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Marine Turtles of West Bengal

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Four species of marine turtles—olive ridley turtles, green turtles, hawksbill turtles and loggerhead turtles—have been reported from the West Bengal coast (Anon. 2000). Current records indicate that the olive ridley is the most common and abundant marine turtle in the Digha and Sunderban coasts of West Bengal (Biswas 1982, Saha 1986, Anon. 2000, S K Das 2001, Roy Chowdhury 2001). Some information exists on the migration, mating and nesting season of the turtles, and also on nesting beaches, clutch size, incubation period, incidental catch, threats to and trade in olive ridleys along the West Bengal coast (Biswas 1982, Sanyal 1983, Silas et al 1983, Saha 1984, 1986, Raut and Nandi 1986, Anon. 2000, Rajagopalan et al 2001, S K Das 2001, Roy Chowdhury 2001). This survey was carried out along the West Bengal coast, in the period 2000–02, to document nesting and evaluate the status and threats to marine turtles.

Study Area

The coast of West Bengal falls under the administrative jurisdiction of two districts, Medinipore and South 24 Parganas. As olive ridley turtles have been reported to visit Digha, Shankarpur, Junput sand bar, Nayachar (Medinipore) and the sea-facing islands of the Sunderbans in South 24 Parganas (Biswas 1982, Sanyal 1983, Tikader 1983, Saha 1984, Raut and Nandi 1985, Anon. 2000), the study was conducted in both districts (Figure 1). Barring Nayachar, there are no other nearshore islands along the Medinipore coast. The entire coast of Medinipore is thickly populated with fishing communities. Certain sections of the coast have been developed as tourist spots and are visited by large numbers of tourists. At some places, the coast is protected from erosion by beach armouring. Barring some *Casuarina* plantations, the entire coastal belt is devoid of forest and no area here is designated as protected.

The Sunderbans, which occurs in South 24 Parganas and continues into Bangladesh, is a cluster of at least 54 deltaic islands formed by the River Ganga. This group of deltaic

islands supports the largest mangrove forest in the world. A large number of islands, such as Gosaba, Basanti, Sagar and Namkhana, have been reclaimed for human settlement. There are many other islands, some named (Mechua, Kalash, Chaimari and Bijeara), others unnamed, which are devoid of permanent human settlement. During high tide, a considerable portion of the uninhabited islands become submerged. Sea-facing islands have vast stretches of sandy beach, while others have a soft muddy substrate. An area of about 9,630 sq km has been declared as the Sunderban Biosphere Reserve, which includes the Sunderban Tiger Reserve (2,585 sq km). The greater part of the Sunderbans is managed under various conservation programmes. However, wood collection, illegal fishing with seines, gill nets, and hooks, and unregulated use of shooting nets of small mesh size (for tiger prawn collection), continues unabated in the region in spite of the conservation measures and regular seizure of boats.

