

# *Kachhapa*

**A newsletter for the Indian ocean on sea turtle conservation and management**



**Indigenising and implementing TEDs in India**

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## **HELP US WITH OUR MAILING LIST**

Since this newsletter hopes to serve as a link for coastal and marine conservation, the more people we can reach, the more effective it will be. You can help by passing the newsletter around to people and organizations who are interested, and by helping us build up our mailing list. Please send us names and addresses of individuals, NGOs, research institutions, schools and colleges and anyone else who would be interested in receiving Kachhapa.

## **CALL FOR ARTICLES**

Kachhapa, the newsletter, was initiated to provide a forum for exchange of information on sea turtle biology and conservation, management and education and awareness activities in the in the Indian subcontinent, Indian Ocean region, and south/Southeast Asia. The newsletter also intends to cover related aspects such as fisheries and marine biology. Kachhapa articles are peer reviewed. Kachhapa will come out two to three times a year. We request all our contributors and readers to send us information from their part of the subcontinent or Indian ocean region, including notes, letters and announcements. We also welcome casual notes, anecdotal accounts and snippets of information.

## **OPINION**

In addition to information and articles, we now invite your opinion on subjects related to turtles, their habitats and conservation.

## **BIBLIOGRAPHY**

We plan to publish a complete bibliography of literature on sea turtles in the Indian subcontinent in the near future. Meanwhile, the bibliography will be available at our website. We would welcome any additional references that we have missed and copies of articles, papers or reports that are absent from the bibliography.

## **ALL MATERIAL SHOULD BE SENT TO:**

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H-VI/2, Habib Complex, Durgabai Deshmukh Road,  
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## **Or by email to:**

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Email attachments should be sent as text files or Word 2000 documents (or any older version of Word). Please refer to earlier issues for formatting articles and references.

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## **Editorial**

### **TEDs in India: From conflict to consultation**

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The interface between marine fisheries and marine turtles has been a major concern not just for the well being of sea turtle populations all over the world, but also for local and international commerce, artisanal fisheries, by-catch reduction policy, marine fishing ground health and the development of eco-friendly fishing gear. In India, what started with a seemingly innocuous warning of sea turtle deaths in fishing nets along the Orissa coast in the early 1980s has, with the death of over 90,000 olive ridley turtles in the last decade, and the ban on Indian marine products by USA and the resultant WTO case, become an eco-political conflict beyond the realm of biologists and conservation strategists.

Ironically, it was one of the apex fisheries organizations, the Central Marine Fisheries Research Institute (CMFRI), Kochi, who first warned that, unless turtle-safe fisheries practices were adopted, the Orissa coast would become a 'graveyard' of olive ridleys. Initially, this triggered seasonal protection of the offshore congregations of olive ridleys along the Orissa coast by the Indian Navy and Coast Guard. However, this has been ineffective since neither agency has vessels that operate in nearshore shallow waters where mechanized fishing activities contribute most to the large scale mortality of sea turtles. When systematic counts gave alarming figures about turtle mortality, the maritime fisheries organizations refused to accept responsibility, suggesting that the cause of turtle mortality was migration fatigue, pollution, disease and many other improbable factors.

The development of the Turtle Excluder Device (TED) and its gradual acceptance in many parts of the world by the mid 1990s, at least by marine fisheries research and development organizations, led the Ministry of Agriculture, Government of India to review its policy on marine fishing and forced the Ministry of Commerce to examine the prospect of the use of TEDs in India. The trawl operators and maritime state fisheries organizations, however,

were completely against TED use, citing heavy loss of fish catch and arguments that TEDs developed outside India were not suitable for Indian offshore waters. In 2000, in response to this latter objection, the Central Institute of Fisheries Technology (CIFT), Kochi, developed an indigenous TED called CIFT-TED. An expert scientific panel of the Ministry of Agriculture also recommended the use of CIFT-TED to safeguard sea turtles in Indian waters. However, the Ministry of Environment & Forests, organizations involved with marine turtle research and maritime state forest departments were vilified by trawler owners in Orissa and any attempt to promote the use of TED fell on deaf ears at the grassroots and was met with scepticism by maritime fisheries organizations.

The Government of India – United Nations Development Programme national sea turtle conservation project (2000 - 2002) made an attempt to bring various agencies together to resolve this conflict. First, a team of fisheries and forest department officials were taken on a study tour to marine turtle conservation programmes in Australia and Malaysia. Here, they were exposed to various management techniques, in particular by-catch reduction. Following this, state fisheries agencies were provided funding support to set up "TED Demonstration Centres" in Andhra Pradesh and Orissa and to organize workshops and discussions at the grassroots level with trawl operators. The independent initiation of the Marine Product Export Development Authority's (MPEDA) programme for free distribution of CIFT-TED was also promoted at these workshops. The TED operation films and leaflets were translated into regional languages and distributed by fisheries officials rather than through wildlife and forest department officials. Numerous workshops and extension programmes have now been conducted in Andhra Pradesh (see Bhavani Sankar & Ananth Raju, pp. 2-5). However, there is still substantial opposition to the use of TEDs in

Orissa, where there is much polarisation between conservationists and fishers.

In December 2002, all stakeholders in marine fisheries were brought together on a common platform and for the first time, some consensus was arrived at for the use of TEDs through proactive demonstrations, promotion and training (see workshop report, pp. 24). Localised improvement of CIFT-TED was also agreed to based on feedback

from demonstrations to Andhra trawl owners. Though the TED is not widely accepted, at least the conflicting agencies are now willing to share a common platform and to discuss issues in a rational manner. Successful implementation of the TEDs will depend on the involvement of fisheries organizations, who have to come to terms with the fact that it is in their own interest to think seriously of responsible fisheries practices and to consider the welfare of artisanal fishers.

## Implementation of the Turtle Excluder Device in Andhra Pradesh

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The state of Andhra Pradesh (AP) has a coastline of 974 km and fishing is one of the important occupations in this state. Marine waters offer promising scope for all fishers who catch fish both with traditional and mechanized craft. Apart from the target species, the fishermen get by-catch of 50-60%. This by-catch includes low cost fishes, as well as vulnerable and endangered species. The Department of Fisheries, Government of AP is taking precautionary steps to tackle this problem and is implementing the Marine Fisheries Regulation Act as part of its conservation measures. The state observes a closed fishing season from April-May during which period breeding and replenishment occur. There is also a restriction on mesh size to help young fish escape from the cod end, thereby replenishing the fish stock.

The Department of Fisheries has recently taken up the protection of sea turtles. Olive ridley turtles (*Lepidochelys olivacea*) are endangered, and protected under Schedule 1 of the Indian Wild Life (Protection) Act, 1972. There is incidental mortality of olive ridleys in trawl nets, particularly along the northern AP coast. The State Institute of Fisheries Technology (SIFT), Kakinada, which is a training institute in the Department of Fisheries, AP launched a programme in August 2001 (with the support of the Wildlife Institute of India, Dehradun) to prevent the incidental mortality of sea turtles in trawl nets along the coast of AP. The following were the main tasks to be undertaken by SIFT, Kakinada:

- ◆ To conduct a two day workshop
- ◆ To demonstrate the operation of TED in AP
- ◆ To train & encourage fishermen to use TEDs
- ◆ To educate fishers on sea turtle conservation
- ◆ To serve as a state-wide information centre on turtle conservation

As part of this programme, SIFT, Kakinada has conducted awareness camps, surveys, workshops, and TED demonstrations in different coastal districts of Andhra Pradesh.

### Awareness camps

A pre-nesting awareness camp was held during October & November 2001 in coastal districts to communicate the need for conserving sea turtles. In the awareness camps, the faculty of SIFT, Kakinada emphasized the necessity for the use of TEDs. It was also explained that the Government had issued orders to use TED in trawl nets. The fabrication, functioning and assembling of TED were demonstrated.

**Table 1:** Awareness camps, 2001 – 02

District	No of villages	No. of Participants
Srikakulam	7	525
Vizianagaram	3	340
Visakhapatnam	5	615
East Godavari	7	720

During the nesting season i.e. January and February 2003, the SIFT conducted awareness camps exclusively in the coastal villages of northern Andhra Pradesh.

**Table 2:** Awareness camps, 2002 – 03

District	No. of Villages	No. of Participants
Srikakulam	2	1980
Vizianagaram	9	690
Visakhapatnam	10	730
East Godavari	14	2460

A mass awareness programme was launched canvassing the need for turtle protection in the fishing villages where *Teku vala* (nets used to catch rays) is in operation. The fishermen themselves agreed to stop operation of these nets during the nesting season. An egg protection committee was formed involving the community in this area to protect turtle eggs from stray dogs, jackals and other threats.

### Survey

Brief surveys were conducted in December 2001 and December, 2002 to February, 2003 in East Godavari, Visakhapatnam, Vizianagaram, and Srikakulam Districts to document the occurrence and causes of incidental mortality of turtles. Several deaths were caused by the operation of *Teku vala*, commonly used in Vizianagaram and Srikakulam districts for

catching rays. The use of these nets coincides with the peak nesting season of turtles in these areas.

**Table 3:** Turtle mortality documentation

Name of the villages	No of carapaces	Cause of death
<b><u>East Godavari District</u></b>		
Kakinada Harbour	7	Trawl gear
Subbampeta	7	Trawl gear
Mayapatnam	7	Trawl gear
Christupuram	2	Trawl gear
Konapapeta	3	Trawl gear
Chodipallipeta	6	Trawl gear
Addaripeta	10	Trawl gear
Hope island	19	Trawl gear/ Seed nets
<b><u>Visakhapatnam District</u></b>		
Palman Peta	6	Ray net
Dibba palem	8	Ray net
Thikkavanipalem	6	Ray net
Vizag, Beach	2	Trawl net
Vizianagaram dist		
Pedakancheru	18	Ray net
Chintapalli	4	Ray net
Srikakulam Dist		
Manchi neella peta	9	Ray net
K. Matsyalesam	28	Ray net
Kapasakuddi	3	Ray net

### TED Demonstration

The TED designed by Central Institute of Fisheries Technology (CIFT), Kochi was fitted in the nets of Andhra Pradesh fishing trawlers to demonstrate its use. During the demonstrations, 270 free TEDs were distributed to fishers in Vishakapatnam (162) and Kakinada (108). These are currently in use. Fishermen unaware of TEDs were encouraged to use this device and informed that it has been made compulsory in shrimp trawling. A necessary amendment to this effect has been made in the AP Marine Fisheries Regulation Act, with a fine of Rs.2,500/- besides confiscation of entire catch for

non-compliance. Several demonstrations were organized to show that the reduction in catch with the use of TEDs is minimal. This was demonstrated using an extra cod end attached to the escape hatch during trials. From the foregoing demonstrations, it is observed that the percentage of escape of fish/shrimp range from 0.5% to 3.3%. In one or two occasions, the escape rate is slightly higher and this may have been due to a large quantity of jellyfish that entered the net. The results of the different demonstrations taken up by the SIFT, Kakinada are given below (Table 4).

