

## Marine Turtles of Tamil Nadu

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All the five species of marine turtles found in Indian waters—olive ridley turtles, green turtles, leatherback turtles, hawksbill turtles and loggerhead turtles—are reported in Tamil Nadu. In fact, this is the only state in India where all five species occur. Barring the loggerhead, all the other species have been reported to nest along the Tamil Nadu coast (Kar and Bhaskar 1982).

The oldest-known references to marine turtles comes from this region, a poem of the Tamil *Sangam* (c. 400 AD) in which the egg-laying of marine turtles is succinctly described (Sanjeeva Raj 1958). Research and conservation of marine turtles along the east coast of India was initiated by the Madras Snake Park Trust (MSPT) in 1974, marking one of the first marine turtle programmes in India (Valliappan and Whitaker 1974, Whitaker 1977, Bhaskar 1981). Currently, several government and non government organisations are involved in marine turtle conservation on the Tamil Nadu coast. The Central Marine Fisheries Research Institute (CMFRI) has been studying aspects of marine turtle biology and monitoring fishery-related turtle mortality in Tamil Nadu and its neighbouring states (Agastheesapillai and Thiagarajan 1979, Silas and Rajagopalan 1984, Rajagopalan et al 1996). The Madras coast, in particular, has been monitored since 1974 by MSPT, the Tamil Nadu forest department, CMFRI and Madras Crocodile Bank Trust (MCBT) (Shanker 2003). This coast has also been monitored annually by the Students' Sea Turtle Conservation Network (SSTCN) since 1988 (Shanker 1995, 2003). There is also some information on the status of marine turtles along the Pondicherry (Banugopan and Davidar 1998) and Point Calimere coasts (Rahman et al 1985).

Marine turtles are known to be exploited in the Gulf of Mannar, Tamil Nadu (Kuriyan 1950, Frazier 1980). However, precise information on the number of turtles exploited is scanty and largely anecdotal. A large number of current and proposed development projects on the coast and in nearshore waters pose serious threats to the survival of

marine turtles in this region. Modernisation of fishing practices is another major threat. For instance, the shift from traditional fishing (using *catamarans*) to highly sophisticated trawlers, especially in the Gulf of Mannar, is a potential threat to the survival of turtles in the long run.

The Tamil Nadu coast has both breeding and foraging grounds. This coast forms a part of the migratory corridor for olive ridleys that mass-nest in Orissa (Pandav 2000). The mortality of thousands of olive ridleys has been reported in Orissa due to incidental catch in fishing gear. Hence, there is considerable concern about nesting habitats and feeding areas in Tamil Nadu.

## Methodology

Tamil Nadu, with a coastline of 980 km (including Pondicherry), has both east (900 km) and west (80 km) coasts (Figure 1). A preliminary survey was conducted along the entire coast of this state in November–December 2000 recording coastline characteristics such as sand, rock, mangrove and swamp at intervals of 10–15 km. Sandy beaches were considered suitable for turtle nesting, and rocky beaches, swamps and areas of development as unsuitable. Based on preliminary surveys, locations for intensive studies were selected.

Fortnightly monitoring of beaches along Nagapattinam (50 km), Rameswaram (15 km) and Tiruchendur–Kanniyakumari (80 km) was carried out during the olive ridley nesting season (December–April). Field surveys started at 0500 hrs and continued up to 0800 hrs. In a day, 10 km of beach was covered and nest sites of turtles were located following their tracks. Information on predated nests (number and predator) and dead turtles (species, number and possible cause of mortality) were also recorded. Turtle tracks once recorded were wiped out and carapaces of dead turtles marked with paint to avoid recounting. Intensity of marine turtle nesting was calculated as follows:

$N = n \times s \times t$ , where,

$N$  = estimated number of nests during the season for the entire zone

$n$  = mean number of nests observed (nests/day/section)

$s$  = number of sections in the zone (for instance, there were 5 sections of 10 km each along the 50-km Nagapattinam coast)

$t$  = duration of the nesting season (assumed to be 150 days from December–April)

In addition, coordinated surveys covering most of the coast were carried out from 20 January–20 February 2001. This was undertaken by hiring local resource persons in each sector to assess the overall status of marine turtle nesting in that sector. As in the fortnightly surveys, 10 km of beach was covered in a day. Exploitation of turtles by local people was monitored in select village markets.