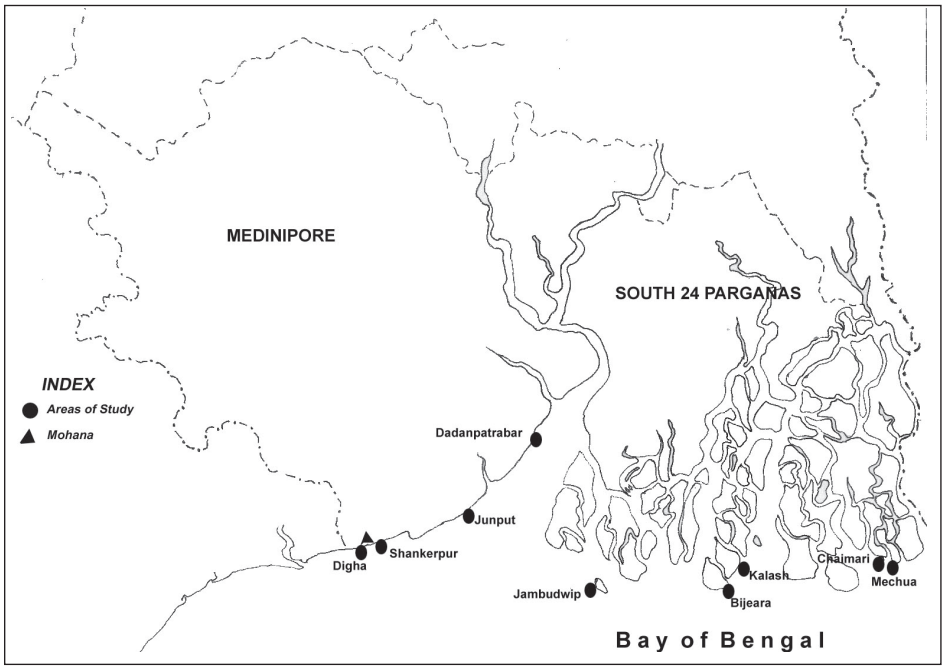

Figure 1. Map of West Bengal coast, indicating key nesting sites and islands in the Sundarbans.

Methods

The field study was conducted during the period May 2000–April 2001 and October 2001–March 2002. After reviewing the available literature, short field trips of one to two days were conducted into different fishing villages, fish-landing centres, beaches and local markets; non government organisations and coastal fisheries and forest offices in Medinipore and South 24 Parganas were also visited. Data on species composition, incidental catch, stranding, nesting beaches, trade, seizure and other related aspects were gathered from records/diaries of forest and fisheries officials, and through interviews with fisher folk, trawler operators, villagers, fish depot owners, traders and local NGOs. Prior to the interview, colour posters of marine turtles were also distributed to obtain species-wise information.

Offshore and nesting surveys were undertaken simultaneously. However, separate trips were arranged for Medinipore and the Sunderbans. Twenty-two surveys of four days each, and one for six days, were undertaken on foot/motor boat/country boat/trawler, in collaboration with the state forest and fisheries departments, between October 2000–March 2001 and in November 2001–March 2002. Migration of olive ridleys in the Bay of Bengal to nesting sites at Gahirmatha (Orissa) and the Sunderbans commences by late-October, and peaks in December–January (Silas et al 1984). Extensive fishing also starts in this region by late October (Raut and Nandi 1986).

During the survey of Medinipore district, nearly 40 km of beach from Duttapur to Dadanpatrabar (through Digha, Shankerpur and Junput) were searched on foot to enumerate dead turtles and nests. All the fish-landing centres were inspected to obtain information on incidental catch. In the Sunderbans, surveys were conducted in most of the sea-facing islands (particularly those which were already identified as nesting sites) and at least 50 percent of each beach was scanned on foot along the high tide mark. The number of live/damaged nests, distance of each nest from the high tide mark, and number of dead turtles were recorded. A few nests were excavated to determine nest characteristics and clutch size. Temperature, relative humidity and signs of predation were also recorded. Direct observations on nesting were made on a few occasions. To avoid recounting, dead turtles were marked on the central or costal scute. Both in Medinipore and the Sunderbans, local persons were engaged to record the arrival, nesting and mortality of marine turtles, particularly from October–March. During six days of offshore survey in November 2000, a total of 58 fishing trawlers were searched to estimate incidental catch and to determine the behaviour of the trawler operators on catching turtles.

Results

NESTING

Interviews with different groups of people revealed that the occurrence of marine turtles off the coast of Medinipore and the Sunderbans was fairly common. However, except in a few records kept by the forest department, no specific information on species was found. During the present survey, except for one dead specimen of a hawksbill turtle, found in Kalash Island in January 2001, all the specimens observed both in Medinipore and the Sunderbans were olive ridleys. The other two species of marine turtles reported from the West Bengal coast—green turtles and loggerheads (Anon. 2000)—were not recorded during this survey.

