

## Tracking olive ridley turtles from Orissa

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### INTRODUCTION

Current knowledge of sea turtle life history suggests that individual turtles occupy a series of different habitats during the course of their life cycles. Satellite telemetry and other modern techniques have made it possible to monitor the movements of free ranging sea turtles on the open oceans.

The olive ridley sea turtle, *Lepidochelys olivacea*, nests in low densities all along the Indian coast. However, the most important nesting beaches lie in Orissa where these turtles are known to nest en-masse. There are three mass nesting sites at Rushikulya, Devi River Mouth, and Gahirmatha in Orissa (Pandav et al. 1994). Olive ridleys arrive in the coastal waters off Orissa by early November and are thought to spend nearly six months before leaving, evidently returning to their feeding areas. So far, little is known about the feeding areas of the ridleys using the Orissa coast for nesting. However, we still have no definite answer about the non breeding area of this olive ridley population that migrate every winter to nest in Orissa, much less the routes used by the turtles to travel from the nesting beaches.

The results presented here include reviews of tagging and molecular genetic studies and a recent exercise on satellite telemetry of olive ridleys in Orissa.

### METHODS

**Satellite telemetry.** Four Kiwisat 101 transmitters (Sirtracks Ltd, New Zealand) were employed for this study. The specifications selected were: 1 Watt transmissions, 30 second repetition rates, 2 lithium D cells, 8-bit temperature sensor, two, 8-bit "surface-time" counter, "surface-time" data to be reported in four 6-hour categories, duty cycle to be 24 hours on for first two weeks, followed by a 72-hour cycle of 24 hours on/48 hours off until the end of the transmission. The transmitters were attached at the end of April to minimize the chance of turtle mortality due to trawling. Between 18 and 21 April 2001 four satellite transmitters were attached to each of four female, post-nesting olive ridley sea turtles from the nesting beach south of Devi River mouth, Orissa. The transmitters were attached to the carapace of the turtles using Epoxy.

**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 (for details, see Pandav et al. 2001).

**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. Mitochondrial DNA sequencing and microsatellite analysis was carried out on samples from Orissa and Madras (for details, see Shanker et al. 2000).

### RESULTS

**Satellite telemetry.** We received 48 to 114 days of data on the 4 turtles, with 25 to 88 high quality location points. Initially, the turtles moved into offshore waters and seemed to be moving randomly. It then became clear that 3 of the turtles were moving in large circles off the coast of Orissa and northern Andhra Pradesh. After that, one of the turtles began to move south towards Sri Lanka. This turtle then swam 1000 km in 18 days to reach the coast of Sri Lanka (Fig. 1). The turtles swam a total of 1300 to 2900 km, but they all averaged about 25 to 30 km per

day despite differences in daily and monthly travel rates. The turtle that swam to Sri Lanka achieved rates of about 150 km per day during her migration south. In July and August, the transmissions ceased suddenly for each of the 4 transmitters. Though there are several possible causes -failure of transmitter, failure of battery, method of attachment, and damage to antenna - it seems likely that the high fishery related mortality of turtles on the coast of Orissa may be the cause.

**Tagging.** There were 20 long distance tag returns from Sri Lanka and the Gulf of Mannar region in southern Tamil Nadu. 80% of these tag returns were from Sri Lanka and most of them, interestingly, were during the breeding season.

**Molecular Genetics.** Both mitochondrial DNA sequencing analysis and microsatellite analysis has shown that ridley turtles do not exhibit strong population structure on the east coast of India (Shanker et al. 2000). However, the sequencing analysis suggests that Indian ridleys may have served as an evolutionary source for global populations of olive ridleys (ibid.). Current projects are examining ridleys from a wide variety of sources in the Bay of Bengal and Indian ocean.

### DISCUSSION

The tagging data demonstrates that ridley turtles that nest in Orissa migrate to southern Tamil Nadu and Sri Lanka during the non-breeding season. The occurrence of tagged turtles in these waters during the breeding season and the absence of population genetic structure raises questions about the precision of natal homing in these turtles. However, it is the satellite telemetry study that provides evidence about the exact migratory route taken by turtles, including important data such as travel rates and offshore distance from the coast. Another important finding is that ridley turtles occur in Orissa and northern Andhra Pradesh waters during the post nesting period. During their post nesting movement, they may come into nearshore waters (within 30 km) and are thus vulnerable to trawling related mortality. Considering that all four turtles are believed to have fallen prey to trawling related mortality, the results also highlight the threats to this population. More than 75,000 turtles have been counted dead in the last years on the Orissa coast (Pandav and Choudhury 1999, Kar 2001), and this situation needs to be remedied at the earliest.