## Results

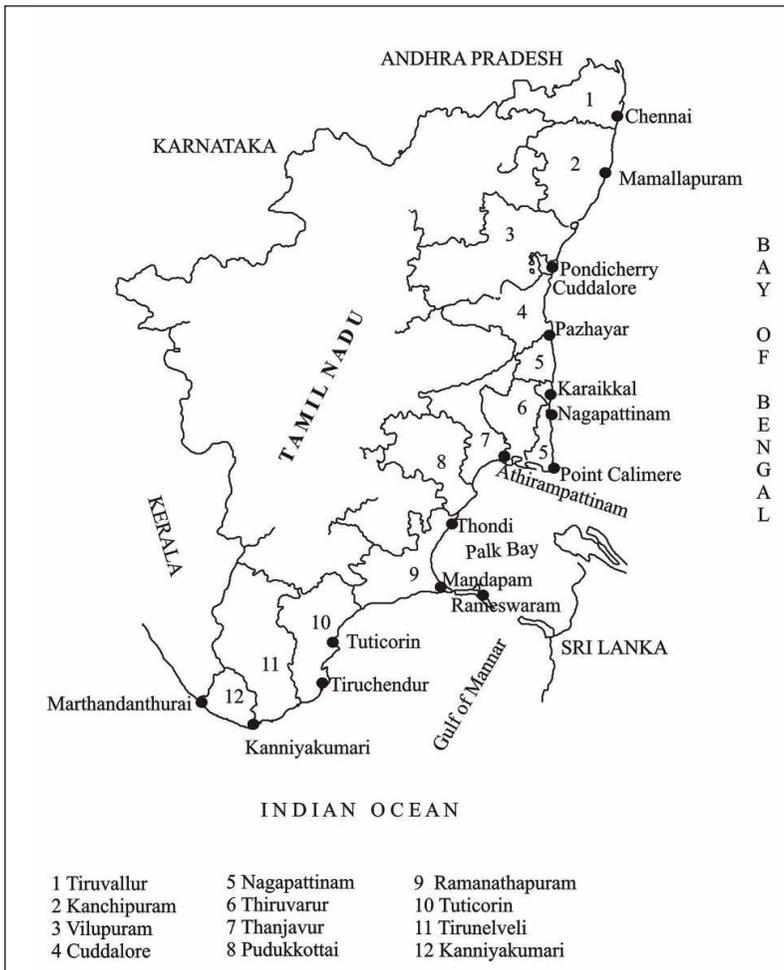
### STATUS OF THE TAMIL NADU COAST

Of the state's 980-km coastline (Figure 1), about 821 km (79 locations) was covered during the preliminary survey. About 530 km (65 per cent) of the coastline had sandy beaches, and was assumed to be suitable for turtle nesting. Human habitation, with its



related developmental activities, and rock and swamps accounted for the rest (Table 1). The predominant coastal vegetation was *Spinifex littoreus*, *Ipomoea pescaprae* and *Casuarina equisetifolia*.

Even though a majority of the coast, especially between Kanniyakumari and Tiruchendur, had sandy beaches, these areas were highly impacted by sand mining. Sea walls built to protect the land from sea erosion left no space for nesting in most parts of west coast. Elsewhere, the sandy beach left between the sea and human habitation was low (<5 m). The east coast, from Rameswaram to Kanniyakumari and from Nagapattinam to Chennai, has considerable sandy beaches (Table 1). The beach between Mandapam and Atherampattinam is predominantly covered with swamps and backwater marshes. Large numbers of human settlements and industries are found along the Nagapattinam–Chennai coasts. Based on the availability of sandy beaches, the coasts north of Nagapattinam and south of Mandapam appear to be more suitable for turtle nesting.



