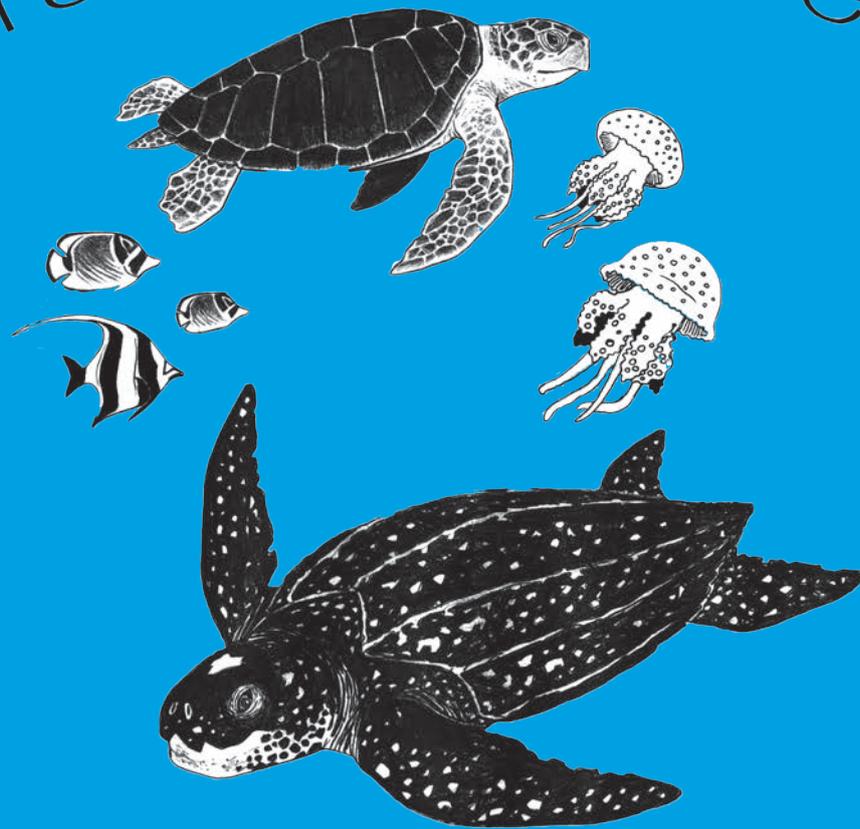


Tracking Turtles



Since 2008

Project Report

Promoting conservation of sea turtles in India at a national scale through a network of partners and index sites.

Submitted to the US Fish and Wildlife Service under the Marine Turtle Conservation Act Fund
2015-2016

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1.

Executive Summary

The Indian coastline has significant nesting and feeding grounds for four species of marine turtles, namely leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*) turtles. The most remarkable among these are the mass nesting beaches of olive ridley turtles in Odisha, feeding and nesting grounds for green and hawksbill turtles in the Andaman and Nicobar Islands and the Lakshadweep islands, and the nesting population of leatherback turtles in Little Andaman Island and the Nicobar Islands. These sites are of high importance in terms of conservation. Even though all four species are listed under Schedule I of the Indian Wild Life (Protection) Act, 1972, their populations in the Indian waters are under threat due to indiscriminate coastal development and incidental catch in fisheries.

Sea turtles play an important role as flagship species for diverse habitats such as coral reef ecosystems, sea grass meadows, open seas and sandy beaches. The threats that sea turtle populations face are representative of threats that impact other marine and coastal flora and fauna. In the Indian subcontinent, coastal and ocean resources play an important role in the economy of fishing and other coastal communities. Sea turtles have also been part of legend and culture in this region for more than a thousand years. They move freely across socio-political boundaries, and many factors need to come together for effective conservation.

For this reason, monitoring and outreach projects were started at key sites in India. This project was started in 2008 and has since been involved in uniting organisations and individuals that work along the Indian coast on marine turtle ecology and conservation. In 2008, a consortium of NGOs (Non-Governmental Organisations) called Turtle Action Group (TAG) was formed to work towards sea turtle conservation and coastal ecosystem protection in India.

From 2008 to 2015, the project's activities have been supported through grants from the Marine Turtle Conservation Act Fund of the US Fish & Wildlife Service (USFWS). For 2008-2009, the project funds were administered, and project activities executed through Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangalore, India. Since 2009, project funds have been administered by Madras Crocodile Bank

Trust (MCBT), Chennai, in partnership with Dakshin Foundation, Bangalore which is jointly responsible for the execution of project activities and formulation of action plans for the project.

2008 – 2009: Formation of a national level network: The first grant of \$5000 helped facilitate the formation of a network of committed groups and organisations from across the country's coastline and in the initiation of activities that were undertaken by the network.

2009 – 2010: Expansion of the network and its scope: The second grant of \$30,500 provided support to expand membership of the network to include local, community based organisations and strengthen the activities and broaden the scope of TAG.

2010 – 2011: Building and strengthening the network for conservation of marine turtles of India: The third grant of \$ 39,000 supported the initiation of new activities, and expansion of existing programmes, ensuring inclusion of all community-based groups from around the country working on sea turtle conservation.

2011 – 2012: Strengthening ongoing conservation activities on marine turtles of India: The grant of \$45,000 provided support to strengthen and expand existing activities of the network, execute various capacity building workshops, and to disburse small grants.