In evaluating this and future projects, one has to evaluate the relative merits and demerits of satellite telemetry and other tools for studying sea turtles. Ideally, a combination of methods would help to answer questions about the biology and conservation of sea turtles. However, one additional factor that needs to be considered is the conservation importance of scientific studies. These studies cannot be judged on the success of scientific aspects alone. In this study, much was gained from the awareness and training programs associated with the telemetry exercise. Local communities, local governmental agencies and biologists were addressed during the course of the exercise. In addition, a lot of publicity and awareness was generated through coverage in national newspapers and TV channels. TV channels carried updates on the telemetry over a few months. A website was set up giving the movements of the turtles and this was also frequently visited.

In summary, we learnt some very important lessons from this small data set and also achieved some good results with regard to the awareness and publicity associated with the telemetry exercise.

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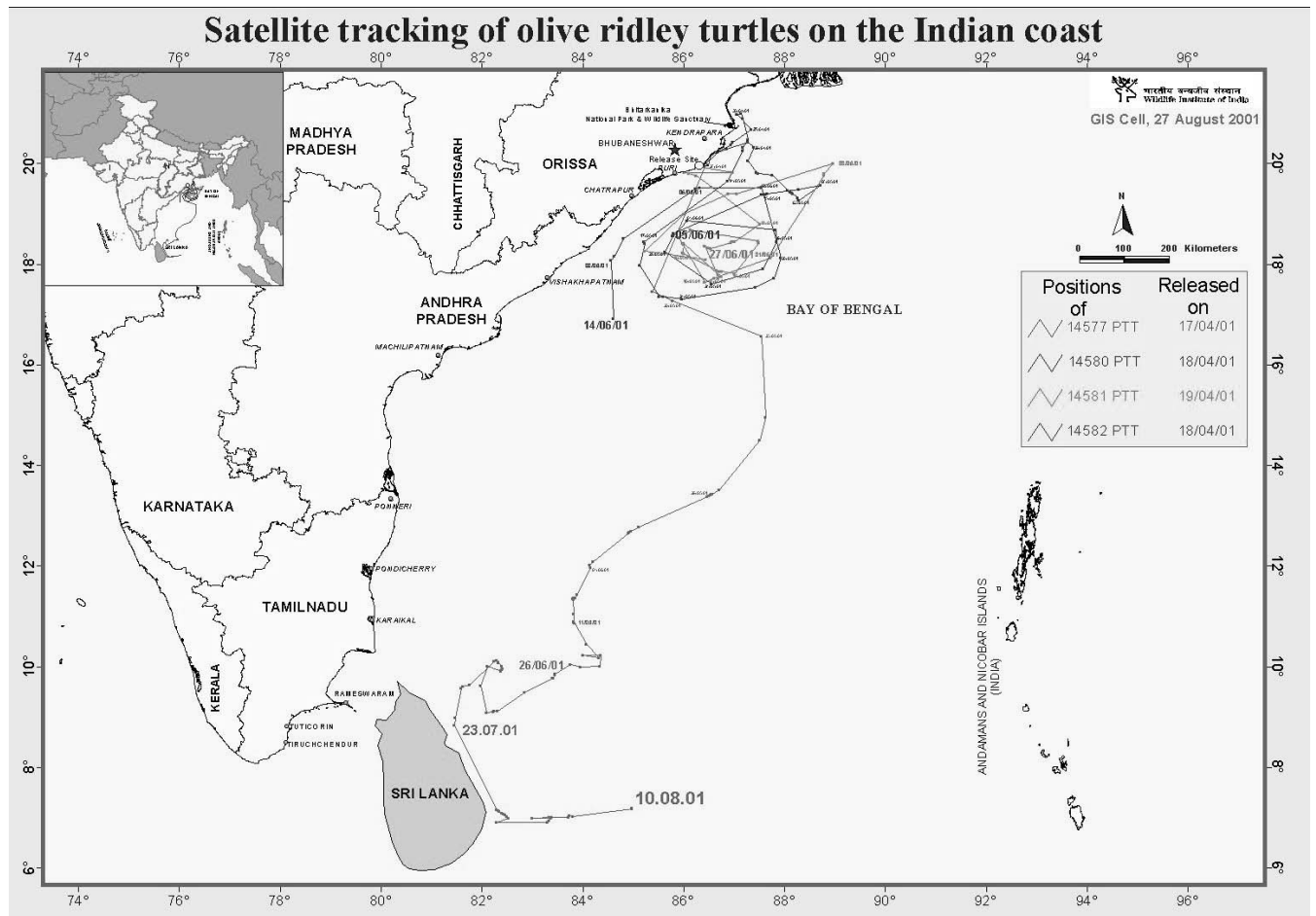


Fig. 1. Satellite tracking of four olive ridley turtles along the east coast of India from April to August, 2001.