We recorded olive ridley nests in the sea-facing sandy beaches of the deltaic islands—Mechua, Chaimari, Jambudwip, Kalash and Bijeara of the Sunderbans. The combined length of the sea-facing beaches is nearly 7.5 km and their width from the high tide line to the forest varies between 50–200 metres. There are reports of nesting in two other islands of the Sunderbans, Kedurdwip and Pirkhali (research officer, Sunderban Tiger Reserve, pers. comm., and Mukherjee 2001), which could not be visited during the present study. Sanyal (1983) reported nesting of olive ridleys in Kanak Island (to the south of Kalash Island); Kanak Island could not be located during the current survey and is probably now submerged. Along the Medinipore coast, though incidental catch

and stranding are frequent, nesting was observed only on Dadanpatrabar beach. However, forest officials reported olive ridleys nesting in 1999 on the beaches of Nayachar, a recently formed island along the Medinipore coast.

Nesting is reported to occur from December to March. In 2000–01, nesting began in the second week of January, while in 2001–02, the first nest was recorded during the last week of January. However, in both years, nesting peaked by the third and fourth week of February. Nesting intensity appeared to be much less in 2001–02 than in the previous year. Nests were usually about 30 metres from the high tide line, but were also found between 100–150 metres from the high tide line. At Bijeara, a few nests were also found 50 metres inside the forest that borders the sandy beaches.

Average air, surface and nest temperatures in February (in the nesting beaches of the Sunderbans) were 24°C, 25°C and 25°C respectively, while in March, they went up to 32°C, 34°C and 31°C respectively. Relative humidity inside the nest during February–March varied between 50–62 per cent. On average, pH was higher on the surface (5.5) than inside the nest (4.5). A total of five nests were excavated; the depth of the nests ranged from 43–58 cm and clutch size ranged from 75–114 (mean=95.4).

Table 1. Number of nests found during the years 2000–01 and 2001–02.

Beach/ Zone	**2000–01**			**2001–02**		
	No. of Nests	**Predated Nests**	**Predation (%)**	**No. of Nests**	**Predated Nests**	**Predation (%)**
Mechua, STR	307	197	64.2	13	5	38.5
Chaimari, STR	123	32	26	25	8	32
Kalash, SBR	303	95	31.4	10	5	50
Jambudwip, SBR	230	48	20.9	24	16	66.7
Bijeara, SBR	495	282	57.0	15	10	66.7
Dadanpatrabar, Digha	106	91	85.8	0	0	
Total	**1,564**	**745**	**47.6**	**87**	**44**	**50.6**

STR= Sunderban Tiger Reserve, SBR= Sunderban Biosphere Reserve

INCIDENTAL MORTALITY

As early as 1984–85 (October–February), fishery-related deaths of 438 olive ridley turtles (186 males and 252 females) were reported from Digha, Jaldah and Junput (Raut and Nandi 1986). Rajagopalan et al (2001) estimated 96, 125 and 60 (landed, trapped or stranded) marine turtles along the West Bengal coast in 1997, 1998 and 1999 respectively, with a peak (46.6 per cent) during February. Raut and Nandi (1986) indicate that a majority of turtles die of asphyxiation following accidental capture. Interviews with fisher folk confirm this. In the '70s and '80s, fishermen usually brought the turtles to the shore hoping they would revive following exposure. However, only a few (7–8 per cent, according to Raut and Nandi 1986) ultimately survived and were despatched to the market, while the rest were discarded.

A total of 11 live olive ridley turtles were found in 7 of the 58 trawlers inspected. However, all the operators indicated that in the period November–February, there was a high possibility of turtles getting caught in fishing nets; a majority of which would be dead

before they were removed from the net. They also reiterated that the turtles, alive or dead, were thrown back into the sea owing to recent vigilance at fish depots and markets by police and forest officials. Though no authentic year-wise records have been maintained, all the operators indicated yearly fluctuations in incidental catch, with no trend of decline over the years. A rough estimate suggests that upto 20 turtles may be caught per trawler per season. Given that there are 1,500 officially registered trawlers, incidental catch-related mortality may be very high. Local reports indicate that nearly 500 unregistered trawlers/mechanised boats may also be operational. In spite of order of the Government of West Bengal, no vessel uses turtle excluder devices (TEDs).