**Table 4: TED Demonstration Results**

Boat No	KKD 1234	KKD 1219	KKD 1021	KKD 1030	NZM 343	NZM 12	KKD 1030	KKD 1021	VSP 506	VSP 836	MRP 020	VDR NEW	KKD 1030	KKD1 030	KKD1 021
Depth of operation (m)	30	30	30	30	36	36	35	30	40	40	20	25	30	32	33
Towing Speed (knots)	2	2	2	2	4	4	4	4	4	4	4	4	4	2	2
Towing Period (h)	1.5	1.5	1.5	1.5	1	1	1	1	1.5	1.5	1	1	3	3	3
No of Hauls	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Catch in Cod end (Kg)	35	30	15	25	20	15	18	10	6	7	15	10	60	18	21
Catch in Cover net (Kg)	0.5	0.3	0.2	0.4	0.1	0.15	0.3	0.1	0.05	0.15	0.5	0.2	2	0.7	0.8
% Escapement	1.43	1	1.33	1.6	0.5	1	1.66	1	0.8	2.1	3.3	2	3.3	3.6	3.5
% Retention of target catch	98.6	99.0	98.7	98.4	99.5	99.0	98.3	99.0	99.2	97.8	96.7	98.0	96.7	96.4	96.5

### Workshop

A two-day workshop on the operation of TEDs was conducted by the Department of Fisheries at Kakinada on 24<sup>th</sup> & 25<sup>th</sup> January 2002. On the first day of the workshop, a demonstration was organized on the use of TED in trawl nets. It was observed that the loss of shrimp catch by the use of TED was negligible during these trials. On the second day of the workshop, a number of issues were discussed and the participants made several recommendations. These recommendations were categorized into three sections, as given below.

### Recommendations

Though several recommendations were made, the most important ones are mentioned below:

### **Protection, Enforcement & Regulation:**

- ◆ Interdepartmental co-ordination among concerned departments i.e. fisheries and forest departments, research institutes, fishermen and NGOs is critical
- ◆ Reclamation of beaches and protection of nesting beaches should be taken up by the AP Forest Department.
- ◆ Illumination of nesting beaches by aquaculture hatcheries should be lessened during nesting season.
- ◆ Strict implementation of the use of TEDs in shrimp trawling, as prescribed in the AP Marine Fishing Regulation Act.

### **Monitoring, Research & Evaluation:**

- ◆ The use of TEDs by fishing trawlers has to be monitored at sea
- ◆ Nesting zones along the entire AP coastline to be surveyed for nesting and incidental mortality; on land by the AP Forest Department and at sea by the AP Fisheries Department.
- ◆ Ongoing research on TED technology to suit the needs of local fishing.
- ◆ Research on TED designs to be explored by CIFT, Kochi. Periodic trials with new designs of TED to be experimented in order to check its efficiency.
- ◆ TED information centre of SIFT to act as nodal monitoring and information centre. Training to faculty of SIFT on conservation of sea turtles and on design of TEDs.

### **Community Based Conservation:**

- ◆ SIFT should play a vital role in increasing awareness and co-ordination among all the stakeholders including NGOs, fishers and Forest Department.
- ◆ For popularisation of TEDs at all the leading fishing harbours of AP, it is necessary to safeguard the interests of fishers.
- ◆ Regional level workshops on a small scale may be organised for a better understanding about conservation of sea turtles.
- ◆ Forest department officials should take ample interest to see that volunteers of *Vana Samrakshana Samithi* (Forest Welfare Group) also cater to the interests of turtle conservation.

- ◆ Formation of turtle clubs at village level
- ◆ Awareness among fisher children regarding conservation can be initiated at school level onwards by arranging competitions like debate, painting and poster making.

After the workshop was completed, the enthusiasm it generated among the public has influenced the Fisheries Department to take up more demonstration programmes in various coastal districts to educate the fishers about the use of TEDs in their trawls.

#### Interactions with trawl operators

The demonstrations and workshops helped to convince the fishers to some extent that the TED is no longer a bane to them and instead may be a boon to sea turtle conservation. Some of the fishermen suggested that there should be some refinements in the TED. Some of the suggestions were that:

- ◆ The space between spokes may be increased
- ◆ Weight of the TED may be reduced

The SIFT, Kakinada has been in touch with the concerned organisations, in particular CIFT, Kochi, to attend to these issues.

#### TED Demonstration Centre

A TED Demonstration cum Information Centre was established in SIFT, Kakinada where the fishers, public and officers of various allied departments will be constantly motivated on the need to protect marine turtles. Hand-outs were prepared and distributed on various occasions like awareness programmes, and other local events in coastal villages. Posters highlighting the urgency to save turtles were affixed in villages at important places and at fishing harbours and made available to all. Youth fishers undergoing a one year training programme at SIFT were also educated and trained on the use of TED during their fishing trips. We plan to conduct awareness camps during pre-nesting periods in all coastal villages with audio-visual aids and results of last year's data. Furthermore, demos at all important mechanized landing centres to create awareness on the use of TED are also planned. Apart from this, we propose to conduct refresher training programmes at SIFT for all coastal fisheries staff. Thus the Department of Fisheries is taking all necessary measures to safeguard the marine turtles of Andhra Pradesh, in collaboration with the Wildlife Institute of India

## **CIFT – TED: Construction, Installation and Operation**

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Due to harvesting of sea turtles and their eggs and their accidental mortality associated with shrimp trawling and other fishing operations, turtles have been threatened with extinction in all parts of the world. The incidental catch of marine turtles is reported to occur particularly along the east coast of India. Researchers have developed a Turtle Excluder Device (TED) that greatly reduces incidental death of sea turtles in shrimp nets. TEDs were introduced in US shrimp trawling operations in 1980s. A TED is a frame consisting of a grid of bars installed before the cod end of the trawl net at an angle leading upward and downward to an escape slit. Small animals such as shrimp, slip through the bars

and are retained in the cod end, while large animals, such as turtles, large fishes and large elasmobranchs are stopped by the grid bars and can escape through the opening. Experience has shown that the use of TEDs when combined with other elements of an integrated turtle conservation, can stop the decline in sea turtle population and will, over a period of time, lead to their recovery.

Shrimp is the major foreign exchange earner contributing to over 70% of the marine products export earnings. Shrimp trawling is currently the most valuable fishing system in India, in terms of the export earnings and domestic supply for fish.

Concerns expressed by trawler fishermen over the lessening quantity of shrimp and fish by-catch owing to the installation of TEDs have to be taken into consideration. Standardization of TEDs for regional bottom trawling operations has to take place before regulations in terms of its mandatory use, can be brought into operation. Trade barriers by the environmentally conscious importing nations of Indian shrimp are still a perceived threat, unless regulatory measures are taken up.

### **Construction and Installation of CIFT-TED**

**Construction of the Frame:** An oval frame measuring 1000 × 800 mm is constructed of 10 mm diameter stainless steel rod. Five vertical grid bars of 8 mm diameter stainless steel rod are welded to the inside of frame. The spacing between deflector bars is 142 mm and the maximum spacing between the frame and the adjacent deflector bar is 86 mm.

**Construction of TED extension:** The TED extension is constructed of a single piece of polyethylene netting of 40 mm stretched mesh size and 1.5 mm diameter twine of size 150 × 60 meshes. The 60 mesh sides of the netting piece are sewn together to construct a cylinder.

**Construction of hoop:** A single hoop having a diameter of 900 mm is constructed of 8 mm stainless rod, for attachment to the leading edge of the TED extension.

**Fixing the grid at the correct angle:** The hoop may be laced to the TED extension leaving 5 meshes from the leading edge. For ease of installation, another hoop could be attached to the other end of the extension. The TED frame may be slid into the extension. Using the hoops, the extension tube may be stretched so that it is taut. The TED extension may be so positioned that the extension seam is at the bottom. Starting from the rear edge of the extension, 36 meshes forward from the rear edge of extension along the seam may be counted followed by counting of 75 meshes perpendicular to the seam to arrive at the top centre attachment point. Later, the TED frame may be attached to the extension netting. The sides of the secured TED frame may then be sewn to the extension netting. The grid angle should be between 40° to 55° from the horizontal for proper operation.

**Cutting the exit hole:** The mesh cut may be initiated in front of the top centre of the TED frame and continued along the frame maintaining mesh distance from the frame to either side until the first and fifth grid bars are reached. The distance between the first and fifth grid bars is 620 mm. 19 meshes may be turned and cut forward on either side. They may be turned again and cut to obtain a rectangular opening of 40 × 19 meshes in the extension.

**Construction and attachment of exit hole cover (flap):** The exit hole cover is made of a single piece of depth stretched and heat set polyethylene netting of 90 × 50 meshes, with 25 mm stretched mesh size and 1 mm diameter twine size. The centre mesh of 96-mesh edge of the flap may be attached to the centre mesh of forward edge of the exit hole opening and this may be continued to 45 meshes of the flap to 20 meshes of the opening on either side of the attachment point. Remaining meshes of the flap may be sewn to the extension meshes to provide strength and shape to the flap. Along the sides may be attached 30 meshes of the flap to 19 meshes of the extension ahead of the TED frame. Six meshes of the flap are attached to 4 meshes of the extension ahead of the TED frame. The remaining 14 meshes of the flap are to be left unattached.

**Construction and installation of accelerator funnel:** Two trapezoidal pieces of depth stretched and heat set polyethylene netting (25 mm stretched mesh size and 1.0 mm diameter twine size) with 75 meshes each in the leading edge may be cut; 30 and 42 meshes each in depth with a cutting rate of 1NIB resulting in 55 and 47 meshes, respectively, in the rear edge. The two pieces are sewn together along the tapered edges, beginning from the leading edges, to form the funnel. The funnel may be installed inside the extension, forward of TED frame with the longer half of the funnel positioned opposite to the exit hole. The funnel is sewn to the TED extension, immediately after the hoop, which is attached to the leading edge. 150 meshes of the funnel may be attached, mesh to mesh to the 150 meshes of the extension. The longer half of the funnel, may be secured at appropriate intervals, to the grid bars, a few centimetres from the bottom.

**Attachment of floats:** Two 150 mm hard plastic floats are to be attached to the outside of TED on the upper side, to the frame at the junction of outer grid



bars, and another float is to be attached to the top of the hoop for weight compensation and stability during operation.

**Installation of TED in trawl:** The complete TED is installed between cod end and hind belly extension of the trawl, with the exit hole facing upwards, by joining the edge meshes.

**Operation and Maintenance**

Before shooting the gear, the net should be inspected to ensure that the netting ahead of the TED is not twisted. The speed of vessel should be increased before deploying the otter boards, so that the TED extension will ride high in water and twists, if any, can be easily detected. If twists are present, they should be removed before deployment of the gear.