2012 – 2013: Monitoring and conservation of sea turtles in India: The grant amount awarded for this year was \$55,000. Similar to previous years, this grant was utilised to strengthen and expand the activities of the network, to disburse small grants, to conduct workshops for capacity building and to produce outreach material. Additional emphasis was laid on monitoring key index sites for sea turtles on the Indian coast.

2013 – 2014: Monitoring and conservation of sea turtles in India through a network of partners and index sites: The grant amount awarded for this year was \$45,000. This year's grant was used to monitor and promote conservation of sea turtles, specifically at the index sites for olive ridley turtles in Odisha and leatherback turtles in the Andaman Islands. Also, as in the previous years, it was used to conduct workshops, disburse small grants and produce outreach material.

2014 – 2015: Conservation of sea turtles in India through a collaborative network: The grant award of \$52,500 was utilised to sustain and augment the activities and reach of the sea turtle conservation network. Certain new projects were undertaken, as elaborated in the appendices. The annual workshop, small grants program and publications were also continued.

2015-2016: Promoting conservation of sea turtles in India at a national scale through a network of partners and index sites: This year's grant of \$52,500 was utilised to continue sea turtle monitoring at Odisha and the Andaman Islands, and to initiate monitoring in

the Lakshadweep islands. It also contributed to the organisation of capacity building workshops, disbursement of small grants, and generation of outreach material.

The primary aim of the project is to provide a common platform for sharing information and experience amongst various groups and individuals working on sea turtles in India. It has strived to strengthen community based NGOs from various coastal states by providing small grants, training and technical assistance. The project seeks effective engagement of network members with other stakeholder groups, research institutions and government agencies in order to better execute conservation action. The fund is being used for website (www.seaturtlesofindia.org) maintenance and to develop an online data repository, which is under progress. A portion of the fund is utilised for the publication of outreach and educational material, and partial support towards the production of the **Indian Ocean Turtle Newsletter**.

Turtle Action Group is a well-established network of over 25 organisations from across the country. The network has established a set of goals and action plans to address sea turtle conservation effectively through cooperative and collaborative efforts. Research and monitoring capacities of the member organisations in collecting uniform and reliable data are being developed through monitoring protocols and training programmes. This will lead to standardisation of data collected during the nesting season at key sites along the Indian coast. The current project seeks to continue to support and coordinate sea turtle conservation activities along the Indian coast, and to undertake collaborative actions that can lead to better coastal and marine conservation.

This report provides details of project objectives, and activities carried out during the current funding cycle, which include sea turtle monitoring programmes at index sites in India, functioning of the network and its member organisations, and the outcomes and outputs from the project. It also lists recommendations and future plans to further effective conservation of sea turtles in India.

2.

Project Objectives

Goal:

To strengthen and sustain collective and collaborative sea turtle conservation through the monitoring of key sites and a network of partners in the Indian sub-continent.

The project objectives for 2015-16 were:

1. To continue and strengthen the long-term monitoring programme of olive ridley turtles in Odisha, olive ridley and leatherback turtles in the Andaman and Nicobar Islands and increase participation of local groups in these efforts.
2. To continue monitoring the status of marine turtles at key sites along the Indian mainland and islands with the involvement of network partners, through the promotion and use of standardised data collection and monitoring techniques.
3. To enable the collation and analysis of data collected across sites to inform studies on population trends and impacts of climate change.
4. To develop and maintain an online portal for the upload and synthesis of relevant data contributed by member organisations.
5. To develop appropriately designed educational and outreach material that can broaden the reach of the network to specific target groups including other stakeholder groups, educational institutions, governmental departments and the general public.
6. To conduct training programmes for capacity building in order to enable individual member organisations of TAG to become financially and programmatically independent.
7. To encourage and support independent, location specific conservation activities of member organisations through the provision of small grants.

3.

Project Activities and Outcomes

To achieve the objectives, the following activities were carried out:

1. Monitoring the status of marine turtles at key sites along the Indian mainland coast and islands

A. Monitoring olive ridleys in Rushikulya rookery, Odisha

Odisha, with a 480 km long sandy coastline, is a suitable nesting habitat for olive ridley turtles (*Lepidochelys olivacea*). Over the past decade, activities such as mechanised fishing have resulted in large scale turtle mortality of turtles in offshore waters. Other factors that possibly affect their populations are rise in sea level, climate change and development activities, both onshore and offshore. It is imperative to protect their breeding habitat and to monitor populations in order to understand their biology and behaviour with respect to climate change. This knowledge will be instrumental overcoming these threats.

With funding from Marine Conservation Society, U.K., a long term monitoring programme was initiated by Indian Institute of Science and Madras Crocodile Bank Trust at Rushikulya rookery, a major olive ridley mass nesting site in the world. The project is coordinated by the Indian Institute of Science, Dakshin Foundation and the Odisha Forest Department and funded by the USFWS Marine Turtle Conservation Act grant. For the past eight years, the project has worked in collaboration with the local Forest Department staff and NGOs involved in marine turtle conservation. As part of capacity building, the forest department staff, NGO employees, local and other researchers are trained in conducting a census of nesting populations during 'arribadas', shore line monitoring techniques, hatchery management, offshore turtle monitoring and other activities related to sea turtle monitoring.