**Figure 1.** Map of Tamil Nadu showing coastal districts

**Table 1.** Beach characteristics of Tamil Nadu with reference to marine turtle nesting.

Coastal sector	Distance sampled (km)	Suitable for Nesting Sandy (km)	Unsuitable for Nesting		
			Rock (km)	Devel- opment (km)	Swamp (km)
Marthandanthurai–Kanniyakumari	63	50 (79.4)	10	3	0
Kanniyakumari–Tiruchendur	78	72 (92.3)	4	2	0
Tiruchendur–Tuticorin	41	30 (73.2)	0	11	0
Tuticorin–Mandapam	114	102 (89.5)		12	0
0					
Rameswaram Island	38	15 (39.5)	8	15	0
Mandapam–Thondi	69	36 (52.2)	0	0	33
Thondi–Athirampattinam	80	15 (18.8)	0	5	60
Athirampattinam–Nagapattinam	107	44 (41.1)	0	13	50
Nagapattinam–Cuddalore	90	60 (66.7)	1	14	15
Pondicherry–Chennai	141	110 (78)	1	30	0
<b>Total</b>	<b>821</b>	<b>534 (65)</b>	<b>36</b>	<b>93</b>	<b>158</b>

Numbers in parentheses indicate percentage.

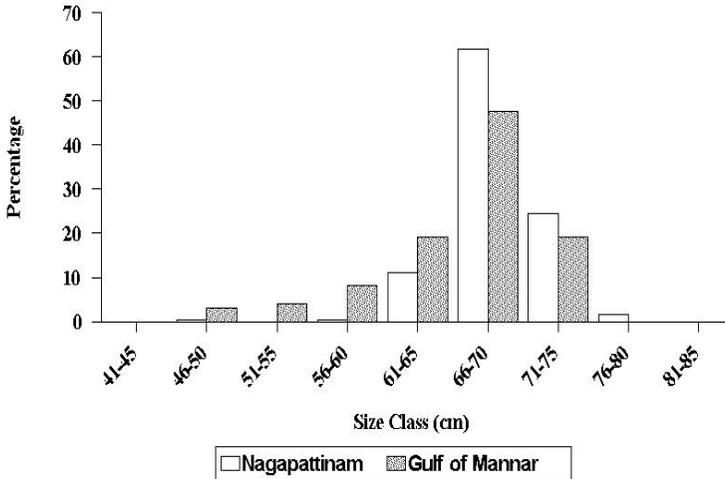
#### DISTRIBUTION OF MARINE TURTLES

The distribution and abundance of marine turtles was based on the number of live and dead turtles observed on the beaches and in select village markets. In all, 462 observations (on five species) were made during this study. The most common species was the olive ridley (81.6 per cent) followed by the green turtle (16 per cent). Species composition in the Gulf of Mannar and Nagapattinam was different. Along the Nagapattinam coast, only olive ridleys and green turtles were observed, with the former contributing to 97.6 per cent. In the Gulf of Mannar, olive ridleys (56.2 per cent) and green turtles (38.2 per cent) together contributed 94.4 per cent; the other three species constituted only 5.6 per cent. The leatherback was observed in the Gulf of Mannar, and hawksbills along Palk Bay, the Gulf of Mannar and Chennai. The olive ridley was common all along the Tamil Nadu coast, and the green turtle was seen more commonly in the Gulf of Mannar than in other areas.

#### SIZE CLASS

The size class information was based on intact carcasses found on the shore, especially along the Nagapattinam coast and the Gulf of Mannar (south of Mandapam). Over 99 per cent of the carcasses of olive ridleys found along the Nagapattinam coast had a curved carapace length (CCL) of over 60 cm (Figure 2), while it was only 85 per cent in the Gulf of Mannar. However, the size class distribution of olive ridleys observed along the Nagapattinam coast was not significantly different from that of Gulf of Mannar (ANOVA  $F=0.895$ ,  $p=0.360$ ,  $n=16$ ).