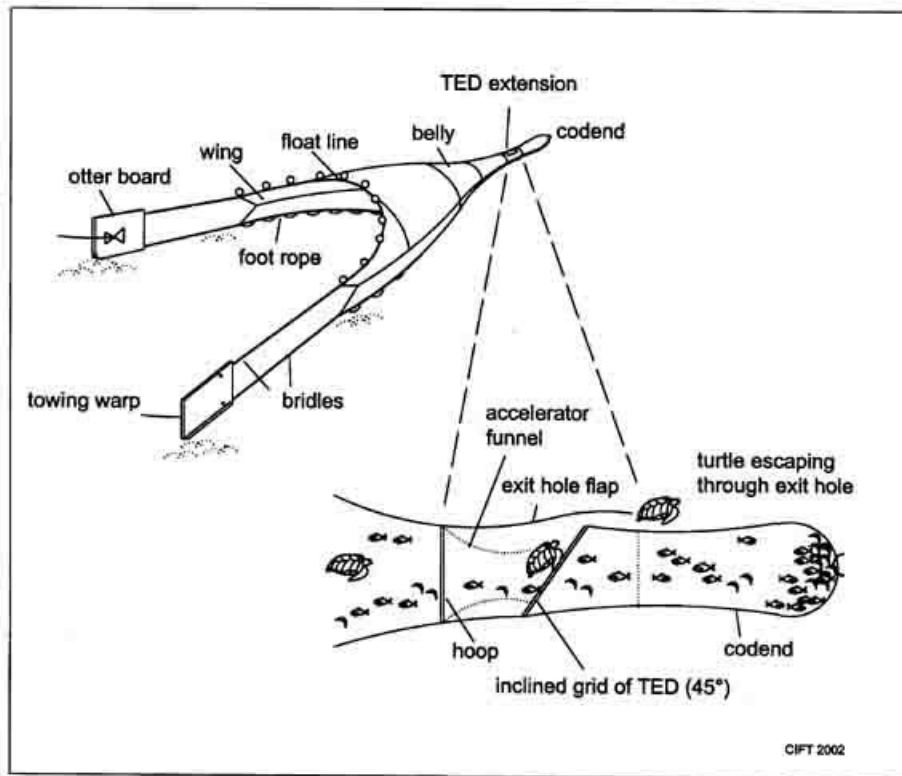
While hauling the gear, it is better to keep the vessel against the current or maintain low speed, in order to prevent the catch from being washed forward, to the exit hole. Once the otter boards are hauled up, the vessel should maintain speed and direction for a few

minutes so that all catch is washed past the TED, into the cod end. After each haul, the accumulated trash and debris that may clog the grid may be removed. Also, any gilled fish in the netting around the TED may be removed in order to permit good filtration.

It is important to check the grid angle on a regular basis, and make sure that it is between 40° to 55° from the horizontal. This can be done as follows:

- ◆ An even row of meshes around the trawl body located approximately 1 m forward of the TED frame may be gathered and tied tightly with a whip line;
- ◆ Using the whip line, the TED frame may be suspended freely, about 1 m off the deck, ensuring that there are no twists;
- ◆ The angle of the grid bar to the horizontal may be measured by using a carpenter's protractor, inserted through the exit hole.

**(Extracted from Fishing Chimes, Vol. 21, No.9, December 2001; reprinted with permission)**



**Fig 1. Principle of TED operation**

# Influence of environmental factors on the hatching success of olive ridley turtles: a preliminary study

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## Introduction

Successful egg incubation is an essential component for the continued survival of sea turtles. Nevertheless, eggs are susceptible to a variety of natural and man-made pressures while they are incubating in the sand. One such pressure is disturbance of the eggs due to harvesting. For instance, as a way to balance the needs of the community with protection measures, some sea turtle projects accept a portion of harvested eggs for reburial in hatcheries (e.g. Hasbun and Melara 1994). The general idea is that at least some of the eggs will be protected and will eventually produce hatchlings.

Such a situation exists at Devbag in Karwar of the Uttara Kannada region of Karnataka on the west coast of India. There, the local community harvests sea turtle eggs for consumption. We purchased a proportion of olive ridley turtle eggs (664 eggs) from the community soon after the eggs had been collected, and buried them in open-air hatcheries to produce and release hatchlings. We were also interested in investigating the possible influence of various environmental variables on the hatching success of these relocated eggs, including temperature, nest depth, moisture, and sand type. Although there was no record as to how these eggs were handled prior to their procurement and thus no way of determining if they had been adversely affected by handling, we assumed all had been treated equally, thus any differences we found would be related to incubation treatment, rather than prior handling.

## Methods

The study was conducted in Karwar, located in northern Karnataka, consisting of a coastal belt of 32kms (14°48'N, 78°07'E). It is well protected by a series of small to medium sized uninhabited barrier

islands in the Arabian Sea. The study beaches - Majali, Devbag, Kodibag and Bhaitkol - are located to the north and south of the Kali River, which divides the main 15 km beach into two long sandy sections. Fishing communities can be found throughout the region.

A hatchery was constructed at Devbag, one of the four study areas. The beach vegetation was chiefly *Casuarina* and *Ipomea pes-caprae*. We purchased freshly collected eggs from the fishing villages and buried them in artificial egg chambers about 45cm deep, in November, December and January. Before and during incubation we measured sand temperature at different times of day at the surface and at nest depth (45 cm) with an alcohol thermometer. We also recorded nest depth, shape, sand texture and sand moisture. Nest shape was recorded by inspection.

Sand texture was recorded both by inspection and through sediment analysis, which included treatment with chemicals and sieving them through sieves of different mesh sizes, where sand, silt and clay get settled at different mesh sizes and finally are weighed to find their proportions. Sediments were analysed from 3 locations, from the hatchery site which had larger sand grains (ST1), from another site where nesting was recorded (ST2), and from close to the High Tide Line (ST3). ST1 was found to be more sandy with little proportions of silt and clay, while ST2 which was closer to the water line had almost equal proportions of sand and silt. Since silt and clay have the property to trap more water than sand, the proportions of silt and clay in any soil indicates the tightness and the strength of water absorbability of the soil. Sand moisture was recorded by comparative inspection of the two locations (ST1 & ST2). At ST1 wet sand could be obtained only after a depth of 30 cm, while at ST2, wet sand could be obtained after a depth of 15 cm. Upon emergence, the species was verified using

standard keys for sea turtle identification. Hatching success was determined by counting all live hatchlings produced by a cavity and dividing that by the total number of eggs originally placed in that cavity. Live hatchlings were kept in captivity for 1 – 3 months, after which they were released.

**Results and Discussion**

We purchased eggs from villagers in the months of November and December 2001, and January 2002 and their incubation was monitored in all the three months. Overall, hatching success was variable and ranged from 0% (in November) to 39% (in January).

**Table 1:** Details of eggs relocated in hatchery

Number of eggs	Hatching success (%)	Buried on	Emerged on
25	0	04-11-01	-----
40	15	26-11-01	10-01-02
42	14.5	26-11-01	11-01-02
50	36	12-12-01	27-01-02
19	4.2	23-12-01	11-02-02
109	0	24-12-01	-----
107	39	10-01-02	09-03-02
160	4.3	25-01-02	13-03-02
64	27	30-01-02	09-03-02

**Table 2:** Range of temperatures recorded in an open-air hatchery for olive ridley eggs in Devbag, Karwar, in 2001/2002.

Month	Surface Temperatures			Temperatures at 45 cm depth recorded at 6 AM, 1 PM, 6 PM
	6am	1pm	6pm	
November	31 – 38 °C	40 – 50 °C	32 – 33 °C	32 – 33 °C
December	31 – 36 °C	42 – 46 °C	35 – 36 °C	30 – 32 °C
January	33 – 35 °C	44 – 49 °C	39 – 41 °C	29 – 31 °C

Sand temperatures were more variable at the surface than at nest depth (45 cm), when measured in the morning, afternoon, and evening (Table 2). Temperatures at nest depth of 45cms were between 30 and 32°C. Previous studies on olive ridley turtles in Gahirmatha, India, indicate that incubation temperatures of > 30°C produce only females (Mohanty-Hejmadi and Dimond 1986).

Sand temperatures at depths less than 30 cm exhibited wide daily variations sometimes reaching 50°C (A. Kurian, unpubl. data) which is lethal for sea turtle hatchlings (Drake and Spotila, 2002). At 45 cm, these variations were far less, staying consistent between 30°C and 32°C (in December) and between 29°C and 31°C (in January). Later in the season (early February), we measured a natural olive ridley nest cavity that reached a maximum depth of 60 cm, which is consistent with some previously published studies (Silas *et al.* 1984). Other authors have reported that olive ridley nest depth can vary from 45-50 cm (Silas *et al.* 1984), or 55 cm (Firdous 1985). A few observations in February indicated that temperatures at this depth

during different times of the day showed very little variation (29°C – 30°C) when compared to the temperature at 45 cm. Nest cavities in the hatchery were less urn-shaped than natural nests. The depth and shape of the nest cavity in the hatchery was likely to have been important in hatching success. This meant that eggs were not concentrated together in one large mass, but were more evenly spaced along a more or less straight column in the sand. This probably contributed to a reduced hatching success in the hatchery .

Sand texture in the hatchery was coarser and had bigger grain size than in natural nesting areas. Sand that is too coarse can result in reduced hatching success (Mortimer 1982). The relationship between sand type, water content, oxygen potential, and hatching success is complex (Ackerman *et al.* 1985). We discovered after the nesting season had begun that the hatchery was located in an area where an old road used to be. Thus, there was a large stony surface about 60 cm below the surface of the sand, which may have interfered with natural oxygen partial pressures and water tension of the sand. All

these factors may have contributed to the low hatching success in the hatchery. We suggest that future attempts at using hatcheries in the region should try to emulate natural nesting areas as much as possible.

Sand moisture may also have had an influence on hatching success. Preliminary results suggest that there was a difference in hatching success rates between eggs buried closer to the high tide line (15 m) and eggs buried further away from the high tide line (A. Kurian, unpubl. data). We recommend placing a hatchery as close as possible to the high tide line (without risking inundation), in order to benefit from the high moisture content of the sand. Interestingly, Kar and Dash (1984) reported that a plantation of *Casuarina* close to marine turtle nesting beaches contributed to the decline of the nesting populations over a period of time. This was because the plantations not only reduced the space available for the turtles to nest but also their root system and leaf litter negatively influenced the moisture and temperature of the sand. Therefore, we also recommend that hatcheries be placed away from concentrations of *Casuarina* trees.

After being reared in captivity for 1-3 months, hatchlings were released in the sea. Initially some hatchlings were allowed to crawl on the beach to the sea, but since they showed disorientation, they were carried to the water and released. Hatchlings released during night were drawn out of the sea due to the presence of torches or bonfires on the beach. Hatchlings released during daylight were never disoriented or drawn out of the sea. Thus, the time spent in captivity did not diminish the turtles' sensitivity to lights.

The current study focused on the possible environmental impacts on hatching success of olive ridley eggs in Karwar, as a means to minimize their

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negative effects. There are other pressures facing sea turtles in this region, and these threats also need to be addressed.

### Threats

In this area, turtles are harvested for their eggs and meat during the nesting season between October and April. Turtles are also accidentally caught in gill nets during fishing. Although gear like purse seine and trawl nets are used in fishing, there is no evidence of turtles being caught in them.

Development activities along the coast may hinder sea turtles from nesting. These activities include sand mining, placing of rock revetments on the beachfront, construction and operation of beach resorts and fishing harbours in Karwar.

Increased pollution from nearby urban areas probably contributes to the reduced health of local sea turtles. In one instance, we noticed a large swelling on the head of an adult olive ridley. Continued vigilance concerning disease and sickness is required in the area.