The primary aim of the project is to study the impact of climate change on the Indian Ocean olive ridley nesting populations. With the help of data loggers, variables such as air, sand and nest temperature are recorded to determine change in temperature and its relationship with hatchling sex ratios. A sample set of nests is relocated to a hatchery from the natural nesting beach to understand hatching success. These nests are collected over a period of 3 months. Along with onshore monitoring, offshore surveys are conducted to monitor the abundance and distribution of mating turtles in offshore waters.

Since 2008, the population is being estimated using a strip transects method during mass nesting. The nesting turtles are also checked for tags. The results show that the number of nesting females has increased over the years at Rushikulya. In February 2014, fewer turtles nested during the mass nesting event than in previous years, while there was a large arribada in March 2015. Despite significant offshore congregations, mass nesting did not occur at Rushikulya in 2016, but such fluctuations are not unusual. A detailed report on this can be found in Appendix I (a).

In response to the training under this project, the Forest Department is actively involved in monitoring and protecting both offshore and onshore turtle habitats. Working with local NGOs, they help in spreading marine turtle conservation awareness through education programmes. A sea turtle interpretation centre has been set up and small events such as beach cleaning with participation from local communities have been undertaken. There has been considerable increase in local awareness and interest generated by working in collaboration with the government and local NGOs.

B. Monitoring leatherback turtles in the Andaman & Nicobar Islands

A long term leatherback turtle monitoring project was started in the Andaman and Nicobar Islands by Indian Institute of Science (IISc), Dakshin Foundation, Andaman and Nicobar Environment Team (ANET), and the Madras Crocodile Bank Trust (MCBT). Since 2008, leatherback turtles (*Dermochelys coriacea*) have been monitored on West Bay and South Bay beaches of Little Andaman Island. Alongside collecting long term data on leatherback populations, the project aims to develop a conservation network in the region with a long-term education and outreach programme for local communities on the islands. Not much is known about the status of leatherback populations in the Indian sub-continent except for studies by ANET, IISc and Dakshin Foundation on Great Nicobar Island and Little Andaman Island. In light of the decline of the Pacific Ocean leatherback population, it is important to monitor Indian Ocean populations and threats to them.

The programme involves monitoring of nests, threats and tagging of leatherback turtles. In 2010, with support from the Indian Space Research Organisation (ISRO) and the Space Technology Cell of IISc, Bangalore, a satellite telemetry study was initiated at Little Andaman Island. A total of 10 turtles have been tagged with PTTs (Platform Transmitter Terminals) between 2010 and 2014 (tracks can be viewed at www.seaturtle.org).

A detailed report is provided in Appendix I (b).

A survey was carried out on the Nicobar group of islands to understand the post-tsunami recovery of the previously known nesting beaches, identify new nesting beaches and current nesting intensities on these beaches. A staff training workshop was conducted at Great Nicobar Island, focussing on hatchery management, monitoring and data collection protocols. Details are reported in Appendix I (c).

Along with the monitoring programme, various education and outreach activities were conducted for the island communities, such as screening of documentaries and distribution of posters. In 2015, three schools in Kolkata were involved in a photo exhibition and interaction for students as well as the general public. Details can be found in Appendix I (d).

C. Assessing the potential of ecotourism as an alternative livelihood for local communities in Rushikulya, Odisha

Following on the 2014 review of sea turtle-based ecotourism models in India, a prospecting study was conducted at Rushikulya to explore the scope for providing alternative livelihoods to local communities while promoting olive ridley conservation. The details are elucidated in Appendix I (e).

2. Monitoring and conservation of green turtles at Lakshadweep islands

A study on the foraging ecology of green sea turtles (*Chelonia mydas*) was initiated at Lakshadweep. The recent surge in green turtle populations at Lakshadweep, coupled with a change in seagrass composition and subsequent changes in fish communities makes it imperative to understand the diet of the green sea turtle in order to design management strategies. More information is available in Appendix I (f).

3. Website and online data repository

The website, www.seaturtlesofindia.org, is a platform for information on the biology and conservation of sea turtles and their habitats in Indian sub-continent. Numerous community based groups, local, national and international conservation organisations (NGOs), academic institutions and government departments have contributed to studies and surveys over the last two and half decades. The website hosts this information and makes it possible for students, researchers and others to get easy access to material. This site also includes a repository of papers, reports, notes, historical records and other grey literature. The bibliography section currently includes over 700 references, with PDFs for a large number of publications, many of which are not available anywhere else.

The website also carries content dedicated to the Turtle Action Group (www.seaturtle-sofindia.org/tag). Information on the networks' activities, workshop reports, member organisations and their detailed profiles is currently made available here.