Out of 32 fisher folk (operating mainly in country boats) interviewed at the landing centres of Digha, Shankarpur, Namkhana, Sagar, Canning and Raidighi, 15 refused to reply. The other 17 stated that incidental catch is highest between November–February, and particularly near the river mouth. Though colour posters were shown to them, they could not identify the species. The number caught per boat per day during January–February was reported to be upto five, though in some years there was reported to be no incidental catch. Upto 1990, the captured turtles were taken to the landing centres for sale, but they are now released in the sea for fear of legal action.

Table 2. Olive ridley carcasses found in West Bengal during 2000–01 and 2001–02.

	Oct	Nov		Dec		Jan		Feb		March	
	2000	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Beach	**–01**	**–01**	**–02**	**–01**	**–02**	**–01**	**–02**	**–01**	**–02**	**–01**	**–02**
Digha	-	1	-	5	4	4	2	3	1	1	-
Shankarpur	4	7	4	7	5	13	10	9	14	2	-
Junput	2	8	6	8	9	10	7	7	9	1	-
Dadanpatrabar	3	7	7	7	5	16	17	12	13	1	-
Mohana	-	-	2	1	-	3	-	4	2	-	-
Jambudwip	-	-	6	11	8	42	34	49	36	1	3
Bijeara	8	15	12	12	6	41	21	16	26	2	1
Mechua	5	7	8	3	1	16	12	9	15	-	1
Chaimari	-	-	1	3	4	7	9	7	10	2	1
Kalash	6	8	9	4	3	33*	21	19	23	2	1
Total	**28**	**53**	**55**	**61**	**45**	**185**	**133**	**135**	**149**	**12**	**7**

*Includes one hawksbill turtle.

Since 1995, between 50–100 carcasses of olive ridleys have been found every year at Lower Long Sand Island beach. It is estimated that there about 400 carcasses were found (Shankarpur 240, Digha 50, Junput 105) in the different beaches of Medinipore during January–February 2000 (divisional forest officer, South 24 Parganas, pers. comm.)

During monthly surveys along a 40-km stretch of beach in Medinipore and an eight-km beach in the sea-facing islands of the Sunderbans, 862 carcasses of olive ridleys (58 per cent female) and 1 hawksbill turtle were counted. In 2000–01, the mortality was highest in January, while in 2001–02, it was highest in February. However, the number of carcasses recorded by the forest department during January–February 2000 from Digha, Shankarpur and Junput is much higher.

TRADE

Biswas (1982) estimated that during the period October 1978–January 1979, 21,361 turtles were collected from six seaside depots at Digha and two at Junput. The turtles were sent by truck to Kharagpur railway station for the Kolkata market. However, repeated inspection of different markets, fish depots and landing centres in Medinipore, the Sunderbans and Kolkata during 2000–01 and 2001–02 revealed that trade in marine turtles has declined to a great extent. Discussions with various sections of people indicates that the demand for turtle meat has declined as well. However, the clandestine trade of turtle meat has not totally stopped. Turtle meat was being sold at the markets of Kultali, Canning, Basanti, Lower Sand Island, Raidighi, Kakdwip and Namkhana of the Sunderbans, and Gharichawk, Thakurchawk, Botipur and Ramnagar of Digha–Shankarpur. Meat is sold at between Rs 15–20 per kg. Though no evidence of active turtle fishing was found in the survey, Mukherjee (2001) reported that turtles were caught along the coastline from Kakdwip (South 24 Parganas) to Medinipore and landed at Babasaheb and Petughat, avoiding the Digha and Shankarpur landing centres which are inspected by forest department officials. Turtle meat is sold mainly in the evenings at interior markets, such as Sopna and Chowrangee of Contai sub-division (Medinipore). To control the clandestine trade of turtles, regular raids and seizures are made by the state forest department in collaboration with the local police (Table 3).

