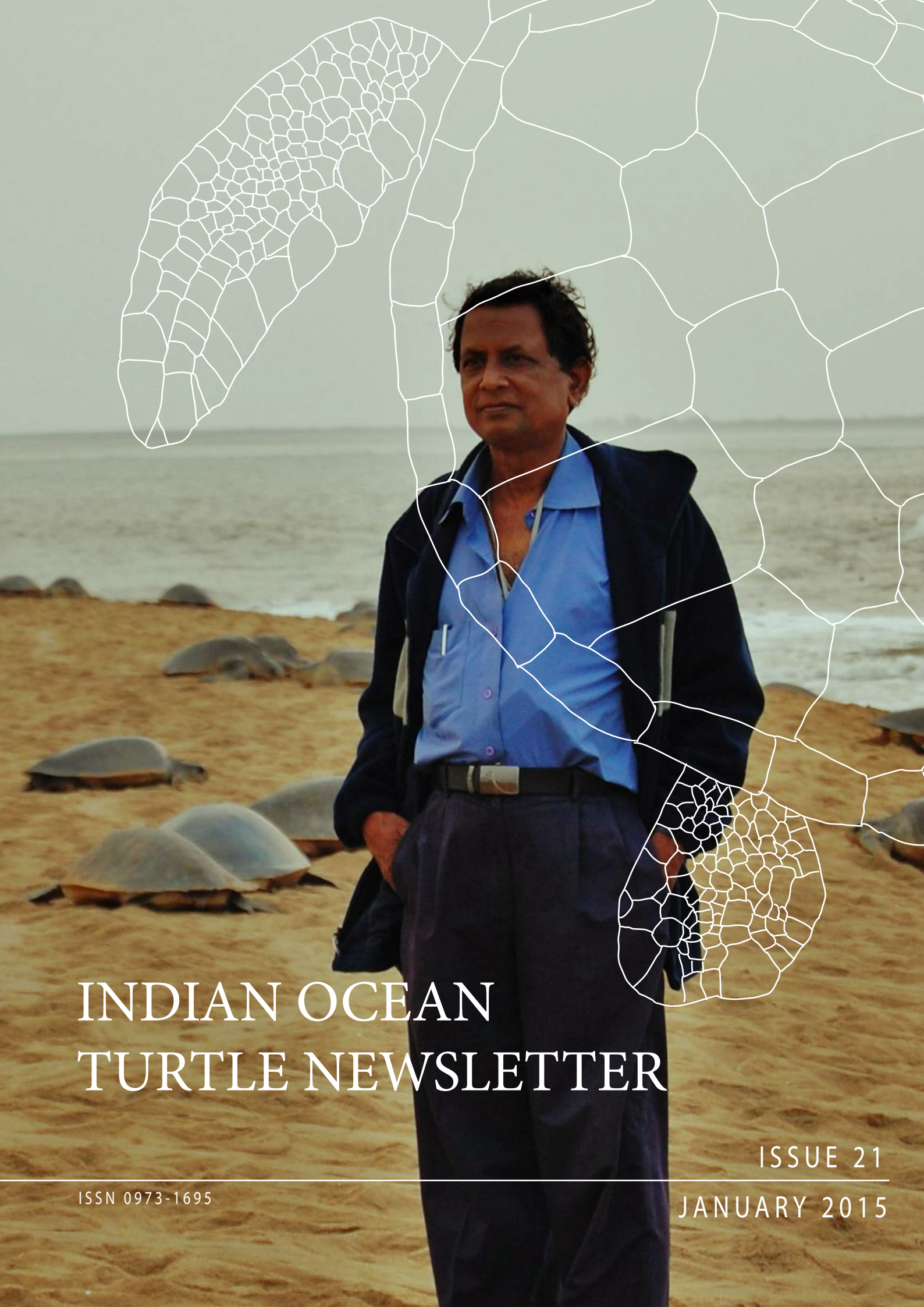

INDIAN OCEAN TURTLE NEWSLETTER

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The Indian Ocean Turtle 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 Indian subcontinent, Indian Ocean region, and south/southeast Asia. The newsletter also intends to cover related aspects such as coastal zone management, fisheries and marine biology.

The newsletter is distributed free of cost to a network of government and non-government organisations and individuals in the region. All articles are also freely available in PDF and HTML formats on the website. Readers can submit names and addresses of individuals, NGOs, research institutions, schools and colleges, etc. for inclusion in the mailing list.

SUBMISSION OF MANUSCRIPTS

IOTN articles are peer reviewed by a member of the editorial board and an external reviewer. In addition to invited and submitted articles, IOTN also publishes notes, letters, announcements, casual notes and anecdotal accounts. We also welcome photographs (broadly based on the theme of sea turtles/sea turtle habitats - see specifications below).

Manuscripts should be submitted by email to: iotn.editors@gmail.com

Manuscripts should be submitted in standard word processor formats or saved as rich text format (RTF). Figures should not be embedded in the text; they may be stored in EXCEL, JPG, TIFF or BMP formats. High resolution figures may be requested after acceptance of the article. Please refer to previous IOTN issues or to the Guide to Authors on the website (www.iotn.org/submission) for formatting guidelines. Authors should provide complete contact information including an email address, phone and fax numbers.

Photographs (including contributions for the cover): Individual photographs should be submitted as JPG or TIFF formats, with an accompanying caption and photo credit. High resolution images may be requested after acceptance of the photograph. Final files should have a minimum resolution of 1200 px or >250 dpi.

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EDITORIAL

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Many thanks for your complimentary emails about the two papers on sea turtle genetics in South and South-East Asia in IOTN Issue 20; we hope future genetics research in the region can be informed by recommendations from the authors.

As we begin 2015, Issue 21 of IOTN reports events from the previous years' sea turtle nesting season. The Students' Sea Turtle Conservation Network describe their ominous start to 2014 and success by the end of the season; we hope their current season is as productive. Two new nesting sites were reported for olive ridley sea turtle in the Andaman and Nicobar Island chain, and the recovery of an injured turtle at Reunion Island was tracked using photographic-identification. Sadly, Chandrasekhar Kar, the turtle man of Odisha, passed away in April of 2014. His efforts in studying and conserving the olive ridley sea turtle nesting population at Gahirmatha are recognized in reflections about his life and work by close associates, peers and students.

Looking ahead this year, we hope to see many IOTN readers at the 35th Annual Symposium on Sea Turtle Biology and Conservation in Turkey. Those working in the Indian Ocean and South-East Asia are encouraged to attend the regional meeting on the 19th April 2015.

CALL FOR SUBMISSIONS

The Indian Ocean Turtle Newsletter was initiated to provide a forum for the exchange of information on sea turtle biology and conservation, management and education and awareness activities in the Indian subcontinent, Indian Ocean region, and south/southeast Asia. Issue 22 of IOTN will be a special joint issue with Marine Turtle Newsletter with a focus on fisheries bycatch; if you would like to submit a research article, project profile, note or announcement, please email material to iotn.editors@gmail.com before 1st May 2015. Guidelines for submission can be found at http://www.iotn.org/submission.php.