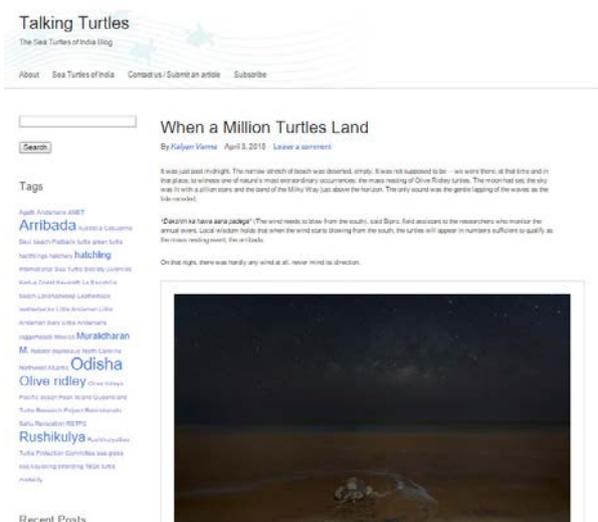
The blog 'Talking Turtles' was started in 2012 to host posts by people working on marine turtles. It features pieces by scientists, journalists, activists, students and enthusiasts. From first encounters with turtles to unusual observations to expert insights, the blog welcomes stories about marine turtles in the Indian Ocean.

TAG-ABLE, an online repository for data collected on sea turtles in India was launched as a prototype in November, 2011 during 4th Annual TAG workshop. However, there have been many changes and modifications to make it user-friendly and accessible to others. The objectives of the database are to create online repositories on turtle nesting patterns, hatcheries, mortality, habitat health and threats to sea turtles. A user-friendly analysis tool enables the members to carry out simple analysis of their data, create charts and graphs that they can effectively use in their reports and outputs. The data portal is currently in the final stages of revision.

Sea turtles of India Website



Talking Turtles blog



TAG-ABLE



4. TAG - the sea turtle conservation and monitoring network

The Turtle Action Group

The Turtle Action Group (TAG) is a network of non-governmental organisations from around India, working towards sea turtle conservation and coastal protection. These groups initially came together in January 2009 at a workshop held in Chennai, where the need for a national level network to enable various groups to work together and collaborate towards more effective sea turtle conservation was acknowledged. There is worldwide consensus that effective sea turtle conservation requires collaboration between agencies and various stakeholders to ensure long term survival of the species and sustainable use of the resources of the habitats they occupy.

Such a collaborative effort at the national level was lacking and TAG was formed to fulfil this need. TAG seeks to benefit from the pooling of resources and knowledge and to bridge the gap between conservation measures that are effective at local, state and national levels.

Functioning of TAG

Executing organisation

The network's fund is channelled through the executing organisation, the Madras Crocodile Bank Trust. Under the programme, a policy team oversees the network's activities and utilisation of funds, and guides the disbursement of funds to member organisations to carry out specific activities. The administrative staff at MCBT carries out specific administrative tasks which include coordinating training programmes, disbursing small grants, administering the work of network members, as and when required, and handling the financial aspects of the MTCA project till the end of the project term.

Members of TAG

The TAG network comprises a core group of community based and local NGOs from across the country. Currently, its membership includes 21 organisations from the mainland and one each from the Andaman and Nicobar and Lakshadweep Islands. Appendix III (a) lists the member organisations.

Seven large organisations, including national level NGOs and research institutions, are part of the network, and do not receive funding support for their activities from TAG. Since 2010, TAG has been providing small grants to a few member groups after evaluating their proposals. Institutional representatives from MCBT and Dakshin Foundation contribute by way of resource personnel and providing inputs at annual workshops, and are represented on the advisory board of TAG.

The network also liaises with state level government organisations, primarily forest departments of coastal states within whose jurisdiction the protection of sea turtles and their nesting habitats falls. TAG also seeks regular inputs from other stakeholder groups and organisations working with fishing communities and coastal development to better inform conservation interventions that the network adopts.

Core Committee

The Core Committee constitutes elected representatives from amongst member groups of TAG. The main responsibilities of the Core Committee are to coordinate the activities of the network that are determined at annual workshops, over the course of the following year through sustained communication with all members of the network. The Core Committee reports to the team at the executing organisation regarding the progress of activities that the network has set out, and identifies areas where a particular group, or the network as a whole, requires support in terms of inputs, resource material, or funds. Individual members of the network approach the core committee with suggestions or queries. The Core Committee is mandated to make decisions based on a consultative process and approaches the project team at the executing agency when required. The present constitution of the Core Committee ensures representation across the geographical scope of the network and its members belong to each coastal state and both the island groups. Appendix III (b) enumerates the members of the Core Committee.

Advisory Board

The network seeks inputs on its activities and agenda from an Advisory Board that includes various individuals from diverse backgrounds and fields of expertise, affiliated with research organisations such as the Wildlife Institute of India, Dehradun and the Madras Crocodile Bank Trust amongst others.

Network Volunteers

At each annual workshop, specific tasks are assigned to volunteers from within the network to take on the responsibility of coordination and ensuring completion. These volunteers communicate with and seek inputs from the Core Committee.

The member organisations are trained to follow standardised monitoring and data collection techniques, in order to study climate change and its consequences for important variables, such as egg and hatchling mortality and sex ratio. These would lead to more precise data collection and enable monitoring changes on a larger spatio-temporal scale and help predict population trends. TAG members are given financial support to help them in data collection, monitoring and conservation activities. Every year, small grants are disbursed for supporting their ongoing work during the turtle nesting season. These primarily include hatchery construction and maintenance during the season, egg relocation, and hatchling release. TAG members are also encouraged to develop their own proposals to support their ongoing projects. Appendix III (c) contains an overview of the profiles of TAG member organisations.