Table 3. Seizure of sea turtles by the West Bengal forest department from 1995–96 to 2001–02.

Year	Seized by	Number of turtles
1995–96	East Medinipore division	70
1996–97	South 24 Parganas division	1
1997–98	Kharagpur Social Forestry division	15
	South 24 Parganas division	2
	Headquarter (Kolkata)	1,071*
1998–99	Headquarter (Kolkata)	229*
1999–00	Kharagpur Social Forestry division	398
	Headquarter (Kolkata)	1,033*
2000–01	West Medinipore division	8
	Headquarter (Kolkata)	467*
2001–02	Headquarter (Kolkata)	1,613*

*May include freshwater turtle species.
(Source: West Bengal forest department)

NESTING BEACHES

Most of the nesting beaches in West Bengal are devoid of permanent human habitation, but they are regularly visited by a large number of fisher folk, particularly during the nesting period. Except Jambudwip, there are no permanent settlements in any of the islands where nesting occurs. At Jambudwip, there is a large fishing village, where about 1,200 fisher folk live during the peak fishing season, using the beach to dry fish. They use the other uninhabited islands to dry fish, repair their fishing nets and collect fuelwood. At this time, they often collect eggs from the nesting beaches for consumption. A large number of motorboats and launches carry tourists around the nesting beaches

of the Sunderbans, obstructing the movement of nesting turtles. Saha (1984) reported that the growth of *Casuarina* trees also affects nesting beaches. Beaches in the Sunderbans are also subject to erosion and flood. Further, cyclones are frequent in the coastal zone, and often change the topography of the beach (Gani 2000).

AQUACULTURE AND DEVELOPMENT

Aquaculture has encouraged the unregulated use of shooting nets of small mesh sizes for the collection of tiger prawn seeds. This results in tremendous loss of biodiversity in the Sunderbans. It has been estimated that for the collection of a single seed of tiger prawn, 208 juvenile fish, molluscs, crabs and other prawns are destroyed (A K Das 2001). Additionally, pollution from industries along the river Hugli, and large-scale developmental activities along the coast of West Bengal pollute the sea surface micro-layer and destroy surface-living marine animals. Further, construction in the upper reaches, and the dykes and embankments in the lower reaches of the Hugli estuary have greatly altered the pattern of freshwater flow and thus affected the salinity, siltation pattern and natural equilibrium of the ecosystem in the Sunderbans (A K Das 2001). This might also have adverse effects on turtle migration and nesting in the Sunderbans.

PREDATORS

Tigers (*Panthera tigris*), wild boars (*Sus scrofa*) and water monitors (*Varanus salvator*) have been identified as predators of nesting females or their eggs in the nesting beaches of the Sunderbans (Saha 1984, 1986, Gani 2000). During the present study, a large number of damaged nests with broken eggshells were found indicating predation (Table 1). Tiger pugmarks were found around the remains of olive ridleys in the Sunderbans. Though there is no conclusive evidence of predation, it is possible that tigers attack nesting females. At Mohana beach (near Digha), a live turtle was seen being dragged by a feral dog, and in the Sunderbans, a number of carcasses were found with injury marks caused by wild boar, though these could have occurred post mortem.

Conservation of Marine Turtles in West Bengal

Conservation efforts mainly involve habitat protection, management and control of trade, measures to reduce incidental catch, awareness programmes and legislation. An area of 9,630 sq km covering part of South 24 Parganas and North 24 Parganas was declared as the Sunderban Biosphere Reserve in 1989. This includes the Sunderban Tiger Reserve (the Sunderban National Park and Sajnekhali wildlife sanctuary) of 2,585 sq km, Halliday Island wildlife sanctuary (5.95 sq km) and Lothian Island wildlife sanctuary (32 sq km). The major nesting beaches under this protected area network enjoy the highest degree of protection under the Indian Wildlife (Protection) Act, 1972. Human interference on the nesting beaches and fishing or movement in the core area is totally prohibited. Since 1990, special patrolling has been organised by Project Tiger and Biosphere Reserve authorities at the main nesting beaches during the nesting season.