ARTICLES

SSTCN YEAR 26 – LOOKING BACK AT THE SEASON GONE BY

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INTRODUCTION

In 26 years of the history of the Students' Sea Turtle Conservation Network, the last few years really stand out! Though there have been a few outstanding years here and there in terms of nesting abundance, the combined count of hatchlings released over the last 4 years, which is more than 80,000, surpasses the combined release from the 15 years prior.

There are two reasons for this phenomenon. Firstly, four years ago, we started monitoring the popular Marina Beach, north of the Adyar River. Previously, we had only monitored the more secluded 7 to 10 km south of this river mouth. We had always assumed that since Marina Beach was a well known commercial attraction, with a lot of human activity and disturbance, sea turtles would not nest there. Also, with limited human resources, we were only just able to manage the stretch we had monitored previously.

Secondly, there does appear to be an increase in the number of turtles that are congregating and nesting on these beaches. While the reasons are unclear, it could relate to the partial or total destruction of beaches just north of Chennai due to industrial activity, as a result of which turtles which used to nest on those beaches have shifted south. It could also be a result of an overall increase in the nesting turtle population along the Coromandel coast.

OMINOUS START TO 2014

All four nesting seasons began distressingly, with 50-60 dead turtles washing ashore within the first few weeks, all likely drowned in trawl nets. In several districts, necropsies were performed on these turtles and the cause of death was confirmed as drowning. In Cuddalore district alone, 30 turtles were examined, and same cause of death was attributed to all of them. By the end of each of the last four nesting seasons, the number of dead turtles was greater than 200.

In 2013, SSTCN petitioned the Chief Minister's "Special Cell" asking for the Fisheries Department to ensure that trawlers not enter near shore waters and also to make it compulsory for trawlers to use TEDs during turtle season, but no action appeared to have been taken. This year, the vernacular press publicised the turtle mortality, but unfortunately targeted the Forest Department for inaction. The Forest Department are not directly culpable, as they do not have authority over the trawlers. The Fisheries Department is the regulating authority and has not, so far, taken any action. As a consequence of media attention, the Forest Department buried the turtles.

By the third week of January, our dead turtle count was already 120 and we had barely collected any nests. Though the dead turtle count kept mounting, we began to find a few nests and by the second week of February, there was a sharp decline in the number of dead turtles and the number of nests began to increase, a trend we have observed in each of the last few years. This might be related to when and where fishing occurs and the movement patterns of the turtles. January to March is peak season for fishing, and there has been an increase in the number of registered trawlers in recent years.

THE PEAK SEASON IN 2014

Peak nesting occurred in February, as usual, with 120 nests, compared to 48 nests in January. On 10th February alone, we found 23 nests over 13 km. This may be compared to years where we found less than 20 nests in the entire season. The patrolling started around midnight as usual and went on till around 8am. The original two volunteers ran out of cloth bags to collect eggs and ran out of time as they had to get to work early in the morning. They were replaced by two other volunteers who went on to work till 8am. Our Marina hatchery watchman, Kumar, was active throughout, personally having found 5 nests and relocated 10, and was exhausted by the morning. The actual count would have been 26 but they couldn't find 3 nests, despite searching for quite some time! We need to relocate every nest as they are unsafe left behind due to the powerful lights on the beach, presence of stray dogs and also due to incidental poaching.

Nishanth's Role

All our volunteers are special. They compromise a night's sleep every time they help monitor the beach. Many of them attend college the next day or go to work. But one person stands out over the others in the last three years. Last season, Nishanth personally collected 74 nests out of a total of 256. This year, he walked the beach on 66 out of a possible 100 nights and collected 78 nests. When he could not be present, he arranged for one of his many friends to take his place. He has already started a trust to carry out environmental education and conservation work in his locality. His team has initiated a programme to stop the use of plastic bags in their neighbourhood. They collect pieces of discarded cloth from tailor shops and use this to stitch cloth bags which they give to shops to use instead of plastic bags. This project has effectively reduced the use of plastic bags in his suburb. There is more... Nishanth is also a volunteer with Blue Cross and is called all over the city to rescue snakes and animals which have fallen into wells etc. We were all overawed one night when we learnt that he had travelled 150 km that day to rescue 5 snakes, 3 of them cobras, and then had rushed to join us for beach monitoring. He has rescued more than 100 animals, some of these in spectacular fashion. Nishanth has just graduated with an engineering degree this year, and we are hoping that he will continue to be work with us.

John's Role

One of the key reasons for our success at managing the beach monitoring 'turtle walks' over the last four years has been the availability of one full time volunteer every year. This volunteer is willing to walk 6/7 days a week through the season and go to the hatchery whenever needed. This year's full time volunteer was John, an engineer by qualification who had worked in the IT industry before quitting. He was deeply troubled with the state of the environment and wanted to be a part of the solution in some way. He had volunteered in our forestation project in Thiruvannamalai, and we suggested that he would be more useful during these months in Chennai by volunteering for the turtle walks. He readily agreed to this and moved to Chennai. He was offered free accommodation in our activist friend Nityanand Jayaraman's office. John walked through the season with barely any breaks. We suggested that he skip the weekend walks as there were enough of us to manage, but he enjoyed interacting with the public about their perception of the environmental situation and ways to address it. The night that we located 23 nests, John had walked the entire southern stretch which is 8 km long, and then, hearing about the struggle in Marina beach, immediately went there to help and found 4 more nests! His help in monitoring the hatcheries too was invaluable. He is immensely talented and has had theatre experience and has now signed up with a travelling theatre group which is committed to creating awareness of environmental issues through the medium of theatre.

One of the unique features of SSTCN is that it offers an opportunity for youngsters to participate and get involved in the field of conservation. While it was John this year, it was a young chartered accountant, Raghuraman, last year, who had committed to working with us the entire season. The year before that, Karthikeyan, an environmental journalist had done the same. All the youngsters walking the Marina stretch have a very kind mentor, who guides them, inspires them and walks with them. 'Lakshmi anna' (elder brother), as they call him, has walked 9 seasons. If not for these dedicated youngsters, it would not be possible for us to manage the monitoring and maintenance of the hatchery.

WORKING WITH THE FOREST DEPARTMENT

After a long hiatus, the Tamil Nadu Forest Department has begun direct participation in turtle conservation from this year. They have received funds from the Japanese government under the aegis of TBGP (Tamil Nadu Biodiversity Conservation and Greening Project). As a part of this, we were asked to conduct a survey of Cuddalore and Chennai districts and come up with a Species Conservation Action Plan (SCAP) for the two districts.

We did the Cuddalore survey, on foot, in June with many volunteers. We found some undisturbed, pristine beaches with lots of mangroves, but even on these beaches we found many dead turtles. We also found the presence of industry everywhere, threatening the future of marine ecosystems through unmitigated pollution. We found evidence of severe beach erosion due to the wharfs, sea walls etc. built on the beaches extending into the sea. In many places there was only ten metres of beach available with the sea having ingressed more than 150 metres.