5. Small grants disbursed to TAG members

Grants were given out to members of TAG to support their data collection, monitoring and conservation activities. The amounts disbursed are provided in the table below.

Name of the organisation*	Grant amount (INR)**
Green Life Rural Association	35000
Manthini Ujwala Welfare Society	20000
Visakha Society for Protection and Care of Animals	31800
Student's Sea Turtle Conservation Network	35000

* Appendix IV contains details of the projects

** 1 USD ~ 66 INR

6. Outreach and education material

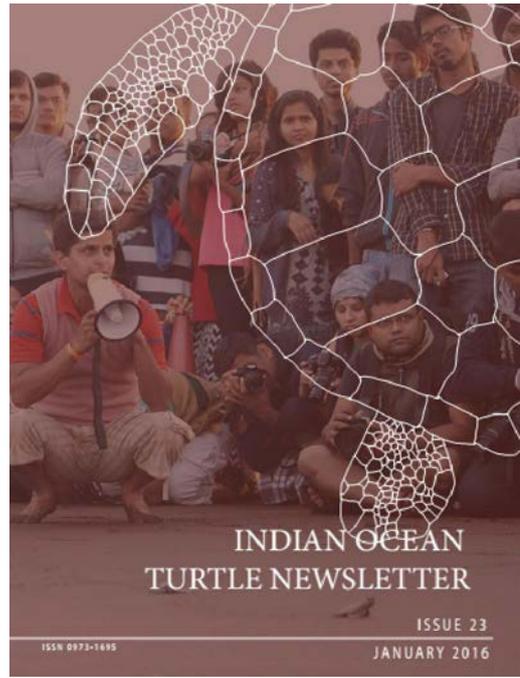
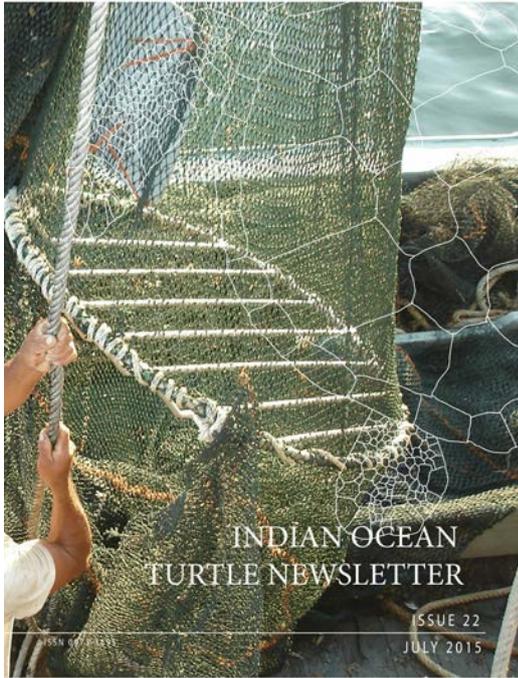
Indian Ocean Turtle Newsletter

The 22nd and 23rd issues of the Indian Ocean Turtle Newsletter were published in July 2015 and January 2016 respectively, with partial funding support from the MTCA.

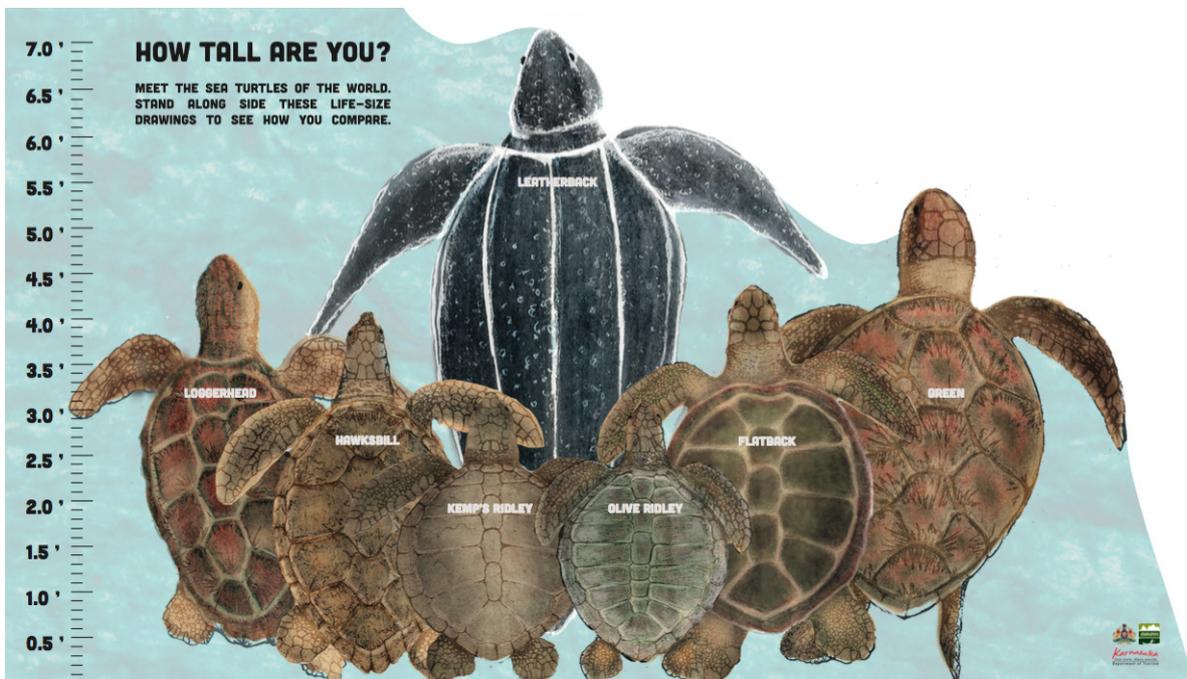
The IOTN was initiated to provide a forum for exchange of information on sea turtle biology and conservation, management and education and awareness activities in the Indian subcontinent, Indian Ocean region, and South/Southeast Asia. The newsletter also covers related aspects such as coastal zone management, fisheries and marine biology. There are nearly 1000 e-copy and 1400 hard-copy subscribers for this biannual newsletter from different parts of the world. The website <http://www.iotn.org/> has an archive section with all issues to date.