The nesting beaches of the Sunderbans, including Bangladesh, are subject to heavy pressure from predators, erosion, accretion and other natural calamities, resulting in

poor hatching success. Project Tiger authorities have established two hatcheries at Sajnekhali and Bhagabatpur, South 24 Parganas. Eggs are collected by forest officials from Mechua, Kalash and other islands and taken to the hatcheries for incubation. When the hatchlings are two months old, they are released. About 2,000 hatchlings were released up to 1983, and another 1,000 till 1999 (district forest officer, South 24 Parganas, pers. comm.). During 2000–01, 1,928 eggs were collected from Mechua by the forest department, out of which 190 hatchlings were released. As *in situ* conservation, in 2001–02 the forest department fenced the nests in Mechua Island with nylon nets supported by sticks.

To enforce wildlife laws in the state, the forest and fisheries departments, the police, panchayat (local government), coast guard and NGOs are meeting regularly to ensure coordination. Vigilance against capture and trade in turtles and habitat destruction has been stepped up through the coordination of these organisations. The coast guard has started special patrolling in the turtle migration zone of West Bengal since 1990. In collaboration with the police, regular raids are carried out at different fish-landing centres, local markets and fish depots as well as on fishing vessels. Several check points have been located in and around the Digha–Shankarpur route to prevent the transport of live turtles by road. The success of protection programmes depends on the quality of information gathered by the management. At present, wildlife wardens and range and beat officers collect information through their network of informers. The system of paying rewards to the informers has also been introduced in the forest department. In order to effectively pursue the cases in the court, legal cells have been established in all the divisions of the wildlife wing.

In order to minimise incidental catch and fishery-related mortality, the West Bengal fisheries department issued Order No. 3209-Fish/C-V/IA-2/90 pt. 1 dated 17.11.2000 and Memo No. 1473-Fish/C-V/IP-5/37 dated. 20.11.2000 regarding the introduction of the turtle excluder device (TED) in mechanised trawlers, as well as several fishing regulations. However, during the present study no vessel was found fitted with a TED.

Fishing restrictions in the offshore waters of West Bengal:

Fishing Zone A (Territorial water up to 15 km)	Vessels fitted with 30 HP engine	Gill net not below 25 mm mesh. Fixed bag net/ dol net of mesh not below 37 mm. Drag net of mesh size not below 25 mm.
Fishing Zone B (Territorial water beyond 15 km)	Vessels fitted with engine of more than 30 HP	Gill net not below 25 mm mesh. Trawl net of standard mesh size fitted with TED suitable to the size of trawl net

The forest department and WWF-India are spreading awareness of conservation of marine turtles by conducting meetings and distributing brochures, leaflets, handouts, posters and other informative material. Signboards about the killing and trade of turtle-meat have been erected at important locations. Fishing cooperatives are being taken into confidence. In 2001, the Central Institute of Fisheries Technology, Kochi and the

state fisheries department provided training to the fisher folk and fishing cooperatives of Digha, Shankarpur and Frazerganj on the use of TEDs in trawl nets. They were also trained in the techniques of releasing captured turtles into the sea. A nature interpretation centre has been established at Sajnekhali to highlight conservation issues. Two seawater ponds were made at Bhagabatpur and Bakkhali during the years 1983 and 1993 respectively. A few live olive ridley turtles are maintained in these ponds for the education of tourists. The state forest department interacts with the Wildlife Institute of India, Dehradun to obtain the latest information and methods for the conservation of wildlife.

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