The forest department set up a hatchery alongside ours and we initially monitored the beach together as our volunteers demonstrated to them how to find and relocate nests. We then began to walk at different times so that we could monitor the beach better. Despite some difficulties in coordination (our volunteers would waste time searching for nests which had already been removed), it was definitely a boon to have more people monitoring the beach. The fact that we found over 300 nests this season is testimony to this. By participating in the programme, the forest department too have a better

understanding of the difficulties at the ground level. We see this as a good model for the future where committed NGOs can partner with the Forest Department.

We released 22,678 hatchlings at our Besant Nagar and Marina hatcheries while the Forest Department released another 5,000 hatchlings. This is our highest ever in a given season and we feel a sense of hope for the future when we see the little turtles enter the sea.

PUBLIC INTERACTION

The turtle walks have become a well-known cultural event in Chennai and draw huge crowds. We struggle to keep the group to a reasonably manageable number every weekend. We decided that we would focus on students of schools and colleges and individuals rather than work with large groups.

For the first time this year, we also started interacting with the public in Tamil, the local language. Harish, who has been with us for four years now, has acquired the expertise to interact with the public very well and anchored the Tamil interaction. This was a hugely popular decision with many participants feeling very comfortable in their own mother tongue.

HATCHLING RELEASE

We released hatchlings several times during a 24 hour cycle. The hatchlings rarely emerged during the day, but when they do we release them immediately to reduce the chance of dehydration. However, the main hatchling release occurs just after dusk in the evening, when the crows have retired for the day. We also check the hatcheries at 10pm, 12am, 4am and 6am. Often the evening release will continue till 10pm as hatchling keep emerging, or the night release will go on from 10pm to 1am. Due to a large number of nests emerging on the same day, we often released several hundred hatchlings in a single evening! Both our watchmen, who are from the fishing community, are invaluable in monitoring the hatcheries around the clock, but Kumar anna from the Marina hatchery is a great asset as he even sleeps in the hatchery to be available all the time and involves his whole family when needed.

The hatchling release programme drew huge crowds, mainly children too young to undertake the over-night walk. There were many children everyday to cheer the young turtles going in to the sea. This seems like a very valuable interface to have young children interact with nature as they always seem to feel touched and keep coming back. Shravan, who has been with us 9 years now, continued to take charge of the Besant Nagar hatchery while managing his business and snake rescue! We have reached out to around 5,000 people this season. Around 1,500 people came for the walks and around 3,500 people participated in the hatchlings release.

CETACEAN STUDY

Early in the season, we were contacted by conservationist and Cetacean Expert Dipani Sutaria and Rahul Muralidharan from ATREE to help with their Cetacean study. They conducted a workshop for us on the procedures and methods. The volunteers were excited to learn about the Cetaceans and the amount of knowledge that could be acquired from live and dead strandings. We plunged in to the task with great enthusiasm and provided information to them. We also released some stranded dolphins back in to sea. One of these is thought to be a striped dolphin (*Stenella coeruleoalba*). We hope to continue on this front in the upcoming season.

COMMUNITY CO-OPERATION

Last, but not the least, we are very grateful to all the fishermen along the coast who have helped us identify many nests whose tracks had been obliterated by the incoming tide. The fishermen have always been friendly to us and have supported us in whatever way they can. This year we also came across a few injured turtles. On such occasions, we contacted Dr. Supraja Dharini from TREE Foundation who immediately agreed to take the turtles and provide the necessary medical care.

Conclusion

At the end of the season we have mixed feelings. We are happy that we released our highest number of hatchlings and for the wonderful work put in by the volunteers. But, we are also worried about the number of dead turtles and are determined to do something about it. A promising development has been the return of Adhith, one of our most experienced volunteers and a trustee with SSTCN. He will dedicate the next five months to reaching out to educational institutions and other stakeholders, such as fishing community members and the fisheries department.

INITIAL OBSERVATIONS ON THE NESTING AND HATCHLINGS OF OLIVE RIDLEY TURTLES AT CORBYN'S COVE, SOUTH ANDAMAN ISLAND

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The Andaman and Nicobar Islands in the Bay of Bengal are the nesting grounds for leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), green (*Chelonia mydas*) and olive ridley (*Lepidochelys olivacea*) sea turtles (Bhaskar,1979a, 1979b, 1984; Bhaskar & Whitaker, 1983; Bhaskar & Rao, 1992; Andrews, 2000, Andrews *et al*. 2006a, 2006b, 2006c). Olive ridley turtles are known to nest on several beaches in the Andaman and Nicobar Island chain (Figure 1), and here, I report on a new nesting site for *Lepidochelys olivacea,* Corbyn's Cove beach, on South Andaman Island.

Corbyn's Cove is a coconut-palm-fringed beach located at Port Blair. The beach is governed and maintained by the Port Blair Municipal Council and is heavily lit with flood lights due to its being a tourist attraction. On 11th March 2014, approximately 80-100 olive ridley hatchlings were observed crawling down the beach to enter the sea, and a further six live hatchlings and several dead hatchlings were sighted on the morning of 16th March 2014. Depredated sea turtle nests containing empty eggshell were observed on 16th, 20th and 23rd March 2014 after the nests were exposed by feral dogs. The night watchman of the beach infrastructure told us that 11 olive ridley turtles had emerged to nest at Corbyn's Cove during the month of January 2014 and nine nests were laid, of which 6 were excavated and relocated by the forest officials to Grub Island in the Mahatma Gandhi Marine National Park some 20 kilometres away.

The present report suggests that a small number of olive ridley turtles nest on the heavily lit Corbyn's Cove beach, and proper management practices should be employed to minimise the effect of lights on hatchling orientations and to safe guard the nests.