The newsletter aims to reach and serve:

- Central government agencies (Ministry of Wildlife, Fisheries and Environment)
- Coastal government agencies (local Forest Departments, Fisheries Departments)
- Coastal enforcement agencies (Navy, Coast Guard)
- Non-government organisations involved in environment and conservation
- Non-government organisations involved in social work in coastal areas
- Academic institutions
- Conservation organisations
- Community-based conservation organisations
- Individual researchers, field biologists and ecologists



As part of the outreach and education initiative, an interactive life-size poster of the sea turtles of India was created. This poster was installed at the Sharavathi Learning Centre at Honnavar in Uttara Kannada district of Karnataka, which hosts solitary nesting sites for sea turtles.



A Marathi version of the poster and pamphlet on best practices in hatcheries was produced in collaboration with the Maharashtra Forest Department and the TAG partner Sahyadri Nisarga Mitra.

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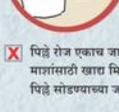
❌ लागोपाठ दोन वर्षे संगोपन केंद्र एकाच जागी उभारू नका. म्हणजे बुरगी, जीवाणु यांचा प्रादुर्भाव होणार नाही.



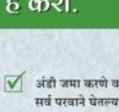
❌ घट्टे पुन्हा वसवतांना अंघी कोरट्या वाळूच्या संपर्कात येऊ देऊ नका.



❌ संगोपन केंद्र वरच्या बाजूने बंदिस्त किंवा झाडांच्या सावलीत असू नये. आवश्यकता वाटल्यास मासेमारीच्या जाळ्याचा वापर करावा म्हणजे तापमानात फरक पडणार नाही.



❌ अंघी उचवण्याच्या सुरुवातीच्या काळात ती झाकू नयेत किंवा जास्त उोल येऊ देऊ नये. त्यामुळे गर-घाटी प्रमाणात धरक होऊ शकतो. तापमान फार जास्त असेल तर पिळे बाहेर पायच्या येऊला ओलावा वाहवायला हरकत नाही. म्हणजे पिळे जाग्याचे प्रमाण वाढेल.



❌ पिळे अंघ्यातून बाहेर आल्यावर पायच्या वादलीत किंवा वाळूच्या टयात ठेवू नये कारण त्यांना जन्मतः पोहू लागण्याची कृती असते.



❌ पिळे रोज एकाच जागी सोदू नयेत, नाहीतर मोठ्या मार्गांसाठी खाल मिळण्याचे एकच ठिकाण होईल. पिळे सोडण्याच्या जाग्यांमध्ये शेकडो मीटर अंतर असावे.



वनविभाग,
महाराष्ट्र शासन

सह्याद्री निसर्ग मित्र

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

सह्याद्री निसर्ग मित्र

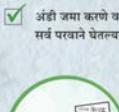
सह्याद्री निसर्ग मित्र

योग्य पद्धती

समुद्री कासवांचा पाळणाघर (संगोपन केंद्र)

समुद्री कासवांच्या संगोपन, संशोधन आणि संवर्धनाचा एक भाग म्हणून त्यांची घरटी संगोपन केंद्राजवळ पुनःस्थापित करता येतील. मात्र केवळ त्यांच्या अस्तित्वाचा धोका असेल अशा परिस्थितीतच (जसे मानवी हस्तक्षेप, भरती किंवा इतर प्राण्यांकडून) ती मूळ जागेपासून हलवितात.

हे करा.



✅ अंघी जमा करणे व घरटी वसवणे यासाठी लागणारे सर्व परवाने घेतल्याची खातर जमा करा.



✅ संगोपन केंद्राची जागा मूळ घट्ट्याच्या जवळ आणि मोठ्या भरती येथेपासून २०/३० मीटरवर असावी म्हणजे ते वाहून जाण्याचा धोका राहणार नाही.



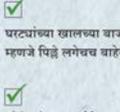
✅ संगोपन केंद्र अंघी घातलेल्या किनाऱ्याच्या जवळपास असावे म्हणजे ती मोठा केल्यापासून कमीत कमी वेळात केंद्रात सुरक्षितपणे आणली जातील.



