 1000 km south along the coast (Harry Andrews, pers. comm.)

Sporadic nesting along the east coast is roughly correlated with mass nesting events in Orissa (Kartik Shanker, unpubl. data). In Orissa, turtles have been recorded nesting at more than one nesting beach (320 km apart) within and between seasons (Pandav, 2000).

While olive ridleys are believed to breed annually, most other species are known to breed at intervals of three to five years. Sea turtles have to lay down their fat reserves and yolk stores in preparation for the breeding migration during the interbreeding period. Hence, the remigration interval in turtles may be determined by the diet during the interbreeding period. This is supported by the fact that the annual green turtle nesting intensity in Australia is correlated to El Nino events (Limpus et al., 2000).

Figure 1. Map showing sites of tagging in Orissa on the east coast of India and recapture sites in Sri Lanka.



Firstly, the data may be explained by imprecise natal homing in olive ridley turtles. However, recaptures at nesting beaches in Orissa (Pandav, 2000) suggest that this is not true. Other species of marine turtles may vary their remigration interval based on the fat reserves accumulated during the interbreeding period. Perhaps ridleys off the Indian coast (and elsewhere) simply choose to travel a shorter distance to nest rather than not nest at all. Hence turtles that would normally nest off the Orissa coast may choose to nest in Andhra Pradesh or Tamil Nadu when they run out of reserves. Though these hypotheses need validation by field and genetic data, we suggest them here as viable alternatives to the now well entrenched paradigm of natal homing, in the hope that future studies might address them.

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Figure 2. Allele frequencies of microsatellite loci for Gahirmatha (white bars), Devi River Mouth (black bars), Rushikulya (grey bars) and Chennai (patterned bars) for (a) Cm 84 (b) Ei 8.