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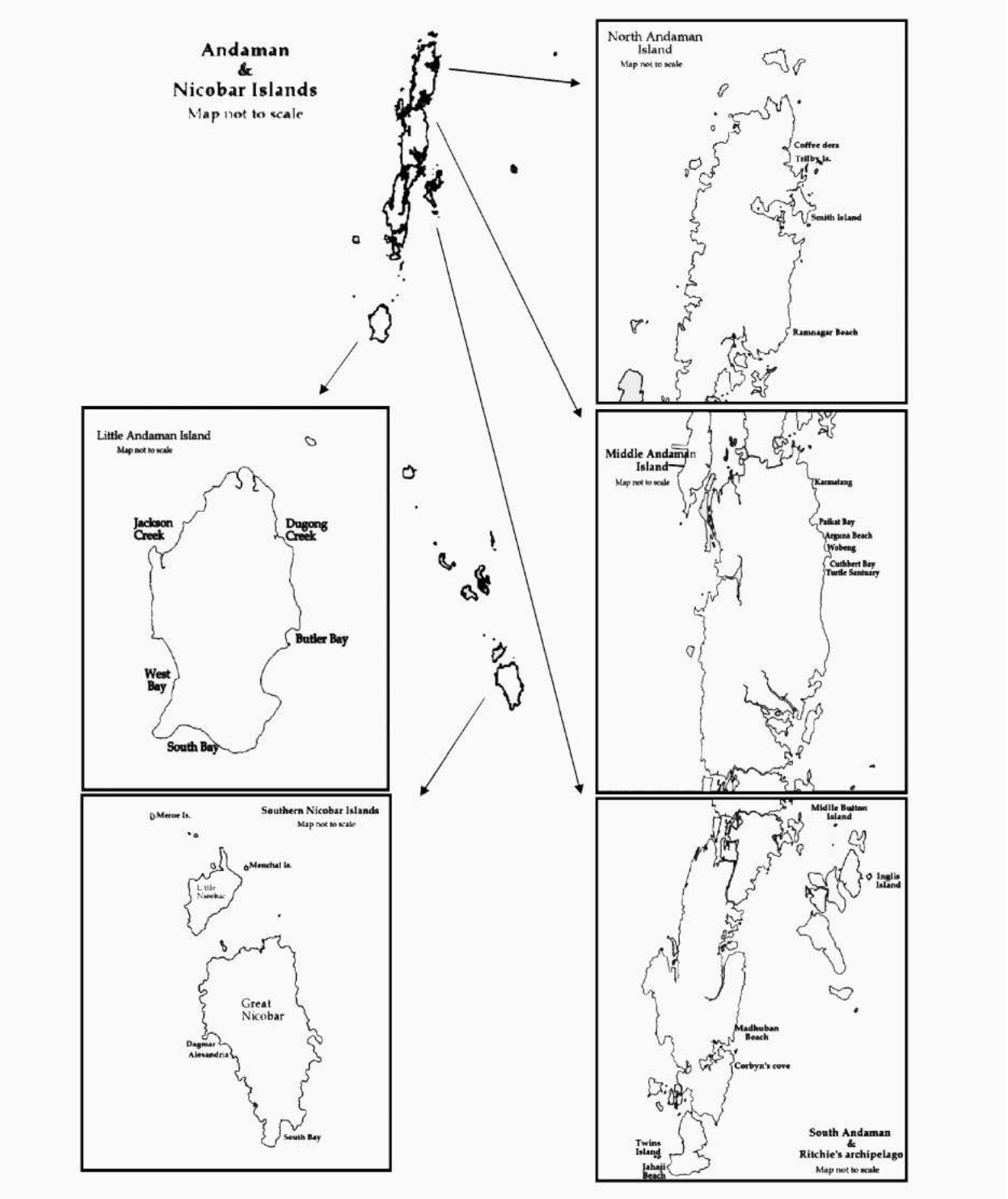

Figure 1. Known olive ridley nesting beaches in the Andaman and Nicobar Islands.

OLIVE RIDLEY MASS-NESTING AT CUTHBERT BAY WILDLIFE SANCTUARY, MIDDLE ANDAMAN ISLAND

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INTRODUCTION

The beaches on the east coast of Middle Andaman have long been known as important nesting sites for olive ridley turtles in the Andaman and Nicobar Islands. Of particular importance are the beaches in the Cuthbert Bay Wildlife Sanctuary, Middle Andaman, where olive ridley turtles have been reported to nest in fairly large numbers from November to April, with a peak between January and March (Fatima, 2011). In 1994, Satish Bhaskar, one of the pioneering sea turtle researchers of India, reported an "arribada-type" phenomenon of olive ridley nesting on the beaches of Cuthbert Bay with 100-200 nests laid on some nights (Bhaskar, 1994). Data collected by the local forest department indicated that more than 50% of the nests for the 1990-91 and 1991-92 seasons were laid in short spurts of 2-3 days (see Table 1; Namboothri *et al*., 2012). Fatima *et al*. (2011) collated information on sea turtle nesting in Cuthbert Bay prior to and immediately after the December 2004 earthquake and tsunami, and determined there was a sharp decline in nesting in the two years following the tsunami. During this period, there is no indication of synchronized nesting.

A new olive ridley mass-nesting site for the Indian Ocean?

Recently, more than 5,000 olive ridley nests were laid on 18th and 19th of January 2014 on Harguna Beach, a short stretch of beach about 6 km north of the Betapur (Dhani) Nallah Beach (see Figure 1) (EOIC, 2014). Forest Department personnel stated that mass-nesting has been observed at the beach since 2012, with more than 1,000 turtle nests recorded on the beaches of Cuthbert Bay from January 15-19, 2013. Though the intensity of nesting is not comparable to the nesting abundance observed at mass-nesting beaches in Odisha (> 100,000/year), there is clearly a pattern of synchronised nesting emergence.

Following reports in the media, the authors visited Cuthbert Bay Wildlife Sanctuary on 7-8th February 2014 to conduct a rapid survey of the nesting sites, examine the hatcheries, and to offer a training programme for field staff of the forest department, Mayabunder Division. The department monitors olive ridley nesting along the east coast of the Middle and North Andaman Islands (at Cuthbert Bay, Karmatang, Ramnagar, Kalipur, Lamiya Bay and Ross and Smith Island) and at Harguna Beach. Interactions with the forest department indicates high nest depredation due to feral dogs and pigs. Hence, sporadic nests on the main Cuthbert Bay Sanctuary nesting beach are shifted to permanent hatcheries set up at regular intervals on the beach. The mass-nesting site at Harguna Beach is a relatively remote and narrow beach and the entire beach is fenced off to reduce nest predation by feral dogs and human poaching of turtles and eggs. Many of the nests are laid below the high-tide level and are relocated into a temporary *in-situ* hatchery on the beach.

A workshop and training programme was conducted for about 30 frontline staff of the Middle and North Andaman ranges on sea turtle biology and hatchery management practices. This was followed by an interactive session where many of the staff discussed and clarified issues pertaining to sea turtle monitoring and hatchery management. Prospects of initiating a tagging programme were discussed along with protocols for monitoring mass-nesting.