✅ घट्ट्यांचा आकार मूळ घट्ट्यासारखाच म्हणजे तळागी परसट आणि नोंडाकडे अर्कट असा असावा. अंघी उोलसर वाळूचा १ शर देऊन झाकावीत. मग शर कोरट्या वाळूचा शर घावा.



✅ घट्ट्यांभोवती प्लॅस्टिकची किंवा धातूची जाळी वसवावी. ती ३ फूट वाळूत रोवलेली आणि वर ६/७ फूट उंचीची असावी म्हणजे कुडी, कोळे अशा प्राण्यांपासून धोका राहणार नाही.



✅ घट्ट्यांच्या खालच्या बाजूने छोटी जाळी असावी म्हणजे पिळे लगेचच बाहेर पडू शकणार नाहीत.



✅ अंघी घांगल्या तऱ्हेने उचवली जावीत याद्वारे दोन घट्ट्यांमध्ये १ ते २ मीटर अंतर सोडावे.



✅ पिळे बाहेर आल्यावर रकम तितक्या लवकर बाहेर सोडावीत, पण शक्यतो ती वेळ सूर्यादयापूर्वी किंवा सूर्यास्तानंतर असावी.



✅ अंघी केंद्रात आणताना त्यांना कमीत कमी धड्या लागेल अशा प्रकारे हाताळली जावीत.



✅ पिळे बाहेर पायच्या सुमारस प्रत्येक घरटें टोपलीने किंवा प्लॅस्टिक जाळीने झाकावे म्हणजे पिळे खाडी जाण्याचा धोका राहणार नाही.



✅ संगोपन केंद्राजवळ झाड किंवा त्यांची मूळ आलेली असू नयेत. वाळूचा प्रकारही शक्यतोच मूळ अधिवासाप्रमाणे असावा. केंद्रभोवती भिंत उभारण्यासंबंधी दिलेल्या सूचना पाळाव्यात.



✅ घट्ट्याजवळ एका फलकावर अंघ्यासंबंधीची प्राथमिक माहिती लिहिलेली असावी. तसेच एक रकम नोंदवारी ठेवून त्यात सविस्तर माहिती लिहून ठेवावी म्हणजे पुढील संशोधनासाठी ती उपयोग्य ठेईल.

7. Project Personnel

The long term nature of this project has provided an opportunity for several young individuals an opportunity to engage with marine systems and ecology over the years. This includes several members of local communities as well as graduate students and interns who have continued to work in different spheres of marine ecological research and conservation. In its sixth year, the project pays a tribute to all the personnel associated with it. Appendix II presents a detailed account.

4.

Future Plans for TAG (2015-16)

Members of TAG are committed to sustaining interactions through annual meetings and workshops, in addition to individually carrying out activities towards meeting the larger objectives laid out by TAG. The specific plans for the year 2016 – 2017 are:

a. To collectively address issues of common concern

A variety of threats and issues on the coastline form the basis of conservation action undertaken by different groups. TAG has identified these specific issues that the network can examine and address. These include:

i. Standardisation of data collection and monitoring techniques: In order to collate data and information collected individually by member organisations, TAG will develop standardised procedures for data collection and monitoring to enable this information to be shared. This would also allow for site-specific data to feed into distribution and abundance assessments at larger geographical scales. The collated data will be available on the seaturtlesofindia.org website which will also be used as a portal to upload/download data and will generate maps of distribution and temperature related data.

ii. Coastal development: Unplanned and unsustainable coastal development along the country's coastline has threatened sea turtle nesting habitats. Although the impacts of such developmental activities (such as construction of sea walls, urbanisation, development of ports, etc.) vary from one location to the next, all members of TAG are individually contesting decisions made at the local scale. Common themes of the development agenda across sites and states have to be brought to the notice of higher authorities, including the central government. Demands can be made for more transparent decision making procedures, greater participation of local communities and stakeholders, and the development of sustainable and responsible coastal zone management plans.

b. Capacity building and initiation of new community-based enterprises

A primary focus area of the network is capacity building for local forest department officials and interested local enthusiasts. By imparting knowledge on proper monitoring techniques and hatchery management, local communities can effectively work towards conservation. The potential of ecotourism as a means of generating revenue and opportunities for conservation has also been explored. Collaboration between the local government and NGOs will motivate local groups to start their own projects and pave the way for such community-based conservation.

5.

Recommendations

After careful assessment of the outcomes of the network and expectations of member organisations, the following recommendations were made to strengthen TAG and enable effective conservation efforts:

1. Increasing interactions of TAG members with other similar regional and global organisations and networks to improve communication, and to help in addressing conservation issues faced in other parts of the world.
2. Collation of information on marine turtle status, biology, habitat and conservation techniques. By encouraging discussion, the member organisations can come up with effective solutions to frequently faced problems.
3. Communication with the central government through the Ministry of Environment and Forests regarding national issues to help the government in effective policy making that could serve as a solution to local conservation problems.
4. Joint awareness programmes with other TAG members, especially within the state by sharing resources, ideas and staff.
5. Advertising network activities through media campaigns to attract other similar organisations and to highlight individual organisations' efforts to give them recognition.
6. Collaboration with local stakeholders including non-members of TAG, individuals working on sea turtles and their conservation and related groups to develop holistic approaches to species-specific conservation.