It is reported that olive ridleys attain sexual maturity when they reach about 62 cm in CCL (Pandav 2000). The present study showed that Nagapattinam harboured a breeding



**Figure 2.** Size structure of olive ridleys in Nagapattinam and Gulf of Mannar

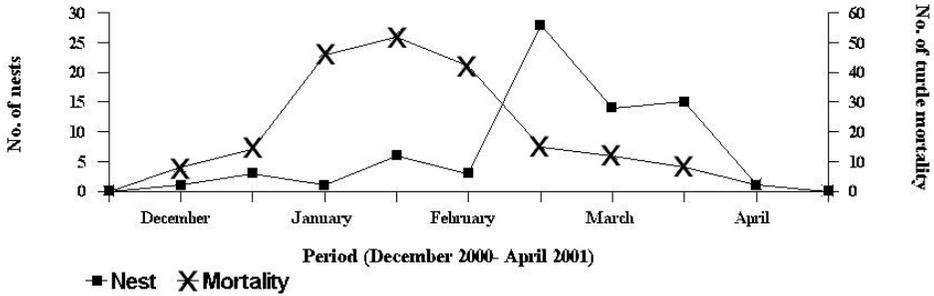
population, whereas the Gulf of Mannar had both immature and adult olive ridleys. Of the 74 green turtle carcasses observed, 68 were from the Gulf of Mannar and six were from the Nagapattinam coast. It appears that the current green turtle population of the Gulf of Mannar is predominantly composed of juveniles and sub-adults, as over 70 per cent of the carcasses observed had a CCL below 80 cm; green turtles attain sexual maturity at a CCL of 80 cm (Agastheesapillai and Thiagarajan 1979). This indicates that the Gulf of Mannar is a major feeding ground and developmental habitat for olive ridleys and green turtles.

#### OLIVE RIDLEY MIGRATION

The Wildlife Institute of India (WII), Dehradun has tagged nearly 10,000 olive ridleys at the beaches of Gahirmatha, Rushikulya and the Devi river mouth in Orissa till 2000 (Pandav 2000). During the field surveys, two tags were recovered from Kanniyakumari area, at the southern tip of the Indian peninsula—a female turtle bearing the tag WR 26135 had been tagged at the Rushikulya rookery on 22.03.1998 (Pandav, pers. comm.); fishermen near Kanniyakumari collected this tag in mid-June 2000 during the non-breeding season, 27 months after it was tagged; the other turtle bore the tag WG 14805, tagged on 6.1.1999 near Gahirmatha (Pandav, pers. comm.). This female was found dead along with five other turtles in a gill net in mid-November 2000, north of Kanniyakumari, in the Bay of Bengal; the recovery was about 22 months after it was marked at Gahirmatha. These recoveries and others (Pandav 2000) confirm that at least some of the olive ridleys that nest in Orissa feed off the coast of Sri Lanka and Tamil Nadu.

#### NESTING

Fortnightly surveys showed that olive ridleys did not exhibit any pattern with respect to nesting in Rameswaram and Kanniyakumari–Tiruchendur. However, along the Nagapattinam coast, turtles emerged from mid-December and continued up to



**Figure 3.** Nesting and mortality of olive ridleys along the Nagapattinam coast.

the first fortnight of April, reaching a peak during the second half of February (Figure 3). The estimated number of nests along the Nagapattinam coast was 1,080 (22 nests/km/season), whereas it was about 1–3 nests/km/season in Rameswaram and further south (Table 2).