### Acknowledgements

A.K. would like to thank Dr V.N Nayak, for his guidance and support. We would also like to thank the Forest Department of Karwar for the various facilities they provided in conducting the study; the local fishing community who set the foundations of the study by sharing with us their knowledge on sea turtles and for providing us with its eggs; my friends at the P.G. Centre, especially Prashant Salgaonkar, for helping me establish links with the local community, which eventually led to buying eggs for incubation in the hatchery.

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## **Status of marine turtles in Maharashtra, India**

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### **Introduction**

Studies on sea turtles in India have mainly focused on the east coast and very little information is available on their occurrence and nesting sites for the west coast. The occurrence of three species of marine turtles viz., hawksbill, green Turtle and Loggerhead has been reported in Maharashtra waters (Daniel 1976). Later Shaikh (1983), Bhaskar (1984) and Das (1985) recorded the presence of olive ridleys. According to Gole (1997), olive ridleys are known to nest all along the coast, while green turtles nest sporadically in Maharashtra. The poaching of the eggs by humans, incidental drowning in the fishing nets and developmental activities are the main threat to marine turtles along this coast.

### **Study Area**

The coastline of Maharashtra extends from the border with Gujarat to the north to the border with Goa to the south and stretches about 720 km. A total of five coastal districts viz., Sindhudurg, Ratnagiri, Raigad, Thane and the urban area of Mumbai share the coast line of Maharashtra (Gole 1997). The main occupation of majority of the coastal population is fishing.

### **Methods**

In the present survey, 60 localities were surveyed to assess the status of marine turtles along the coast of Maharashtra covering all the five districts. The field survey was carried out from March 2000 to April 2001. In addition to the field survey, secondary information was also collected from different sources, such as local coastal villagers, fishers, trawler owners and workers, fisheries and forest Departments and local non-governmental organizations. Landing sites were also visited and information on incidental catch was recorded from trawler owners and workers. Additionally, press releases on sea turtles were given in local newspapers. Schools and colleges located in the coastal villages or towns were also visited. Information was collected by distributing reply-paid postcards in some areas, either during the survey or as a follow-up of the surveys. The surveys were carried out in two phases. A preliminary survey was carried out along the coast of Maharashtra from 13 – 31 May, 2000 and 29 localities were visited during this survey. The second survey was site specific, and the selection of sites was based on the data collected during the first survey. This survey was carried out from 4-22 December 2000. During this survey 43 localities were visited (Table 1).

## **Results & Discussion**

The information received from 60 localities along the five coastal districts confirmed reports of the occurrence of olive ridley, green, leatherback and hawksbill turtles. The olive ridley is a common species, followed by green turtle, leatherback and hawksbill. Sporadic nesting is reported from all the sites (Table 1). On an average about two to three nests were reported from all the localities visited by us during the survey. The nesting season commences in December and extends till March. However, some locals of Thane and Raigad districts reported the nesting during the monsoon, i.e. from June to September but during this study no nesting was reported in monsoon. The details of the occurrence and nesting of marine turtles in Maharashtra is as follows.

### **Olive Ridley Turtle**

The occurrence and sporadic nesting of olive ridleys is reported along the entire coast of Maharashtra (Table 1). This species is commonly seen along the entire coast. Local fishermen and workers on trawlers reported their presence, as the turtles get entangled in their fishing nets. According to them they are seen throughout the year in the sea and recent sightings were reported from most of the landing sites visited by us. During this survey five carapaces of olive ridley and three dead specimens of the same were seen in different localities (Table 2). In all the localities visited, there are reports of nesting of this species. Some confirmed and recent nesting of this species is reported on the beaches of Shiroda-Aravali, Mochamad, Neevati, Khavane, Tondavali, Achara, Vetye, Ambolgad, Hareshwar and Kashid Sarva. Most of these beaches are about 2 to 4 km. in length and are less populated.

The belt of about eight km. between Shiroda to Neevati and about 12 km. stretch between Malwan to Achara, in Sindhudurg district is a potentially good nesting ground for this species. In all the localities in this region, around four to five nests were reported during the breeding season. For some sites like Tondavali and Talashil, there were reports that ten years ago, seven to eight turtles nested in a single night during the breeding season. But in the entire breeding season of 2000-2001 only two nests were reported from these villages, which may

indicated a decline in the breeding population in the recent past. Apart from this, the undisturbed beaches of Vetye, Ambolgad in Ratnagiri district, Hareshwar and Kashid-Sarva in Raigad district are also important nesting sites as five to six nests were reported on these beaches during each breeding season.

### **Green Turtle**

The occurrence of this species is reported from the entire coast of Maharashtra but sporadic nesting is reported from only a few localities (Table 1). This species is seen along the entire coast but compared to olive ridleys, it is rare and restricted in distribution. Their sightings are mostly reported by fishers on trawlers and according to them it is associated with rocks and feeds on algae. Recent sightings are reported from some localities in Sindhudurg and Ratnagiri district. In two villages, Neevati and Khavane close to Malwan in Sindhudurg district, seven carapaces of green turtles were seen. According to the villagers these were killed due to incidental drowning in the fishing nets. Some villagers believe that every year, these species are seen in large numbers during November and December. These two villages were again visited in April 2001, but according to the locals the population of this species was less compared to November and December. In the first week of June 2001, a juvenile green turtle (SCL 9.0 cm) was collected from a fisherman who caught it in the fishing net in the Vashi creek near Mumbai. During the survey, nine carapaces of this species were seen, of which two were juveniles (Table 2).

The nesting of green turtles is comparatively lower than the olive ridley. Out of the 60 beaches surveyed and information gathered, nesting was reported from only 14 localities and of these nine were from Sindhudurg district and four from Ratnagiri district. The potential nesting beaches from which there are reports of nesting of this species are Kelus, Neevati, Khavane, Tondavali, Talashil and Achara in Sindhudurg district and Nevare, Varavade, Vetye and Ambolgad in Ratnagiri district.

### **Leatherback turtle**

This is an uncommon species with sporadic sightings from the entire coast and old nesting

reports from two localities (Table 1). Their sightings in the deep sea are mostly reported by trawler fishermen. The recent and sporadic sightings of this species are reported from the entire coast. Some fishers from Kelus, Achara and Malwan reported recent sightings of this species in the sea. A fisherman at Achara in Sindhudurg district reported that a leatherback nested ten years ago. He remembered it by its large size and ridges. An old fisherman from Kashid in Raigad district claims to

have seen nesting of this species about 15 years ago on this beach.

### **Hawksbill Turtle**

This species appears to be rare. Some locals of Khavane in Sindhudurg district reported having seen this species on the beach ten years ago. They identified it from the photographs of marine turtles. A few workers of trawlers from Malavan and Ratnagiri say this species is seen in their waters.

**Table 1:** Records of nesting of sea turtles in Maharashtra and Goa

<i>District</i>	<i>Locality</i>	<i>Nesting Species</i>	<i>Poaching</i>
<b>Thane</b>	Bordi, Gholvad, Dahanu, Chinchner, Shirgaon, Arnala, Vasai	OR	Absent
<b>Mumbai</b>	Manori, Gorai, Versova, Worli, Vashi Creek	OR, GT	Absent
<b>Raigad</b>	Mandve, Kihim, Nagaon, Revdanda, Korlai, Kashid, Nandgaon, Murud, Nanvali, Borli, Srivardhan, Hareshwar	OR, LB	Present
<b>Ratnagiri</b>	Ade, Anjarla, Harne, Burondi, Dabhol, Guhagar, Velneshwar, Hedavi, Sakhareagar, Nandivade, Sandkhol, Nevare, Varavade, Ganapatipule, Ratnagiri, Gavkhadi, Poorngad, Vetye, Ambolga, Vijaydurg, Devgad	OR, GT	Present
<b>Sindhudurg</b>	Kunakeshwar, Achara, Vayangani, Tondavali, Talashil, Kolamb, Malvan, Tarkarli, Neevati, Khavane, Kelus, Mochemad, Shiroda-Aravali, Shiroda-Kerwada, Redi	OR,GT,LB	Present

### Threats

The major threats to the marine turtles of Maharashtra are from the poaching of eggs and adults, incidental catch in fishing nets and due to developmental activities along the coast.

Poaching of eggs is the main threat to sea turtles in all the localities surveyed in Maharashtra. Locals collect the eggs for consumption. Earlier, when nesting was abundant, eggs were even sold in the local markets.

Sea turtles are generally not killed by most of the fishermen of Maharashtra due to religious reasons, since they are believed to be an incarnation of God in Hindu mythology. Thus, if the turtles are caught

in the fishing nets, they are immediately released. However, some killing of adults occurs and the extent of killing varies in different localities. Poaching was mainly reported from numerous localities in Ratnagiri district. In Velneshwar, a small village in this district, a freshly cut carapace of an olive ridley was seen. In most of the fish landing centres in this district, there are reports of trade in live turtles which are sold for Rs. 200 to 500 each, depending of their size. In other districts killing of the turtles is reported from very few localities.

Another major threat to the sea turtles is mortality due to incidental catch. According to information obtained from locals in different areas, on an average, five turtles were caught in the fishing net of each trawler per year. Around two to three dead

turtles were reported every year in all localities (beaches) visited. Local fishermen cited nearshore fishing by trawlers as the cause of turtle mortality. Though this information is very sketchy, it indicates the impact of trawl fishing on turtles of Maharashtra coast. According to the locals, about 25 green turtles were caught in the fishing nets in a period of two months in Neevati and Khavane near Malavan during October and November 2000. During the survey, five carapaces and three dead specimens of olive ridley and nine carapaces of green turtles were recorded along the entire coast (Table 2). The straight carapace length varied from 44.5 to 100.3 cm for green turtles and from 62.7 to 73.0 cm for olive ridleys. Most of the carapaces were encountered on the beaches of Neevati (3 olive ridley and 3 green turtles), Khavane (4 green turtles) and Achara (1 green turtle and one olive ridley) of Sindhudurg district (Table 2).

**Table 2:** Mean, Standard Deviation (in parenthesis) and size class distribution of dead turtles encountered during field survey. SCL is Straight Carapace Length

<b>Mean SCL</b>	<b>Range</b>	<b>Number</b>
<b><u>Olive ridley</u></b>		
67.9 (3.8)	62.7 – 73.0 cm	8
<b><u>Green turtle</u></b>		
	44.5 – 100.3 cm	9
	40 – 50 cm	2
	60 – 70 cm	2
94.1 (5.1)*	80 – 100 cm	5

\* - mean within this size class

### **Conclusion and Recommendations**

Even though four species of sea turtles are reported from the Maharashtra coast (Daniel 1976, Shaikh 1983, Bhaskar 1984, Das 1985), the present survey confirmed the presence of olive ridleys, green turtles and leatherbacks. Among these species, olive ridleys showed wider distribution, while green turtles were

restricted to the coast of Sindhudurg district. leatherbacks were very rarely seen and recently reported at only three sites in Sindhudurg district. Poaching of eggs and killing of turtles for meat are the major threats along the entire coast. Due to low nesting, locals collect eggs for their consumption and not for commercial use. Secondary sources and encounter of carapaces and dead turtles showed that turtle mortality occurs due to incidental catch.