Recommendations and suggestions for the sea turtle monitoring programme and hatchery management

Following the training programme, we provided a brief list of recommendations for the sea turtle monitoring programme at Cuthbert Bay. We plan to initiate collaborative monitoring of the mass-nesting site with the Forest Department of Andaman and Nicobar Islands in the upcoming season. We also plan to provide training for monitoring and management, and posters and manuals are being developed towards this end. The recommendations were as follows:

Nesting season	Total nesting duration	Total no. of nests	Peak nesting nights	Number of nests laid on the peak nesting nights	% of nests laid on the peak nesting nights*
1990-91	16/11/1990-30/04/1991	706	04/02/1991	70	58%
			06/02/1991	37	
			11/02/1991	147	
			12/02/1991	156	
1991-92	01/12/1991 - 26/02/1992	711	14/01/1992	52	73%
			29/01/1992	170	
			30/01/1992	93	
			26/02/1992	205	

Table 1: Data from Satish Bhaskar's surveys of olive ridley nesting at Cuthbert Bay, Middle Andaman Island, indicating an arribada-type event, with peak nights during the nesting season (Namboothri *et al.* 2012)

Sea turtle monitoring programme

- A tagging programme needs to be initiated at this site, which will generate crucial information on the inter- and re-nesting intervals of these turtles.
- The standardised strip transect approach to census mass-nesting events (Valverde and Gates, 1999) could be used to enumerate mass-nesting in the Middle Andamans.
- Long-term monitoring will provide more information on the temporal and spatial patterns of nesting at this site.
- Genetic studies will elucidate whether the Andaman olive ridley populations are distinct from the *arribada* population in Odisha.
- Satellite telemetry studies can provide information on their post-nesting movements as well as in identifying foraging grounds.
- Additional information on beach profiles (Berlie *et al*. 2008), nest predation (visual approximation based on footprints) and mortality of turtles through interactions with fisheries and other causes (examining dead carcasses on the beach) would be valuable to understand the threats these turtles face.

Nest protection and hatchery management

- *In-situ* protection of nests from feral dogs, pigs and monitor lizards can be achieved by building fences around existing nests to cause minimal disturbance.
- If there is a need to relocate eggs (as in the case of sporadic nests that are vulnerable to flooding or predation), they could be moved to temporary hatcheries situated on the nesting beach. A poster on 'Best Practices for Sea Turtle Hatcheries' is being developed for distribution and manuals on sea turtle conservation and hatchery management practices (Sea Turtles of India, 2011) have been provided to the forest department staff.
- In the case of existing permanent hatcheries, the sand needs to be replaced at the end of every season and not at the beginning of the season (as is the case currently). This ensures that the fresh sand added is exposed to wind and rain and resembles the natural beach sand as much as possible.

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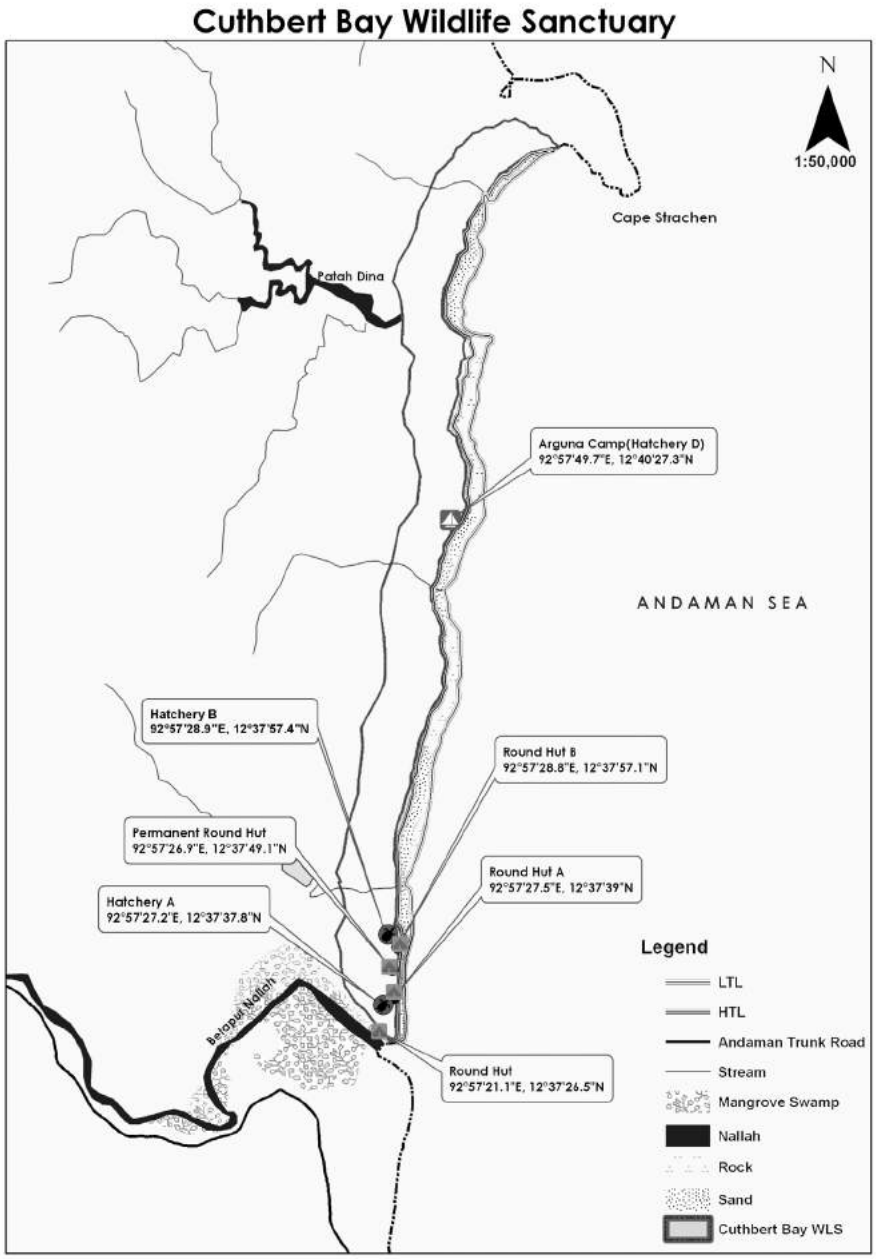

Figure 1. Map of the Cuthbert Bay Wildlife Sanctuary indicating the locations of the hatcheries and staff camps along the beach and the mass-nesting site at (Harguna Beach). Source: Forest Department, Middle Andaman.

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CAUSE AND HEALING OF A SEA TURTLE INJURY REVEALED BY PHOTO-IDENTIFICATION

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In January 2012, a dive club contacted the Sea Turtle Rescue and Rehabilitation Centre at Reunion Island, Kélonia, as they had seen an injured, immature green turtle (*Chelonia mydas*). The animal presented with a round shaped wound on the back of the carapace (see 2012 in Figure 1) and limited mobility in the posterior flippers. The wound was healing well and was diagnosed as a shark bite based on its shape. The turtle was weighed (25kg), measured (curved carapace length (CCL) 59cm), and identified using photo-identification (Photo-ID) software developed by Kélonia (Jean *et al*., 2010). After eight weeks at the rescue and rehabilitation centre, the turtle was eating normally and had good blood parameters so was judged healthy enough to be released into the wild. Members of the dive club who had rescued her named her Kiki Gloria and participated in her release at the original capture site.

After the turtle was released, Kélonia continued to promote citizen science through its photo-identification program, and distributed a poster explaining how to participate to all the dive clubs in La Reunion. The program encouraged divers to send photos of sea turtles to dedicated websites (http://www.museesreunion.re/sciences-savoirs/la-photo-identification and http://torsooi.com/index.php?page=Public.PhotoIdentification) or to search the databases themselves to identify individual turtles.