**Table 2.** Fortnightly nesting of olive ridleys along select sectors of Tamil Nadu.

Month and Fortnight	Nagapattinam (50 km)		Rameswaram (15 km)		Kanniyakumari–Tiruchendur (70 km)	
	Nests	Nest/day/10 km	Nests	Nest/day/10 km	Nests	Nest/day/10 km
December I	1	0.2	0	0	0	0
December II	3	0.6	0	0	4	0.6
January I	1	0.2	1	0.5	1	0.1
January II	6	1.2	0	0	0	0
February I	3	0.6	0	0	4	0.6
February II	28	5.6	0	0	4	0.6
March I	14	2.8	0	0	1	0.1
March II	15	3	0	0	0	0
April I	1	0.2	0	0	0	0
April II	0	0	0	0	0	0
<b>Total</b>	<b>72</b>	<b>14.4</b>	<b>1</b>	<b>0.5</b>	<b>14</b>	<b>2</b>
Estimated nests		1,080		11		210
Nests/km		22.6		1		3

Coordinated surveys between 20 January–20 February 2001 showed that overall nesting intensity was about 4/km/season (range 0–11 nests/km). Lack of turtle nesting north of Mandapam up to Thondi could be due to the non-availability of suitable sandy beaches; swamps and backwaters cover most parts of this stretch. Higher nesting was observed between Point Calimere and Chennai where about 87 per cent of the nesting occurred; this is largely due to the availability of suitable sandy beaches. The estimated number of turtles nesting along the Tamil Nadu coast is ~2,500/season (Table 3).



**Table 3.** Nesting of olive ridleys along various sectors in Tamil Nadu during January–February 2001; distance sampled per day=10 km.

Coastal sector	Distance (km)	Survey days	Nests	Nests/night/10 km	Estimated nests/30 days	Nest/km
Kanniyakumari–Tiruchendur	80	8	4	0.5	120	1.5
Tiruchendur–Mandapam	60	6	1	0.17	30	0.50
Rameswaram	15	1.5	1	0.67	30	2
Mandapam–Thondi	30	3	0	0	0	0
Point Calimere–Nagapattinam	30	3	4	1.33	120	4
Tranquebar–Pazhaiyar	50	5	18	3.6	540	11
Pondicherry–Mamallapuram	60	6	7	1.17	210	3.5
Mamallapuram–Chennai	40	4	13	3.25	390	9.8
<b>Total</b>	<b>365</b>	<b>36.5</b>	<b>48</b>	<b>10.69</b>	<b>1,440</b>	<b>32.3</b>

Overall nesting intensity in the sampled areas = 4/km/season

Nest estimate for suitable nesting area (637 km or 65 per cent) = 2,548 nests

## Threats

### MORTALITY

In all, 462 turtle carcasses were counted, and a large number of them were observed along the Nagapattinam coast (4.9 turtles/ km). Rapid surveys showed that turtle mortality was also high along the Chennai and Pazhaiyar coasts (Table 4). Turtle mortality due to incidental catch in fishing gear, especially gill nets, was widespread. The exploitation of turtles for food was restricted to southern Tamil Nadu.

**Table 4.** Mortality of marine turtles along select coastline sectors of Tamil Nadu from November 2000 to April 2001.

Species	Kanniyakumari–Tuticorin	Mandapam	Nagapattinam	Chennai*	Total
Olive ridley	64 (59)	36 (6)	239	38	377
Loggerhead	0	4 (2)	0	0	4
Green turtle	55 (52)	13 (3)	6	0	74
Hawksbill	2 (2)	2 (0)	0	1	5
Leatherback	1 (1)	1 (0)	0	0	2
<b>Total</b>	<b>122 (114)</b>	<b>56 (11)</b>	<b>245</b>	<b>39</b>	<b>462</b>

\* One survey only.

Numbers in parentheses indicate number of turtles exploited by locals.

### INCIDENTAL CATCH

Gill nets are widely used for marine fishing along the Tamil Nadu coast. Of the 94 fresh carcasses observed along the Nagapattinam coast, 66 turtles (70 per cent) had visible injuries. The head or one of the flippers was missing in eight cases. When turtles get entangled in nets, the fishermen chop off the flippers or club the head to remove them

from the net without major damage to the net or person. This is particularly common along the Nagapattinam coast. This is contrary to the practice on the Tuticorin–Kanniyakumari coast, where live turtles are collected and consumed or sold. The number of registered fishing vessels is far lower than actual numbers that are seen on the shore near fishing villages (Table 5). For instance, according to the fisheries department, there were 1,278 fishing vessels registered in Nagapattinam district. However, interviews and counting in 11 villages indicated at least 2,110 vessels. Incidental catch of turtles in fishing gear has been reported as a major cause of turtle mortality along the Indian coast including Tamil Nadu (Rajagopalan et al 1996).