Monitoring of potential nesting sites, and offshore and beach surveys during the entire nesting season are crucial to assess and fully evaluate status and threats. Creation of public awareness among locals, fishers and trawl owners and workers will have a significant effect in reducing the threats. Creation of turtle conservation movements and involvement of the local community, NGOs, schools and college students are also suggested for the conservation of sea turtles in Maharashtra.

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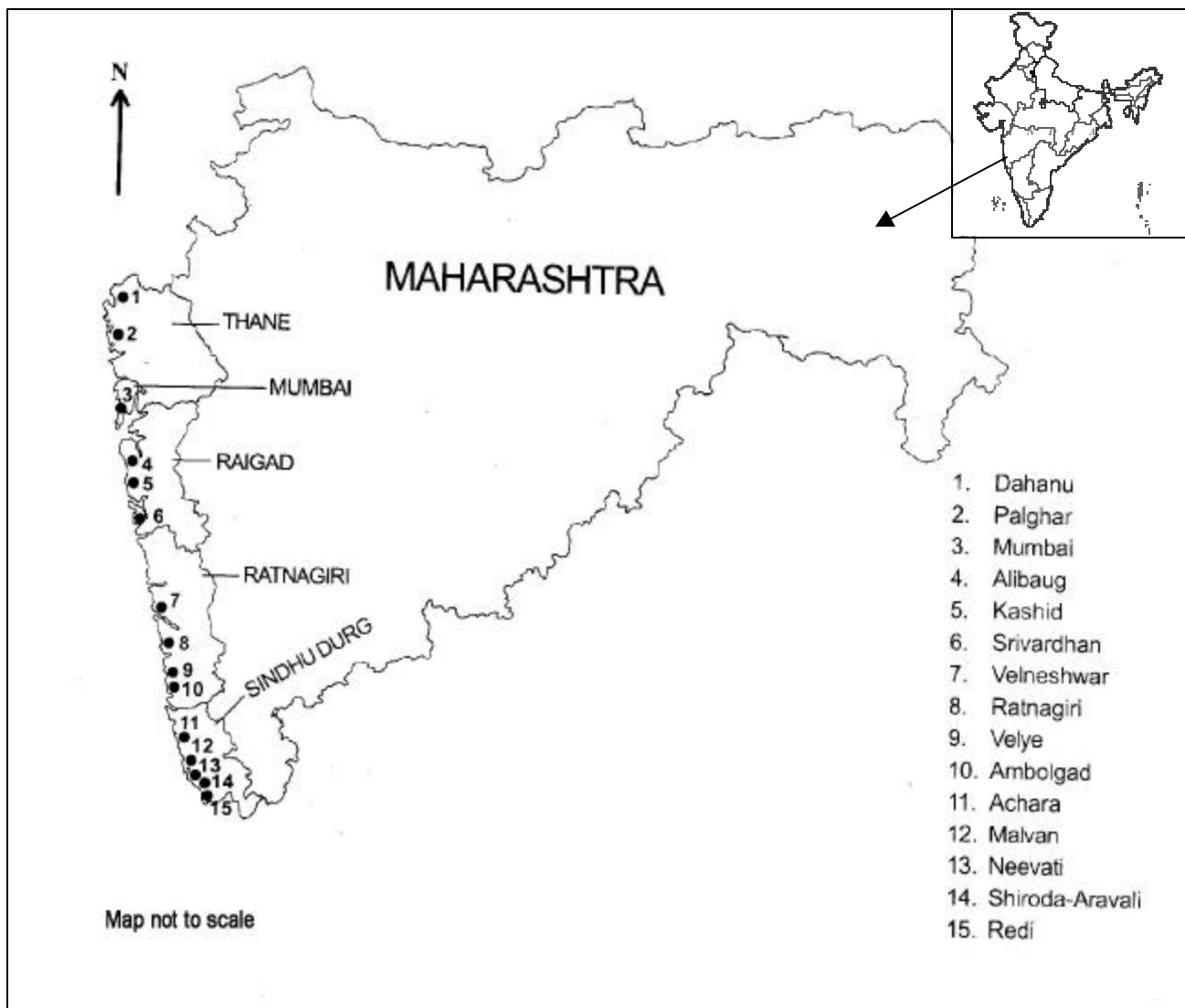
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# Thirty years of sea turtle conservation on the Madras coast: a review

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## Introduction

The earliest reports of marine turtles in Tamilnadu in southern India are found in Tamil Sangam literature (circa 4<sup>th</sup> century A.D.), from a poem which describes a nesting turtle (Sanjivaraj 1958). Olive ridley turtles nest along much of the Tamilnadu coast and may also forage in the Gulf of Mannar in southern Tamilnadu. Principal nesting areas include the Madras coast, Point Calimere and Nagapattinam, and Mandapam in southern Tamilnadu. Nesting data are available from Madras thanks to a series of conservation programs, starting in 1973, while landing data are available from Mandapam (Gulf of Mannar) from the research stations of the Central Marine Fisheries Research Institute (CMFRI). Recent surveys by Bhupathy and Saravanan (2002) provide information on status and threats to sea turtles along the entire coast of Tamilnadu.

The first conservation efforts on the Madras (Chennai) coast were started in 1972, curiously around the same time that J.C. Daniel and S.A. Hussain of the Bombay Natural History Society reported the mass nesting beaches in Orissa. Subsequently, a research and conservation program was initiated in Orissa after Bustard (1976) described Gahirmatha as the 'world's largest olive ridley rookery'. Meanwhile, sea turtle conservation in Madras was initiated by a few dedicated herpetologists, conservationists and wildlife enthusiasts, including R. Whitaker and Satish Bhaskar, who was also to serve later as mentor to the founders of the Students' Sea Turtle Conservation Network (SSTCN). Since then, remarkably, one organization or another (both government as well as non-government) has been active on the Madras coast, most recently the SSTCN since 1988. Other sea turtle conservation programs have been initiated along both coasts of India by the Forest Department, students and local fishing communities, notably in Goa, Kerala and northern Andhra Pradesh.

## Nesting along the Madras coast

In northern Tamil Nadu, nesting occurs primarily along a 50 km stretch from Adyar river, Madras to Kalpakkam to the south (Valliapan & Whitaker 1974, Abraham 1990, Shanker 1995, Bhupathy & Saravanan 2002). While nesting occurs at sandy beaches north of the Adyar river, this area is highly developed with well-lit public beaches, thermal power stations, and the Madras Port. The first survey of this coast was conducted from December, 1973 to March, 1974 (Valliapan & Whitaker 1974) from Madras to Kalpakkam. No nesting estimates are provided, but 40 depredated nests were found on a single night during the peak season (10 – 15 km of beach were covered each night). They also found 17 dead turtles during the survey. Eleven nests were collected and incubated in a hatchery, the first in India (Valliapan & Whitaker 1974).

The Madras Snake Park Trust (MSPT) maintained a hatchery for the next 4 years, during which 197 nests were collected (Whitaker 1979). In 1975 and 1976, 18 and 42 nests were collected (Anon 1976). In 1977, the Central Marine Fisheries Research Institute (CMFRI) became involved in the program and paid for 125 nests (Anon 1977); 14,546 eggs were collected for the hatchery.

From 1978 – 1983, the CMFRI had an egg-collection and hatchery program at Kovalam, south of Madras (Silas and Rajagopalan 1984). During this period, 72 – 309 clutches per year were collected for the hatchery, but no information is available on the annual effort in terms of distance covered. Since eggs were purchased from egg-collectors, the eggs may have been brought from the entire coast spanning nearly 50 km. Collection periods approximated one month, and collections from mid-February to mid-March were about 100 nests per month, while collections from mid-January to mid-February were 200-300 nests per month. In 1982,

the World Wildlife Fund – Tamilnadu Branch hatchery collected 44 nests (Anon 1982).

The Forest Department of Tamilnadu (TNFD) took over the egg-collection and hatchery management programmes in 1982-83. They established 5 hatcheries in the state, of which two were near Madras (Moll *et al.* 1983). Shanmughanathan & Jogindranath (1984) report that a total of 94,000 eggs were collected during 1982-83. During this season, 25,000 eggs were collected in the Madras hatcheries (probably about 200 nests). Moll *et al.* (1983) suggest that these two hatcheries covered 40 km of beach, giving a nesting density of about 5 nests / km / season, but it is unlikely that all nests were collected. The Forest Department maintained hatcheries till 1987-88, but no data are available for many of these years.

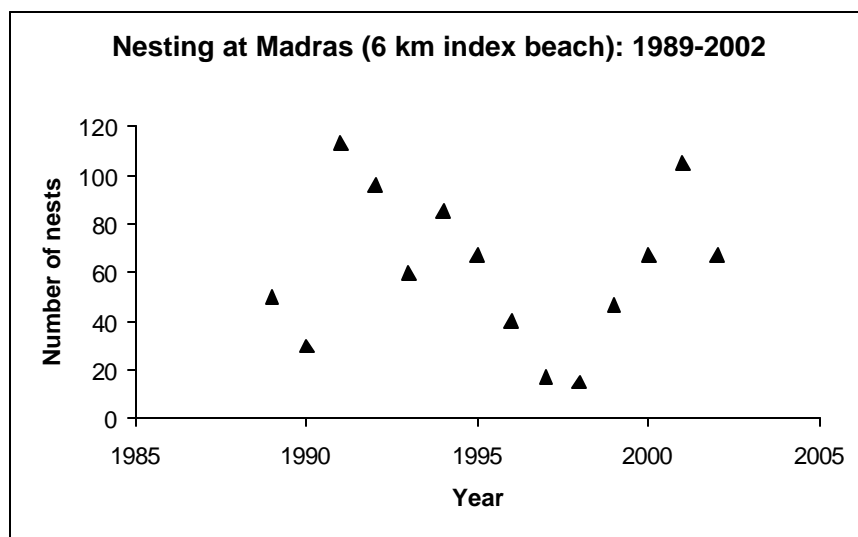
The Students Sea Turtle Conservation Network (SSTCN) was formed and established its first hatchery in December 1988. The sea turtle programme including beach monitoring, hatchery management, protection of wild nests, education and awareness and has continued from 1988 till present. Egg collections were mostly carried out over 6 km between Besant Nagar and Nilankarai, though an additional distance of about 10 km was patrolled in some years (Abraham 1990, Abraham *et al.* 1990, Mathew *et al.* 1991, Anon. 1993, Sivasundar *et al.* 1994, Sivasundar *et al.* 1995, see Shanker 1995 for a review and map, SSTCN, unpubl. data).

Overall trends in the past twenty five years do not indicate a drastic decline (Table 1). However, the data largely refers to nests in hatcheries and may not be an accurate reflection of nesting. Furthermore, different distances were covered by different workers, which adds error when evaluating trends. Since 1988, 6 km of beach has been sampled intensively each season, and there is wide inter-annual variation in nesting numbers, but again no conclusive evidence of a downward trend (Figure 1).

Nesting densities are consistent with results from recent surveys (Bhupathy and Saravanan, 2002) which indicate that olive ridley nesting densities range are about 4 nests / km / season for Chennai and Nagapattinam coasts (~ 50 km each).