Local divers and dive clubs submitted their underwater photographs of sea turtles for photo-ID (Chassagneux *et al*., 2013). Some divers sent older photographs that were stored on their hard drives, which included photographs of Kiki Gloria several years earlier than her rescue by divers in 2012. Photographs of Kiki Gloria now span 2007 to 2015, allowing evaluation of the injury over time. In the oldest photograph of 2007, the characteristic wound was already visible on the rear of the carapace. However, the damage at that time appeared to be due to propeller impact rather than a shark attack. Analysis of the series of photographs from 2008- 2011 suggested that the impact of the propeller had broken the carapace and some vertebrae, which would explain the paralysis and lack of sensitivity in the hind flippers, and reduced circulation to tissues behind the lesion. In 2008 and 2009, we noticed loss of parts of the carapace and skin necrosis. In 2010 and 2011, further loss of tissue, possibly due to action of fish or other necrophages and potentially aided by a lack of sensitivity in this area, was observed. In 2012, cicatrisation appeared complete and new tissues were appearing at the wound periphery. Without photo-ID and participation of the divers, it would have been very complicated to determine the origin of the wound and link the different stages of healing.

On January 29th, 2015, Kiki Gloria was recaptured and brought back to the rescue centre because she appeared very weak and had buoyancy problems. She weighed 27kg and had a CCL of 63cm;since her first capture she had gained 2kg (~0.66kg per year) and 1.3cm carapace length. Interpretation of this data is difficult since growth rate of sea turtles is dependent on age and habitat (Limpus & Chaloupka, 1997; Zug *et al*., 2002; Kubis *et a*l., 2009) and she was injured. Kiki Gloria is still recovering at the centre. The buoyancy problems have been partially resolved, and radiography revealed a pelvic disruption responsible for paralysis of the rear flippers. Nevertheless, this lack of mobility in the flippers did not prevent her making round trips between two diving spots 3km apart since 2009, as revealed by her photographs location. As her health improves, we hope she can soon be released and will still stay in the field of dive photographers along Reunion Island coasts for a long time.

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CHANDRASEKHAR KAR (1956-2014)

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When Robert Bustard arrived in Odisha in the 1970s, he set about trying to establish a research programme there on crocodiles and sea turtles, and recruited several Ph.D. students. One such student, Chandrasekhar Kar, would carry out pioneering research on olive ridley turtles in Orissa. Chandrasekhar joined the Forest Department in Orissa as a Research Scholar in 1976. Initially stationed at Nandankanan Zoo, he then decided to shift to Gahirmatha as no one else was willing to work there. Madhab Chandra Dash at Sambalpur University agreeed to supervise Chandrasekhar's research formally, with Bustard as a co-guide. Chandrasekhar conducted field work at Gahirmatha between 1977 and 1982, tagging over 10,000 nesting females and amassing huge amounts of data on their nesting biology. Kar's book, co-authored with his supervisor M.C. Dash, "Gahirmatha: A Turtle Paradise" is a detailed account of sea turtles in the region and his work there.

Chandrasekhar worked under extremely taxing conditions for several years. In 1979, his paper with Satish Bhaskar on sea turtles of the eastern Indian Ocean was presented at the World Conference on Sea Turtle Conservation in Washington DC, USA. It was published in the 'Biology and Conservation of Sea Turtles' (Edited by Karen Bjorndal, 1982) and remains a classic and comprehensive account. Chandrasekhar also discovered a second rookery at the Devi River Mouth in 1981, and along with Bivash Pandav, a third rookery at Rushikulya. He mentored both Bivash and Basudev Tripathy, who made their name as sea turtle biologists in Orissa in the 1990s. He was involved with several research projects on olive ridley turtles in Odisha in the 1990s and 2000s. In 2001, when the very first satellite telemetry project on olive ridley turtles was launched in India, the first turtle fitted with a transmitter was named 'Chandra' in his honour.

When I interviewed Chandrasekhar in 2011 for my book on sea turtle conservation in India, he spoke with great nostalgia about his years at Gahirmatha, and with passion about sea turtle conservation in the state. Chandrasekhar retired from the Orissa Forest Department as Senior Research Officer in February 2014, and passed away suddenly in April of that year.

I LOST MY BEST FRIEND, CHANDRASEKHAR, THE SEA TURTLE BIOLOGIST

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It was April 21, 2014 at 9.30 pm, and my wife and I were in Bangalore when I got a message on my phone from my friend Dr. L.A.K. Singh. "*Dr. C.S. Kar passed away after a fall in bath room at his Burla home. Prof. M.C. Dash has just informed us*". The news came as a shock and initially I could not believe it. Soon after,

I got another message from Lala "*We are shocked to learn about this and his body will be taken to Puri for cremation and is expected to reach his residence between 6-7am tomorrow*". Immediately, I got in touch with our Chief Wildlife Warden, Sri S.S. Srivastav and informed him about the sudden demise of Chandrasekhar. That was a terrible night for me and I couldn't sleep a wink. My wife and children were equally saddened by this news, as Chandrasekhar was an integral part of my family.

L.A.K. Singh and I joined the Govt. of India/FAO/ UNDP Project "Crocodile and Sea Turtle Research and Management' as researchers in mid-1975 and were stationed at the Bhitarkanika and Satkosia Research centres. Chandrasekhar joined us the following year. He was initially given an assignment by the Chief Wildlife Warden, Sri. G.M. Das, and Dr. H.R. Bustard, FAO/ UNDP Chief Technical Advisor, to study the captive breeding of the three Indian crocodilian species at the Nanadankanan Zoological Park. He later moved to Habalikhati on the Gahirmatha coast to study the ecology and biology of olive ridley turtles (*Lepidochelys olivacea*), since Gahirmatha had just recently been discovered and hailed as one of the world's largest sea turtle rookeries by Dr. Bustard.

I was involved in a study of estuarine crocodiles (*Crocodylus porosus*) in the Bhitarkanika mangrove ecosystem and was stationed at the saltwater crocodile research and conservation centre, Dangmal, and Chandrasekhar was stationed at the Habalikhati camp on the coast. Our initial years of research in the harsh conditions of Bhitarkanika and Gahirmatha, in the deltaic area of the rivers Brahmani, Baitarani and Dhamara, was very difficult for both of us since we had to negotiate the tidal rivers and creeks using small row boats and kerosene lanterns through our study period. At the time, we lacked even basic postal and communication facilities in these remote areas.

Even though we were located not too far away from each other in Bhitarkanika, we could not meet frequently. To meet him at his study site at Gahirmatha was difficult as it took several hours to traverse the inner tidal creeks in a row boat. When he visited me at Dangmal we would have a good time together, interacting about our respective research activities and other related subjects. We used to visit Chandabali regularly to attend the monthly review meeting at the Wildlife Division Office.

