ground at Rushikulya, which is the second largest in Orissa with 60,000 turtles nesting in 1996; and

Considering that the terminal has a capacity of 18 million metric ton per annum for giant oil tankers from the Gulf and other oil producing countries; and

Considering that the pipelines will be connected to Kantiagoda village, which is virtually on top of the Rushikulya turtle mass nesting site; and

Considering that the Environmental Impact Assessment Report [interim], which was prepared by the National Institute of Oceanography of Goa, has not adequately addressed the presence of turtles in the area and has also ignored the fact that the seacoast off Rushikulya is a proposed marine sanctuary which is awaiting government notification; and

Considering that the report actually states that "sensitive and fragile ecosystems…are absent in the project area", and briefly mentions the potential for crude oil spills: "in very rare events of tanker accidents or subsea pipeline rupture, large spill may occur"; and

Considering that the oil spill from a similar Single Buoy Mooring in Gujarat in 1999 has resulted in substantial damage to marine life and to marine ecosystems in the area: and

Considering that the mass nesting beaches at Rushikulya, where more than 60,000 turtles nested in 1996, enjoys no legal protection so far;

It is hereby resolved that:

The Members of the 20th Annual Sea Turtle, Orlando, Florida

Request the Government of India to review the Dhamra port project, subject the proposal to objective Environmental Impact Assessment and have the proposal passed through the proper channels of the Ministry of Environment and Forests; and

Request that since other sites for the construction of the port have been identified, these sites are objectively considered and evaluated as alternatives; and

Request the Government of India to reassess the Crude Oil Terminal at Rushikulya which threatens one of the most important nesting beaches of olive ridleys in Orissa.

Offshore studies on olive ridley sea turtles in Gahirmatha, Orissa.

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Introduction

The largest known population of the Olive ridley sea turtles (*Lepidochelys olivacea)* occurs along the Orissa coast (Bustard, 1976, Limpus, 1995). Enormous arribadas have been observed over the past decades and as many as 600,000 turtles have nested in the course of two weeks (Dash and Kar, 1990). The *L olivacea* population that occurs along the Bay of Bengal has suffered severely over the past decades. Apart from the threats faced while nesting, marine turtles are particularly vulnerable when they aggregate offshore (Richard & Hughes, 1972; Pers. Obs.).

The interactions between turtles and the fisheries is inevitable in a region like Orissa, the outcome of which has not always been favorable for both turtle or man. The ever-increasing human induced mortality of several thousand breeding individuals along the coast of Orissa has been an alarming concern over the past several years (Pandav et al., 1998). Incidental capture and mortality resulting from such capture are currently recognized as important threats to sea turtles (Hilllestead et al., 1982). It is believed to account for more deaths than all other human activities combined (Henwood and Stunz, 1987, National research council, 1990, Robins, 1995). Mortality in the last 5 years alone has exceeded 50,000 turtles (Pandav, unpublished data). Large scale mortality of olive ridleys in Mexico and the subsequent collapse of three large breeding assemblages in the 1970's & 1980's clearly illustrates the consequences of such actions (Cliffton et al., 1982).

While much of the conservation efforts have focused on protecting nesting habitats, protection in the marine environment has been overlooked, as enforcement is difficult and problematic. However, since turtles spend nearly all of their lives at sea (Owens, 1997), it is imperative that conservation efforts be directed in this region. Information on the offshore ecology of sea turtles is hence very crucial during the phase in their life history. Despite two decades of sea turtle research in Orissa (Bustard, 1974; Dash and Kar, 1990, Pandav et al., 1998), hardly any have studied them away from the nesting beach. Pandav et al. 2000 presented the first such account from this region. In order to shed more light on this aspect of sea turtle biology and also to aid in the conservation effort, I carried out a study in Gahirmatha during the 1999-2000 season. The survey period coincided with the mating period of the olive ridleys for this area that is spread over a maximum period of 90 days (Dash and Kar, 1990, Pandav, pers comm.) My objectives were to determine the spatial and temporal distribution of these turtles during the period prior to nesting and to get an idea of the intensity of mating that occurs in the vicinity of the rookery.

Methods

L. olivacea sighting data was collected between December 1999 and February 2000 using Line transects. The study area was surveyed in a country boat powered by a 10-hp diesel engine at an average speed of 8 km/hr. The bearing and radial distance of turtles sighted was measured using an 8 x 50 binoculars with a built in magnetic digital compass and a range finder (Leica Vector, Leica Corporation 1994). Environmental factors that were likely to affect detectability were also recorded.

Apart from the sightings, pairs were also captured and tagged during the study period. Locations from these captures were used for determining the extent of distribution in these near shore waters. Latitude and longitude position of each capture and sighting was recorded throughout the study period using a hand held Global Positioning System (Garmin Inc.). A depth profile of the study area was also constructed along representative lines. The distribution was determined by plotting capture locations on the map using arc view.

Results

The estimated surface density of pairs was 26 pairs km $^{-2}$ (CV 11.4 %) and the encounter rate was 3.9 pairs/km. The influence of various environmental factors on transects was found to be statistically insignificant but the sea state clearly affected detectability. Individuals tagged while mating exhibited some degree of inter-rookery movement. 1524 adults stranded in the first 3 weeks of the mating period and the overall mortality was over 3000. Sex ratios of the stranded turtles were skewed more towards males (1.47:0.68). Capture locations pooled over a 3 year period seems to suggest that the area used for breeding did not exceed 57.98 sq. km. The reproductive patch was situated at a depth of 8-65 feet.

The density of pairs even when extrapolated fails to account for the intensity of nesting that occurs

at Gahirmatha. It is possible therefore that females from several such assemblages aggregate during arribadas. The extent of offshore distribution seems to be consistent with observations off Nancite where individuals in the reproductive patch although transitory were found within 5 km offshore during the breeding period. These mating pairs also tend to occur in much shallower waters than do other species of sea turtles (Heather Kalb, pers. comm.) A possible explanation for such assemblages appears to be the one provided by Richard and Hughes (1972). They attribute assemblages of ridleys to near shore environments to the effects of river effluents, which may influence recognition of the same site at a later stage. The location of the aggregations in the present study is close to the mouth of the river Maipura where considerable deposition takes place. Although the size of the patch is quite variable both within and between seasons, the location has remained the same. Another explanation may involve the role of near shore currents.

Incidental capture and threats other the offshore waters to this highly endangered group is cause for great concern. As this study clearly shows, turtles suffer significant mortality when they aggregate in nearshore waters prior to nesting. An effective conservation strategy needs to incorporate these findings in order to protect the ridleys of Orissa.

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