### Threats

While the long term conservation program may have prevented a drastic decline thus far, the intensity of threats may have increased. The main threat to adult sea turtles is fishery related mortality, with about 10 – 20 dead turtles washed ashore every season. Apart from this, depredation of eggs by humans and animals represents a major threat. Fishing villages dot the entire coastline and opportunistic poaching by members of the fishing community is, and depredation by feral dogs is major problem. Furthermore, as residential colonies spread along the coast, beachfront lighting is becoming a problem along a greater stretch of this coast each year.



**Figure 1:** Number of nests collected from a 6 km stretch of beach in Madras between 1989 and 2002

## Education and Awareness

Education and awareness has always been a major component of the sea turtle conservation programs in Madras. In the 1980s, the WWF, Tamilnadu office conducted 'turtle walks' for the public and students, and eggs collected during these walks were relocated in Forest Department hatcheries. Since 1988, the SSTCN has been conducting education and awareness programs. Many schools and colleges have participated in the walks and been involved in running the program. In the mid 1990s, an attempt was made to initiate an in-situ management program. This has gained momentum this year with the

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involvement of TREE, who have mobilised youth from fishing villages along the coast in turtle conservation (see article pp 22). It is hoped that the sea turtle programmes of the students and fishing community will work synergistically to give impetus to conservation on the Madras coast and beyond.

## Acknowledgements

In 15 years, the SSTCN has been run by several 'generations' of students and members, all of whom must be commended. In the last few years, Sanjiv Gopal and Arun have kept me updated and helped collect the reports and data for this review.

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**Table 1:** Nesting and Hatcheries in Madras along the east coast of India. Blank cells indicate lack of data.

Year	Agency	Distance (km)	No. of nests	Density	No. of eggs	Hatching success (%)	Dead	References
1974	MSPT		11			21760 eggs 13059 hatchlings (60 %)	20	Whitaker & Valliapan 1974
1975	MSPT		18					Anon. 1976
1976	MSPT		42		~ 4500			Anon. 1976
1977	MSPT/CMFRI	10 - 15	125	~ 10	14546			Anon. 1977
1978	CMFRI	> 20	106		11423			Silas & Rajagopalan 1984
1979	CMFRI	> 20	309		38317			Silas & Rajagopalan 1984
1980	CMFRI	> 20	165		20438			Silas & Rajagopalan 1984
1981	CMFRI	> 20	128		13403			Silas & Rajagopalan 1984
1982	CMFRI/WWF	> 20	234 + 44		30013			Silas & Rajagopalan, 1984; Anon. 1982
1983	CMFRI/TNFD	> 20	72 (+ ~ 200)		8133			Silas & Rajagopalan 1984
1984	TNFD	> 20	~ 200		50000			Moll <i>et al</i> 1983
1985	TNFD	> 20						
1986	TNFD	> 20						
1987	TNFD	> 20						
1988	TNFD	> 20					12	
1989	SSTCN	6 – 15	68	~ 8	8625	66.4 %	4	Abraham 1990
1990	SSTCN	15	55	3.7	6635	63.9 %		Abraham <i>et al.</i> 1990
1991	SSTCN	15	206	13.7	24586	50.7 %		Mathew <i>et al.</i> 1991
1992	SSTCN	15	175	11.7	19626	84.8 %		Shanker 1995
1993	SSTCN	6	27 <sup>h</sup> + 33 <sup>w</sup>	10.0	3198 <sup>h</sup>	93.0 %		Anon 1993
1994	SSTCN	6	66 <sup>h</sup> + 20 <sup>w</sup>	14.3	7621 <sup>h</sup>	64.8 %	12	Sivasundar <i>et al.</i> 1994
1995	SSTCN	6	41 <sup>h</sup> + 26 <sup>w</sup>	11.2	4920 <sup>h</sup>	63.7 %	12	Sivasundar <i>et al.</i> 1995
1996	SSTCN	6	40	6.7	4782	82.3 %		SSTCN, unpubl. data
1997	SSTCN	6	17	2.8	2166	68.7 %		SSTCN, unpubl. data
1998	SSTCN	6	15	2.5		80.0 %		SSTCN, unpubl. data
1999	SSTCN	6	47	7.8		86.0 %		SSTCN, unpubl. data
2000	SSTCN	6	67	11.2		82.0 %		SSTCN, unpubl. data
2001	SSTCN	6	105	17.5		60.0 %		SSTCN, unpubl. data
2002	SSTCN	6	67	11.2				

w- wild nests; h – nests in hatchery

## School Education to support sea turtle conservation: Experiences from Goa and Orissa

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Centre for Environment Education (CEE) is a national institution supported by the Ministry of Environment and Forests, Government of India. CEE, through its state offices, has initiated a one year educational project to support sea turtle conservation. The project is supported by the Ministry of Human Resource Development, Government of India and aims to sensitise teachers and students in three key turtle nesting areas of Goa (Morjim, Galgibag and Agonda), and one site in Orissa (Puri) and through them the local community and tourists, to issues related to turtle conservation.

### **The project involves:**

- ◆ Development of resource material on sea turtles and their conservation for teachers and students
- ◆ Training of teachers in issues relating to turtle conservation, conservation education methods, etc
- ◆ Planning and implementation of a year-long programme of structured educational activities in the selected schools
- ◆ Establishment of linkages between teachers, students, forest officials, the local community, and tourists, for sea turtle conservation.
- ◆ Events organized by the schools for the communities.

CEE in consultation with the Departments of Education selected 24 schools in Goa (Morjim, Galgibag and Agonda) and 16 schools in Orissa (Puri) for this pilot project.

### **Development of resource material on sea turtles for teachers and students**

As part of the project, CEE is developing resource material that includes a manual titled “**Turtles in Trouble**” which is under development. The manual will have both information and activities that the teachers can take up with their classes. The manual will have six chapters viz.: What makes a turtle a turtle, Marine turtles, Habitat, Turtles in our lives,

Threats to sea turtles and sea turtle conservation. The manual will include scientifically validated, current information on Indian sea turtle populations.

A set of 10 colour posters dealing with different species of sea turtles, different phases in the life of turtles, threats to turtles, conservation measures as well as some Dos and Don'ts has been developed.

### **Training of teachers in issues relating to turtle conservation**

Three, three-day workshops were held in Arambol and Poinguinim in Goa in May 2002, and Panaspada in Puri, Orissa in September 2002.

The objective of the workshops was to:

- ◆ Introduce the project and draft manual to the teachers of the selected schools
- ◆ Orient the teachers to turtle conservation issues
- ◆ Make the teachers familiar with active teaching and learning methods, and to carry out the developed activities
- ◆ Develop a programme that would help the teachers to implement the activities during the school year.

A total of 67 teachers of 40 schools have been trained under this project. A draft of the manual was shared with the teachers at the workshops and the reworked draft is being sent to the teachers in instalments, a single section every month, for trial. Simultaneously, comments are being sought on the draft from scientists and field workers. At the end of the year, all the inputs received will be consolidated into the final manuscript which will be printed and disseminated widely.

### **Planning and implementation of a year long set of activities in the selected schools**

The manual that will be developed has to be implemented month-wise in the respective schools.

Each school developed a schedule by which they would implement the activities in the school. It was also discussed that the teachers can carry out education activities in the school to make the community aware of sea turtle conservation. The scientific concepts in the manual could be infused into the curriculum; eg. habitats of turtles can be discussed while teaching about ecosystem and habitat. Extra-curricular activities could also be carried out, including field trips to nearby beaches.

### Networking

It is necessary to establish links between teachers, students, forest officials, the local community, and tourists for turtle conservation. One person from each of the above departments were called for the teacher training workshops. The Goa Forest Department carries out regular monitoring of the coast and protection of nests and release of hatchlings. In addition, activities like organising competitions for school students as well as field trips which could help to build a good rapport between the community and the forest department, were discussed. It was also suggested that the panchayat could also play an important role by giving support to the conservation activities and organizing awareness programmes like slide show and talks.

### Events organised by the schools for the communities

All project schools were asked to organise a one-day festival in the village or on the beach. The objective of the festival was to spread the word of sea turtle conservation to the community through children. The festival reaches a wider audience, including tourists that visit the beach.

On the 10<sup>th</sup> of January a one day festival was organised in Morjim, a nesting beach in Goa. Over two hundred students from 12 schools of Pernem, Goa were present and took part in various events. Posters prepared by students with drawings and messages related to the conservation of turtles were displayed at the festival. A set of 10 posters prepared by CEE were also displayed. Students as well as teachers were enthusiastic about clay-modelling. Each of the schools made one model. Most of the

students made models of the different species of turtles and some actually showed the turtle laying eggs. Poems in English, Marathi, Konkani and Hindi were written by 56 students. Apart from the exhibition, various resource persons gave information on the sea turtle, its biology, importance in the marine ecosystem, various conservation efforts by various agencies and its status. 'The Ridley's last stand', a film by Shekar Dattatri on the status of olive ridley turtles and conservation along the Orissa Coast, was screened. The students enjoyed flying kites in the evening. These were provided by CEE. Each had a picture of a turtle and Save our Sea turtles (SOS) printed on them. The volunteers also participated in this.

The students were taken on a rally through the village with slogans on turtles. The rally reached the main temple in the village, where a skit was performed by them. It was about a hatchling that sees a bigger turtle getting caught in a fisherman's net. The fisherman who accidentally catches the turtle is unaware of its conservation status and sells it to a hotel owner. After his confrontation with the Forest Department he comes to know about its importance and vows never to commit the mistake again. The turtle then finds it safe to return to the coast.

A similar festival was also organised in Galgibaga, on 15<sup>th</sup> of February 2003. Twenty students each of 14 schools of Canacona participated.

The festival was the first occasion of this kind where the conservation message was strongly conveyed to the community. In Morjim, turtle eggs are still under threat because of market demand for them. The enthusiasm of the students surely must have been carried to the community. Through this model project, it is hoped that useful resource material and a model education programme will emerge, which will be useful not only in India, but other countries as well.

### Acknowledgements

Inputs and comments for this article have been given by Ms. Meena Raghunathan, Programme Coordinator CEE Ahmedabad

## Turtle conservation by local communities in Madras

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Although the major nesting grounds of the olive ridley turtles are in Orissa on the east coast of India, there are sporadic nesting beaches of these turtles along the beaches of Chennai (Madras). There has been a drastic decline in the nesting population due to urbanization, predation of eggs and hatchlings by dogs, crows and poaching by man. It is in this context that TREE initiated its sea turtle conservation programme on the Chennai coast.

TREE is a registered charitable trust involved in environment education. TREE's mission is:

- ◆ To respect and have compassion for all living and non-living sources
- ◆ To promote understanding of all cultures and inspire each individual to take action
- ◆ To make this world a better place for environment, its flora and fauna, and the human community.
- ◆ To foster symbiotic and harmonious existence between nature and man.

TREE is a member of, and is inspired and guided by Dr. Jane Goodall's Roots and Shoots International Network. TREE helps create environmental awareness among children and youth and the general public. The target group includes the fishing communities along the east coast (Bay of Bengal) from Marina (Chennai) to Marakanam in Chengalpet District, Tamil Nadu numbering around 30 villages.