**Table 5.** Statistics of fishing gear in major coastal districts of Tamil Nadu.

Statistics	Tuticorin	Ramanathapuram	Nagapattinam
Mechanised boats	361	5,973	1,278 (2,110)
Non-mechanised boats	2,617	786	-
Catamarans	1,516	-	-
Fishing villages	25	149	42
Vessels/fishing village	180	46	30 (192)

(Source: Tamil Nadu fisheries department; numbers in parentheses indicate a figure obtained based on counts in 11 coastal villages in Nagapattinam district.)

## EXPLOITATION

Marine turtles are regularly exploited for food along the southern coast of Tamil Nadu (Table 4). Mandapam is a part of the Gulf of Mannar Biosphere Reserve, and an area where the presence of field staff of the wildlife wing of the Tamil Nadu forest department deterred fishermen from catching turtles. The inhabitants of this area are aware of the Indian Wildlife (Protection) Act, 1972 and of the punishment for hunting wildlife, especially marine turtles. However, turtle nests are predated by humans all along the Tamil Nadu coast, though this may be low in protected areas such as Point Calimere Wildlife Sanctuary and the Gulf of Mannar. The locals consume eggs; over 95 per cent ( $n=87$ ) of the nests were predated by humans. Exploitation of marine turtles along the southern districts of Tamil Nadu has been reported earlier (Kuriyan 1950, Agastheesapillai and Thiagarajan 1979). The locals of Tuticorin relish green turtles and believe that the blood of this species can cure respiratory ailments.

Mortality of turtles along the Nagapattinam coast was highest during January, which is prior to the nesting peak (Figure 3). High adult mortality due to incidental catch and exploitation of turtles and their eggs may wipe out the nesting olive ridley population along this coast.

## Recommendations

The exploitation of marine turtles continues in the southern districts of Tamil Nadu, especially in parts of the Gulf of Mannar. Controlling this is important as this offshore area forms a part of the foraging and developmental habitat for marine turtles. Awareness programmes in consultation with local communities may reduce the pressure on turtles. Recently, the Trust for Environmental Education (TREE) has been successful in



involving local fishing youth in marine turtle conservation on the Chennai coast (Dharini 2003). The formation of groups like TREE and the Students' Sea Turtle Conservation Network (SSTCN) may improve the situation in important turtle areas such as Nagapattinam, Rameswaram and Tuticorin. This network may be effectively utilised by the forest department during beach patrolling and awareness programmes.

Live turtles entangled in fishing nets are beaten (sometimes to death) especially along the Nagapattinam–Chennai coast. Awareness programmes to obtain voluntary support from local fishing communities for the safe release of turtles is necessary. This should include demonstration of appropriate techniques for removing the entangled turtles and release. This demonstration could be organised by the forest department utilising the expertise of the Central Marine Fisheries Institute (CMFRI) and other government and non government organisations. It appears that along the southeastern coast, most turtle mortality is due to incidental catch in gill nets. However, the necessity and effectiveness of the turtle excluder device (TED) may be assessed in areas such as Tuticorin, where trawler fishing is common.

Turtle tagging and monitoring along the Gulf of Mannar, Nagapattinam and Chennai coasts would provide further insights into the migration of olive ridleys. Data on population trends, nesting and poaching are important for planning conservation strategies. Local networks may be involved in monitoring turtle nesting, mortality, beach patrolling and awareness programmes. Building the capacity of personnel is important for the long-term conservation of a species or ecosystem. Training programmes and workshops should be organised especially for the benefit of field officers of the forest and fisheries departments. Resource persons may also be trained at local levels involving stakeholders such as government departments, fishing communities, students and research organisations.

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