Chandrasekhar was a very hard working and committed researcher. He was nationally and internationally renowned for his pioneering research on sea turtles at Gahirmatha, as well as the rest of the Odisha coast. He received his Ph.D. from Sambalpur University for his outstanding research on olive ridley turtles of Odisha coast. He had contributed a chapter (co-authored with Satish Bhaskar) to the "Biology and Conservation of Sea Turtles" which was published by the Smithsonian Institution Press, Washington DC. He also co-authored the book "Turtle Paradise: Gahirmatha", much of which was based on his PhD and subsequent research. He co-authored several other books and booklets published by the State Wildlife Headquarters, Bhubaneswar from time to time. He was also a member of IUCN/SSC Marine Turtle Specialist Group.

Chandrasekhar and I hail from a region that was previously under the Aul dynasty of undivided Cuttack (now in Kendrapara). His original birthplace was Bari and mine is Aul, and later Chandrasekhar's parents moved to Kantabanji of Bolangir district of Odisha. Coincidentally, Chandrasekhar and I worked on ancient reptilian species at the same place in the Bhitarkanika Sanctuary. Together, we co-authored several publications and wildlife manuals. Since we both shared the same surname, "Kar", at times it was confusing for our colleagues and correspondents. There were times, while publishing articles on crocodiles and sea turtles, that our names were misquoted, with Chandras' name associated with crocodiles and mine with sea turtles.

Chandrasekhar and I also had the opportunity to attend and participate in a number of seminars, workshops, conferences and training programs throughout the country. We used to travel together to participate in conferences and workshops on wildlife, especially for crocodile and sea turtle conservation and research. We both attended the 30th Annual Symposium on Sea Turtle Biology and Conservation in Goa in 2010. Our last visit together was to Jamnagar, Gujarat, to attend the Turtle Action Group (TAG) meeting in January, 2013 organised by our friend Dr. Kartik Shanker. It was quite memorable to have travelled and stayed together, as well as participated in the TAG meeting and field visit.

The untimely death of my best friend Chandrasekhar is a great loss to the Odisha Forest Department as well as a personal loss to me and my family. Whenever he visited my house, it was always a pleasure to extend my hospitality, to provide food and his mandatory cup of tea without which his meal wouldn't be complete.

It is hard to believe that Chandrasekhar is no longer with us. I lost a colleague and my best friend.

REMEMBERING CHANDRA: FIELD DAYS AT GAHIRMATHA

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My reaction on hearing the sad news of the sudden passing of Chandrasekhar Kar, the turtle man of Odisha on April 21, 2014, from a common colleague Lala Ashwini Kumar Singh, was that of disbelief and surprise as I had just met with Chandra (as he was known to all) earlier in February before his retirement from the Odisha Forest Department on the February 28, 2014. All of his friends from Odisha in 1977-78 (when Chandra joined the marine turtle project), including L.A.K. Singh and Sudhakar Kar, got in touch and consoled each other while reminiscing the good and bad times we had experienced in our professional journey in the wildlife conservation world. Lala shared the sequence of events, of how Chandra was moved from Sambalpur to Bhubaneswar in a last effort of revival after a cardiac arrest and how his mortal remains were later taken to the seashore of Puri for last rites. All of us felt it was appropriate that he should rest in peace on the sandy shores of Odisha, where he spent much of his time ensuring the survival of the olive ridley turtles and their habitats.

A week later, on April 28, I met his wife at his residence in Bhubaneswar to share the grief and sorrow of losing someone so dear to us, and I felt his presence while surrounded by all the books, papers and journals that he had so carefully collected during his life. I had no courage or voice to talk with his wife, but the silence conveyed more than what words could have. Chandra was preparing to move out of his official residence after retirement and all his collections were packed neatly in bags and cartons. My next stop in Bhubaneshwar was to meet the Principal Chief Conservator of Forests, Mr. J.D. Sharma, and the Chief Wildlife Warden, Mr. Srivastava, to request them to name the interpretation centres of the Bhitarkanika Wildlife Sanctuary in his memory. After all, this was where Chandra had spent most of his time as a researcher and later as a Research Officer with the Odisha Forest Department. In the following week, I also wrote to the Marine Turtle Specialist Group Chair, Jack Frazier and to Kartik Shanker to write to the Government of Odisha to endorse this request, which they did.

When did I first meet Chandra? Perhaps in late 1977, I am not sure. But my first meeting with him was at the Bhitarkanika Sanctuary in Dangmal. By this time, Sudhakar Kar was based in Dangmal as the saltwater crocodile researcher, and I was a researcher on crocodilians with the Andhra Pradesh Forest Department in Hyderabad. As I was surveying the entire Andhra Pradesh state for crocodilians, I remember Chandra asking if I could also collect information about marine turtles along the Andhra coast. All his correspondence with me since then would mainly be requests for publication or materials related to marine turtles. It all began with my assisting him in obtaining the first set of sea turtle tags through the GOI-UNDP project headed by Dr. H.R. Bustard. Even his last request, when I met him in February 2014, was that I should send him any information that I obtained about Odisha turtles and to inform the Wildlife Institute of India researchers to be in touch with him. I had assured him then that no research or researcher on marine turtles now or in the future could ignore him or his work.

Chandrasekhar was deeply concerned about the drastic developmental changes along the Odisha coast, both onshore and offshore, and their potential impact on marine turtles and their habitats. Often, he would say that, being with the Government, he was not in a position to strongly oppose many of the state decisions, but he had never given any expert opinion officially that would go against the interest of turtles or for that matter any coastal biodiversity. His opinions about Dhamra and Gopalpur Port and the offshore hydrocarbon exploration projects are testimony to his beliefs. He was also keen to be a co-supervisor for any research project being carried out on sea turtles along the Odisha coast; in fact, all the marine turtle projects of the Wildlife Institute of India had him as a co-supervisor and received his support.

Chandrasekhar was one of the twenty officials who participated in a study tour to south Asia and Australia led by the Additional Director General of Wildlife, Government of India, S.C. Sharma and Saroj Kumar Patnaik, then head of the Odisha FD. During the tour, Chandrasekhar was the cynosure of all eyes as he had worked longest on marine turtles and that too at Gahirmatha nesting beach. One of the pioneers of sea turtle research in Australia, Colin Limpus, spent most of his time with Chandra when we were in Queensland and after every detailed discussion, he would ask Chandra his opinion on the subject. We all were envious of him.

Chandra (meaning moon) in his life was really like the moon, the other side of which remained hidden from us. He kept his family life private and did not share his personal problems with anyone. He never took care of his health, travelling endlessly, eating at odd hours, and not following his medical regime. He would also not share with anybody what he was working on. In the initial years of our acquaintance, we would often joke that "Chandra is so secretive that he himself does not know what he is working on". Little did we know then that he had shared all his work with his co-authors for two famous books without any hesitation, even becoming the second author for each one. Many are probably unaware of the harsh conditions under which he carried out his work in the initial years- staying under a tarpaulin sheet with all his belongings in a large wooden box which also served as a bed in the day time. The nearest drinking water was many kilometres away and at times he had to boil water from the nearby ditch, use a cloth to filter and to make it potable. No researcher would have continued to work in such conditions but he did. Indeed, he was a pioneer and will remain one for all those who continue working on sea turtles along the Odisha coast.