### **Sea Turtle Project of TREE (2003)**

TREE started its first campaign to conserve and protect olive ridley turtles along the east coast, specifically from Nilankarai fishing village to Injambakkam fishing village (~ 3 km) and Panayur fishing village (~ 3 km) during December 2002. Selected youth from the above villages attended a one-day workshop at Madras Crocodile Bank Trust in July 2002, and planned activities like tree planting and planned waste disposal. For sea turtle conservation, the youth from the above villages named themselves as *Kadal Aamai*

*Padhukavallargal* [KAP] (Sea Turtle Protection Force) After receiving guidance on night patrolling and hatchery maintenance from members of the Students Sea Turtle Conservation Network, Chennai, the KAP members of Nilankarai and Injambakkam (from December, 2002) and Panayur and Nainar (from February 2003) have been patrolling the beaches of their respective villages and keeping track of the turtles nesting sites.

Initially, the members were disillusioned on seeing the number of dead turtles, which numbered around 14 and 10 respectively in Neelangarai and Injambakkam. But on 22-01-03 night the members sighted their first nesting turtle. The next day an enclosure (about 4' x 4') was erected on the nest site itself with 4 bamboo poles and chicken mesh, in order to safeguard the nest. It is hoped that this will also protect the hatchlings when they emerge. Relocation of eggs is not encouraged unless the clutch is below the high tide line or otherwise threatened.

Besides these, 17 more nesting sites were located by KAP members during this season. The areas were not cordoned off, but the location was identified and recorded in a logbook maintained by the members to keep track of the arrival of the hatchlings. On 01-02-03, the members of Neelangarai KAP were delighted to see the first batch of hatchlings from a wild nest (about 45) moving towards an artificial light source. Members of KAP immediately rescued the hatchlings and directed them towards the sea and ensured that they reached the sea. The constant vigil by the members will continue till the end of the season.

This is the first effort towards involving the local fishing community youth for the conservation of the ridley turtles on this coast. TREE hopes that this will help reverse the bleak situation of these endangered turtles as well as to restore the ecological balance and promote harmonious co-existence with nature.



## WORKSHOP REPORTS

### **Workshop on 'Networking and Coordination for Ted (Turtle Excluder Devices): Manufacture and Promotion along the Indian coast', December 2002**

Turtle Excluder Devices (TED) are currently being promoted all over the world to reduce fishery related mortality of marine turtles. The TED has gone through rigorous testing vis-à-vis its efficiency and fish catch loss under various conditions. Legislations have also been passed to make TED mandatory in trawl fishing nets in some coastal states of India, including Andhra Pradesh and Orissa. However, without proper manufacture, demonstration, extension and evaluation programmes, the trawl operators at the grassroots level are reluctant to adopt TEDs. Hence, a two-day workshop was organized on 10-11 December, 2002 by the Wildlife Institute of India, Dehradun and the Marine Product Export Development Authority (MPEDA), Kochi, at Visakhapatnam, Andhra Pradesh.

This workshop aimed at reviewing the present situation of TED implementation and promotion in India and to share current research and information on TED among the three major official agencies; Ministry of Commerce, Ministry of Agriculture and Ministry of Environment and Forests, and various fisheries organisations and NGOs. The workshop also aimed to bring together contributors and stakeholders from various levels on the same platform to discuss the most important issue i.e. networking and coordination for TED promotion along the coast. The workshop was inaugurated by the Conservator of Forests, Visakhapatnam Circle, T. Rao, IFS, and was presided over by D.V. Prasad,

IAS, Director, MPEDA. The participants included various state forest departments, fisheries officers of the state fisheries departments, Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, Kochi, State Institute of Fisheries Technology, Kakinada, Fishery Survey of India, Central Institute of Fisheries and Nautical Engineering & Technology, and NGOs from Orissa, Andhra Pradesh and Tamil Nadu. The workshop was attended by over 60 participants from various maritime states of India. An onboard TED demonstration and efficiency test was carried out at sea with two fishing trawlers.

At the end of two days and review of local innovations for TED improvisation and indigenisation, the workshop recommended TED implementation. The need for proper coordination of TED distribution among various agencies and promotion of TED through concerned government and non-government organisations was emphasized. It was also recommended that the efficiency of locally designed alternatives to TEDs should be tested. B.C. Choudhury, Nodal Officer, GOI-UNDP Sea Turtle Project and Dr. K. R. Prasad, President, Forum of Fisheries Professionals, co-ordinated this two day workshop held at Visakhapatnam.

*Source: GOI-UNDP Sea Turtle Project, Wildlife Institute of India, Dehradun, India. (undpturtle@wii.gov.in)*

### **Workshop on 'Eco – (Sea Turtle) Friendly Coastal Development' December, 2002**

Next to fishery related mortality, the threats to marine turtles on nesting beaches are from various developmental activities by agencies that destroy or contribute to the shrinkage of nesting beaches. Realizing the intensity and magnitude of the problems sea turtles face along our coast, a workshop to promote 'Eco-(Sea Turtle) Friendly Coastal Developments' was conducted at Visakhapatnam, Andhra Pradesh during 12 - 13 December, 2002.

The workshop was organised by the Wildlife Institute of India, Dehradun in collaboration with the Andhra Pradesh Forest Department, Government of Andhra Pradesh. The workshop was inaugurated by H. Malhotra, IFS, the Additional Principal Chief Conservator of Forests, Government of Andhra Pradesh and Harpreet Singh, IAS, Managing Director of the Andhra Pradesh Mineral Development Corporation (APMDC), Hyderabad. This two day workshop was attended by over 50

participants from state and central government agencies. Among the organisations, representatives from the Ministry of Environment and Forests, state forest departments, National Highway Development Authority, New Delhi, the Andhra Pradesh Tourism Development Corporation, APMDC, Hyderabad, the Integrated Coastal and Marine Area Management, Chennai, Indian Navy and Coast Guard, National Institute of Oceanography, Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology and NGOs shared their views on eco-friendly coastal development with reference to sea turtle conservation and management. A field visit to Rushikonda sea turtle nesting beach was organised

to assess the impact of developmental activities along the coast of Visakhapatnam city and similar activities that are undertaken in various important beaches of India. Based on the interactions during the workshop, a sustainable eco-friendly coastal development plan with respect to conservation and management of sea turtles and their nesting habitat along the coast of India was mooted, the details of which are to be published in the form of a manual. B. C. Choudhury, Nodal Officer, GOI-UNDP Sea Turtle Project, coordinated the workshop.

*Source: GOI-UNDP Sea Turtle Project, Wildlife Institute of India, Dehradun (undpturtle@wii.gov.in)*

### **Workshop-cum-Demonstration on Turtle Excluder Device for trawl owners and operators of the Orissa coast, February 2002**

A four-day participatory programme of 'Workshop-cum-Demonstration on Turtle Excluder Device for the Trawl owners and Operators of Orissa coast' was held at Paradip from 9th to 12th February 2002 under the joint aegis of Directorate of Fisheries, Government of Orissa and Project Swarajya, an NGO based at Cuttack. Inaugurated by S.K. Mohapatra, Chairman Paradip Port Trust at Employees Recreation Centre, it was attended by A.K. Tripathy, Commissioner – cum – Secretary Department of Fisheries and Animal Resources Development, S. Sahu Director Fisheries, A.P. Tripathy Chief Wildlife Warden, A. Behera, Managing Director of Orissa State Disaster Mitigation Authority and Special Relief Commissioner, M. Praharaj, Inspector General of Orissa Police and C. Hari Das, Assistant Commissioner of Fisheries Government of India. The essence of their talks was an appeal to the trawl owners and operators to examine the suitability of the proposed TED from the point of view of both its impact on their fish catch and its efficacy for safeguarding the endangered turtles. C.R. Behera Advisor to Project Swarajya, a Co-convenor of the programme coordinated the event in collaboration with the Fisheries personnel. Dr. C.S. Kar, Wildlife Research Officer of Government of Orissa and Dr. B. Pandav, Wildlife Institute of India served as resource persons of the programme, responding to and interacting with the trawl owners and other participants on the biology of sea turtles.

About 60 representatives of various trawler associations from Dhamra, Paradip and other fishing bases of the state came together under the banner of 'All Orissa Coordination Committee of Trawler Owners' and took an active part in the programme. They were vociferous about their interests and at one point staged a demonstration outside the meeting hall to express their resentment against an allegedly exaggerated and false media report having negative implications for the trawling industry. Leaders of trawl owners, T.K. Pattnaik, K. Rath, K.N. Praharaj and D.K. Sahu not only delivered long and fiery speeches, but also forcefully intervened on several occasions to press for the attention of the audiences to their 'hitherto ignored' points of view. Moreover, on the concluding day, a 9 point memorandum was circulated by their Committee, in which the existing model of CIFT-TED was squarely jettisoned on the apprehension that it would reduce their fish catch by 50%. The same memorandum pleaded that any alternative device that CIFT might design in future would be acceptable to them only if it would cause no loss to the fish catch while saving turtles, and only after a year of test and trial of the viability of the new device. Further the memorandum underlined the willingness of the trawl owners to close down their industry for a period of 3 months during turtle breeding along the Orissa coast to avoid trawling related turtle deaths, provided they are paid compensation for the period of closure. The memorandum called for amendment to all laws that

prohibit an extensive 20 km seaward area from fishing activities, since the turtle congregation takes place only within 3 to 4 km of shallow waters off the coastline. The memorandum while deploring the wastage of huge chunks of UNDP and Government money after counter-productive measures in the name of turtle conservation, strongly appealed to all concerned authorities to earmark a part of this money for paying allowances to the trawling crews and fishermen, who are willing to carry out all difficult and painstaking programmes for turtle protection at field level.

The second day of the workshop was devoted to hands-on lessons in net preparation, TED fabrication and installation in the premises of New Fishing Harbour, under the guidance of the scientists of Central Institute of Fisheries Technology, Kochi, State Institute of Fisheries Technology, Kakinada, Fishery Survey of India, Central Institute of Fisheries and Nautical Engineering & Technology. On the third day a comparative demonstration of fishing trawlers with and without attachment of TED and also with and without the attachment of the second cod end was held by four trawlers at a depth of around 16 fathoms, about 10 to 12 km off the coastline, in the presence of the scientists, trawl owners, NGOs, media men and Government officials.

On the concluding day, both Government personnel including the scientists and the trawler leaders presented their respective views and interpretations on the results of TED demonstration, which were found to be widely divergent. On the basis of the deliberations so made, a 10 point Resolution was proposed by the President of the Valedictory session T.K. Behera, Joint Director of Fisheries, Orissa, which was subject to threadbare discussion. After incorporating the consensus on the amendments, the resolution was passed unanimously which inter alia called for review and revision of all turtle conservation measures adopted so far, minimum one year trial of any new design of TED or any alternative device to precede its use by the trawl owners, necessary modification of the present design of CIFT TED found to cause excessive escape of fish, amendment of the concerned legislations on 'no fishing zone' following mandatory use of TED, a coordinated effort on the front of turtle protection

and TED use between the four coastal states on the east coast of India (West Bengal, Orissa, Andhra Pradesh and Tamilnadu), further in-depth studies on the endangered marine bio-diversity and ecosystems, deployment of special officers of the Fisheries Department in two coastal districts Kendrapara and Bhadrak for better implementation of turtle conservation measures, provision of identity cards for the marine fishermen and colour codes for the fishing vessels by the Coast Guard, more welfare oriented and compensatory schemes for the fishermen to offset their poor conditions and declining fish catch, and above all demarcation of the boundaries of 'no fishing zones' to avoid conflict between fishermen and enforcement authorities.

R.S. Mishra, an ex-Deputy Director of Fisheries, while expressing his whole-hearted sympathy for the plight of the fishermen, suggested that the trawler owners might try as an alternative to TED, a new simple and inexpensive device i.e. Trawl Guard, which is made of only 4 kg of nylon rope and fitted to the mouth of the trawl net. The Trawl Guard would allow even large fishes into the trawl net while preventing turtles and sharks and even logs of wood and other sea debris from entering.

Anwar Khan, Assistant Commandant of Coast Guard, Orissa observed that they are duty bound to seize the vessels found illegally operating in the sanctuary areas, just as they are duty bound to recover the lost and stranded vessels of the fishermen. The Chief Guest of the Valedictory Session, C. Hari Das, Assistant commissioner Fisheries, Government of India observed that he would strive for introduction of more fishermen friendly schemes to compensate their loss, if there be any on account of the use of TED. T.K. Behera President of the Valedictory Session in his concluding address expressed happiness for the active role that the trawl owners played in both deliberation and field demonstration of TEDs through out the Workshop. He requested them to procure TEDs free of cost from their local Departmental store for the purpose of field trial by themselves, if they so wanted.

*Source: Project Swarajya, Cuttack, Orissa, India. (www.projectswarajya.com)*

## Letter to the Editors

Dear Editors,

This is with regard to the “**Workshop cum Demonstration on Turtle Excluder Device at Paradip from 9 – 12 February 2002**”. The workshop was conducted amidst heavy protest by the trawl operators throughout the proceedings. The four days of the workshop were chaotic and the organisers seemed to have no control over the events. Prior to the inauguration of the workshop, nearly 30 trawler owners from different parts of the Orissa coast started protesting against the use of TED, which led to a heated altercation between the trawl owners and the journalists present at the venue of the workshop. Finally with the intervention of A. Tripathy, IAS, Fisheries Secretary, Government of Orissa, the trawler owners were pacified and were brought to the meeting. Thereafter the scene was completely dominated by the trawler owners. The invited speakers from Fisheries Survey of India, Central Institute of Fisheries Technology (CIFT), Kochi and the Wildlife Institute of India, Dehradun were not allowed to express their views regarding the use of TED and its relevance to sea turtle conservation. The first day of the workshop was filled with much shouting by the trawler owners with most others watching as mute spectators.

The second day of the workshop was meant for fabrication and installation of TEDs. The proceedings of the second day started more than two hours late and like the previous day, there did not

appear to be any control over the events. Only few trawler owners were present. The construction and installation of the TED in the net, which should have been the major thrust of the second day of the workshop, was not explained at all.

The third day of the workshop dealt with the field demonstration of TED. However, the demonstration was poorly organised. Four fishing trawlers were used to carry out the field exercise. Unfortunately all these fishing vessels were of different size and were using different kind of nets. This made it impossible to compare the efficiency of TED. All four fishing vessels carried out one or two trawls off the Paradip coast and in the final day, deliberations were focused on these four or five trawls that were carried out during the third day of the workshop.

In the final day the trawl owners put forwarded their views regarding TED and they unanimously rejected the use of TED in their trawl nets. Dr. Raghu Prakash of CIFT, Visakhapatnam centre gave a presentation on the CIFT-TED. T. Behera, Joint Director Fisheries, Government of Orissa presided over the last day's proceeding. At the end of fourth day's proceeding the workshop recommendations were discussed. These recommendations reflected the biases of the trawler owners and their opposition to using TEDs.

*Bivash Pandav, Wildlife Institute of India, Dehradun, India.*

## Operation Kachhapa News

### Forest Guard Killed in Gahirmatha

In a shocking incident that took place on Saturday evening, three forest guards were abducted by the crew members of two gill-netters that had been seized inside the Gahirmatha Marine Sanctuary for illegal fishing. One of the forest guards, Shyam Singh, resisted and was pushed overboard. Shyam Singh, who was from Keonjhar, could not swim. His body was washed ashore on the beaches of Babubali Island on Monday afternoon.

The incident began when a forest patrol boat from Rajnagar Mangrove Wildlife Division intercepted the gill-netters inside Gahirmatha on the evening of 8th February. The seized boats were brought to Babubali Island, where most of the forest team disembarked and went to their tents. Three forest guards were left to watch over the seized gill-netters and their crew of thirteen. Later in the evening, the guards were overpowered by the crew members and abducted. One boat travelled towards Dhamra, where forest guard Bamdev Pradhan was released.

The second boat, with forest guards Sankarsan Lenka and Shyam Singh on board, moved towards the Balasore coast. Shyam Singh, who put up some resistance to the attack, was thrown overboard as the boat headed out to sea. Late in the night, Sankarsan Lenka was asked to disembark in the shallow waters near Bhadrak coast. He was able to find his way to the beach through chest deep waters.

Our heartfelt sympathies go out to Shyam Singh's family and friends. The incident is also a major setback to the Orissa Forest Department's turtle conservation efforts and Operation Kachhapa. We will be supporting the funeral arrangements for Shyam Singh and making an *ex gratia* payment to his family.

*Wildlife Protection Society of India, New Delhi.*

### **Sea turtle interpretation centre in Orissa**

A sea turtle interpretation centre has been opened in Bhubaneswar to provide information about the olive ridley sea turtles which come to the Orissa coast for nesting every year. The centre, which was formally inaugurated on Friday, has been set up by Operation Kachhapa, with financial assistance from Ford Motor Company. The centre will be beneficial for the wildlife lovers and researchers and also help create awareness among the school children about the conservation of the endangered olive ridleys. The centre has a series of photographs, posters, models, books and reference material on olive ridleys. It also has the facility for the screening of films on sea turtles. An artificial beach depicts the dangers that the sea turtles face from mechanised fishing trawlers illegally operating along the Orissa coast .

*Wildlife Protection Society of India, New Delhi.*

### **Turtle Mass Nesting Begins In Orissa**

The much-awaited sea turtle mass nesting finally began in Orissa on the evening of 9th March at Rushikulya nesting beach near Kantiagada village. According to estimates by Operation Kachhapa field staff about 50,000 olive Ridley sea turtles climbed ashore to lay their eggs on a one-kilometer stretch of beach at the Rushikulya river mouth. The mass nesting or *arribada* continued into the morning

hours and thousands of female turtles were seen laying their eggs upto 8.00 a.m. During the last few days there had been sporadic nesting of 100 to 300 turtles a day on this beach. "News of the turtle nesting has come as a great relief to conservationists", said Belinda Wright, Project Director of WPSI's Operation Kachhapa. "There was no mass nesting in Orissa during the previous turtle season of 2001-02 at any of the three important nesting sites of Nasi Islands in Gahirmatha, Devi River mouth and Rushikulya River mouth." A few days ago, there was also significant nesting of turtles at Pentha beach in the Gahirmatha Marine Sanctuary when about 10,000 turtles nested there over a three-day period from 5 – 7 March, 2003. No *arribada* has as yet taken place at Gahirmatha.

Operation Kachhapa field watchers have been deployed to assist the Forest Department in counting the nesting turtles as well as to protect the eggs from natural predators such as dogs, jackals, wild boar, hyenas, crows, eagles, and gulls. Observers noticed that a number of the turtles that climbed ashore to nest at Rushikulya were individuals that had been tagged in earlier years in Gahirmatha. Due to uncontrolled illegal mechanized fishing - particularly by trawlers from Andhra Pradesh - in prohibited zones of Rushikulya River, more than 2,235 dead olive ridleys have been counted on the Chilika mouth to Bahuda river stretch during the current nesting season. The Rushikulya River mouth nesting-beach faces an additional threat from the proposed crude oil terminal project of Bharat Petroleum Corporation Limited at Kantiagada village. If this project becomes a reality the Rushikulya turtle mass-nesting site will be lost forever.

*Wildlife Protection Society of India, New Delhi.*

### **Turtle Film**

A 17-minute film on CD "The Killing Fields: Orissa's Appalling Turtle Crisis" is available with the Wildlife Protection Society of India (WPSI). Please contact us if you would like a copy.

*Wildlife Protection Society of India, New Delhi.*

## Marine Turtle Newsletter

**ONLINE** - The *Marine Turtle Newsletter* and *Noticiero de Tortugas Marinas* are both available at the MTN web site <<http://www.seaturtle.org/mtn>> and <<http://www.seaturtle.org/ntm>>

### Issue No. 98 October 2002

#### Articles

Preliminary Check-List of the Epizootic Macroalgae Growing on Loggerhead Turtles in the Western Mediterranean Sea – *J.C. Báez et al.*

Recent Sightings of the green Turtle *Chelonia mydas* on the Coast of Andhra Pradesh, India - *Basudev Tripathy & B.C. Choudhury*

Cayman Turtle Farm Head-starting Project Yields Tangible Success - *Catherine D.L. Bell & Joe Parsons*

#### Notes

Results of Experimental Carapace Tagging

Observation of Accidental Capture of a Loggerhead Turtle by Hand-line Fishing in Kefalonia, Greece

Green Turtle Encrusted with White Matter Observed Nesting at Akyatan Beach, Turkey

#### Meeting Reports

#### Book Reviews

#### Letter To The Editors

#### Announcements

#### News And Legal Briefs

#### Recent Publications

### Issue No. 99 January 2003

#### Obituary

John Roscoe Hendrickson 1921-2002 – *David Owens*

#### Editorial

Living Tag, Living Reputation.- *N. Mrosovsky & M.H. Godfrey*

#### Articles

A Conservation Success: leatherback Turtles in the British Virgin Islands – *Mervin Hasting*

Epibionts of hawksbill Turtles *Eretmochelys imbricata* in a Caribbean Nesting Ground: A Potentially Unique Association with Snapping Shrimp (Crustacea: Alpheidae) – *M.G. Frick et al.*

Predation on Loggerhead and leatherback Post-Hatchlings by Gray Snapper – *F.E. Vose & B.V. Shank*

Marine Turtle Conservation Initiatives at Ras Laffan Industrial City, Qatar (Arabian Gulf) – *M.R. Tayab & P. Quiton*

The Surf Crab (*Arenaeus cribrarius*): A Predator and Prey Item of Sea Turtles - *M.G. Frick*

#### Notes

First Record of Juvenile leatherback Stranding in Mona Island, Puerto Rico

Juvenile green Turtle Tagged in Florida Recorded at Tortuguero, Costa Rica.

First Record of olive Ridley Nesting in the State of Ceará, Brazil.

#### Book Reviews

#### Announcements

#### News & Legal Briefs

#### Recent Publications

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MARINE TURTLE NEWSLETTER (MTN100)

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