In his demise, we have all lost a human being of great humility, the sea turtles of Odisha have lost someone who cared for them deeply, and his family has lost their guardian who so that they could have a better life. For me, Chandra will remain with me whenever and wherever I see a marine turtle.

THE TURTLE MAN OF ODISHA

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In January 1997, the delegates of the Northern Indian Ocean Sea Turtle workshop visited Gahirmatha, hoping to see an olive ridley turtle *arribada* on Nasi Island. I was a fresh recruit as a researcher with the Wildlife Institute of India (WII) and had just begun learning about sea turtles so was very curious to meet the giants of the field of turtle research. That was the first time I met Dr. Chandra Sekhar Kar, and in Gahirmatha where he had started his sea turtle research. I introduced myself to him and he was elated to know that several years after him, another new researcher was going to be studying turtles in Gahirmatha, and coincidently from the same district and college where he had graduated. We even spoke the same Odiya dialect. He then began talking to me about his days in Gahirmatha in 1974-75 and his memories of how difficult it was to walk down from the Chinchiri-Barunei mouth to the the Maipura-Ekakula mouth, a stretch of approximately 35 km backed with Casuarina and mangroves, at times dodging wild boar, feral dogs and negotiating the high tide to cross areas which are inaccessible and inundated.

In later years, I moved to the Rushikulya rookery and met Dr. Kar again during the mass nesting census in March, 1997. We had a long talk about his discovery of Rushikulya with Bivash Pandav, and how the two of them had surveyed the area on a scooter travelling from Bhubaneswar. His memories then went back to his surveys of the Andhra coast with Satish Bhaskar in the early 1980s, including the exciting surveys of Hope Island in Kakinada.

In the years to come, we were in constant touch and I often met him at his office or at field sites. During the satellite telemetry project with WII from 2006 to 2010, he was always supportive as a co-investigator of the project, both in the office and field. I travelled extensively with him along the coast of Odisha and learnt a lot from his research experience with olive ridley turtles.

Dr. Chandra Sekhar Kar was man with a vision for sea turtle research in Odisha. He had several plans, including policy level changes for sea turtle conservation in Odisha, was closely involved in actions by the Coast Guard and Navy in protecting turtles, and promoted offshore patrolling by engaging fisheries department vessels. He envisaged capacity building for young researchers to pursue a career in sea turtle research resulting in several young biologists engaging with the forest department of Odisha and working on different beaches for data collection and management for sea turtle protection.

His sudden demise has created a vacuum in the sea turtle research and conservation movement in Odisha. Dr. Chandra Sekhar Kar, the sea turtle man of Odisha, is no more, but the turtle paradise he worked on will remain forever.

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RESEARCH SUMMARY

PLASTICS, GHOST NETS AND DEBRIS– IMPACTS ON MARINE TURTLES

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Last month researchers reported that between 5 and 13 million tonnes of plastic enter the world's oceans each year (Jambeck *et al*., 2015) and large quantities originate from countries in the Indian Ocean region. It is clear from this study and previous research that plastic pollution has become a ubiquitous problem affecting the world's oceans and coasts. An example of the magnitude of the issue occurred in 2014 when popular media reported that frequent sightings of marine debris floating within the south-eastern Indian Ocean were hindering the search efforts for missing commercial airliner MH370 (Pattiaratchi & Reisser, 2014). Yet, despite the clear potential impact to coastal ecosystems, few data on the scale and magnitude of the problem exist from the Indian Ocean.

The pollution of the ocean is known to affect marine turtles (e.g. Wabnitz & Nichols, 2010), and in 2014 Schuyler and colleagues reported in Conservation Biology that the impact of plastic on marine turtles was increasing (Schuyler *et al*., 2014). Most of their data, however, came from studies in the Pacific and Atlantic Oceans, with numerous knowledge gaps remaining for sea turtles in the Indian Ocean. For example, we don't yet know which turtle species are impacted, and we lack information on high-risk areas where marine plastics abound (Vegter *et al*., 2014). While data from seabird studies and oceanography offer some information, further insight into these gaps are required before we can fully assess the vulnerability of Indian Ocean turtles to plastic pollution.

Examples of marine plastic pollution affecting marine turtles in the Indian Ocean come from the Maldives and the Arafura Sea region of Australia. While documentation and removal of ghost nets has occurred in Australia since the late 1990s, it has only been in recent years that researchers have been able to quantify the risk to marine turtles (Wilcox *et al*., 2013; 2014). Ghost net impacts were first described as an issue for marine turtles in the Maldives in the late 2000s. In 2011, a project began to document the occurrence of ghost nets and entangled turtles, and ultimately used the data to try and mitigate the threat (Stelfox *et al*., 2014). Data collected in both the Maldives and the Arafura Sea region strongly indicate that ghost nets pose a significant risk to marine turtles. Exacerbating the problem, discarded nets often drift to these locations from overseas fisheries, requiring solutions that will take considerable international negotiation across multiple jurisdictions.

The high volume of plastic debris and discarded fishing gear within the Indian Ocean is almost certain to pose an ongoing risk to marine turtles. Only time will tell whether species or population scale impacts may occur. There is certainly scope for increased monitoring and research focus to improve our knowledge and quantify the 2014 baselines. In terms of management, improved mitigation of plastic pollution will require a reduction of plastic inputs into coastal and marine systems. At the very least, this will require targeted efforts towards changing the behavior of people, reforming policy and boosting infrastructure to process waste. Marine turtles are often used as flagship species for environmental change, and marine turtle-based tourism could be a key component of future strategies to minimize the vulnerability of marine turtles to plastic pollution.

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INDIAN OCEAN AND SOUTHEAST ASIA REGIONAL MEETING AT INTERNATIONAL SEA TURTLE SYMPOSIUM, 19TH APRIL 2015, DALAMAN, MUGLA, TURKEY

LALITH EKANAYAKE

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The Indian Ocean and Southeast Asia Regional Meeting will be held on 19th April 2015 8.30am-11.30 am, prior to the International Sea Turtle Symposium presentations commencing on the 20th April. This informal regional meeting provides an opportunity for people from each major stakeholder group to meet and discuss important issues such as nesting beach management, by-catch, migration, and social, economic and cultural aspects of marine turtle management and conservation that is specific to the Indian Ocean and Southeast Asian region.

You are invited to attend and share your ideas and storied with other participants so as to make this meeting a useful and informative event. Please email Lalith Ekanayake (lalitheml@yahoo.com; Subject: Indian Ocean and Southeast Asia Regional Meeting -2015) by 5th April, 2015 if you are planning to attend this meeting, and if you would like to deliver a 3-5 minute presentation of what is happening or of interest in your region.

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Unpublished/Undated references: In press, Forthcoming, In review, etc.

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