6. Acknowledgements

We are grateful to the US Fish & Wildlife Service for providing funding support under the Marine Turtle Conservation Act Fund.

We are also thankful to the staff at Dakshin Foundation and Madras Crocodile Bank Trust for carrying out the administrative tasks under the project and lending their constant support as and when required.

We are also thankful to the Ministry of Environment and Forests for endorsing the network. We are hopeful that representatives of the Ministry and coastal state government agencies will be actively involved in network activities in the future.

Finally, we would like to thank all our member organisations, whose enthusiasm in sustaining the network and dedication towards sea turtle conservation has validated our efforts in initiating and facilitating the Turtle Action Group.

7.

Appendices

APPENDIX I (a) Monitoring olive ridley turtles in Odisha

Odisha has a 480 km long coastline lined with sandy beaches suitable for olive ridley turtle (*Lepidochelys olivacea*) nesting. This population is an evolutionary source for other populations across the world. This population is facing large-scale mortality due to natural and anthropogenic causes such as predation, mechanised fishing and other related development activities. Extreme changes in the nesting beach topography due to erosion have also affected nesting within the area. In order to assess the population trends of this species in response to threats and climate change, it is important to understand their biology and behaviour. This is essential to set and achieve conservation goals.

The Madras Crocodile Bank Trust (MCBT) initiated a long term monitoring project with funding from Marine Conservation Society, U.K. and USFWS Marine Turtle Conservation Act grant to study the population trends of these turtles in 2007. Rushikulya rookery, one of the major mass nesting sites in the world, was chosen as the study site. In 2008, long term monitoring began in collaboration with the local Forest Department and NGOs involved in sea turtle conservation. The forest department staff, NGO employees, enthusiastic locals and researchers have been trained in activities such as hatchery maintenance, beach monitoring, nesting population census and other monitoring methods through capacity building workshops. To understand the effect of climate change on the olive ridley population, air, incubation and sand temperatures are recorded by placing data loggers in a room, relocated nests and sand respectively. A hatchery is maintained close to the natural nesting site, for relocated nests. Hatchlings succumbing to natural mortality are collected and sexed using histological techniques to study the effect of climate change on the sex ratios.

Arribada monitoring

Mass nesting events at the Rushikulya rookery were not monitored using standardised methodology before 2007. Since 2008, Indian Institute of Science and Dakshin Foundation have been monitoring the Rushikulya beach, recording both solitary and mass

nesting data, using a scientifically robust method known as a strip transect. During each *arribada*, a 20 m strip transect method is used to count the nesting females. Table 1 provides estimates of mass nesting from 2008 to 2016.

Table 1: Arribada estimates from Rushikulya, 2008-2016

Year	Day	Mean	LCL	UCL	SE
2008	1	53138.0	41372.0	64904.1	5883.0
	2	17847.9	14509.7	21186.1	1669.1
2009	1	30828.2	25017.8	36638.5	2905.2
	2	31031.0	25767.2	36294.8	2631.9
	3	9785.9	7514.5	12057.3	1135.7
2010	1	11171.8	9177.1	13166.5	997.3
	2	46732.4	40925.0	52539.8	2903.7
	3	29983.1	26315.3	33650.9	1833.9
	4	1453.5	983.7	1923.4	234.9
	5	7149.3	5974.8	8323.8	587.2
	6	2416.9	1834.5	2999.4	291.2
	7	980.3	585.5	1375.1	197.4
2011	1	28123.0	23215.9	33030.1	2453.5
	2	35501.6	31297.9	39705.4	2101.9
	3	33818.8	30718.7	36918.9	1550.0
	4	24368.9	22356.4	26381.4	1006.3
	5	9530.7	7703.5	11358.0	913.6
	6	12928.8	11161.8	14695.8	883.5
	7	2313.9	1915.3	2712.6	199.3
	8	4530.7	3723.7	5337.8	403.5
2012	1	31634.99	28955.5	34314.47	1339.74
	2	9588.865	8633.87	10543.86	477.5
	3	1707.245	1348.3	2066.19	179.47
2013	1	16347	14487.72	18206.63	929.73
	2	19781	18251.48	21310.95	764.87
	3	59290	55462.47	63116.83	1913.59
	4	30458	27025.33	33890.6	1716.32
	5	7702	5717.7	9685.93	992.06
	6	8972	7869.29	10074.31	551.26
2014	1	6211	5107.04	7314.76	551.93
	2	8638	6394.03	10881.9	1121.97
2015	1	33177	28725.90	37628.90	2225.76
	2	44703	40316.80	49088.88	2193.02
	3	49234	45235.74	53232.15	1999.1
	4	25043	21696.49	28388.94	1673.11
	5	12666	9107.68	16223.92	1779.06
	6	6116	4879.86	7351.42	617.89
2016	0	0	0	0	0

Monitoring offshore congregations of olive ridleys on the Odisha coast

The team from Indian Institute of Science and Dakshin Foundation started offshore monitoring at Rushikulya in 2010. A line transect approach is used to measure the changing offshore abundances of turtles during the breeding season (Figure 1). Initially done only in Rushikulya, this was extended to cover the entire coastline of Odisha in January 2014. The other places included in the survey are Bahudha, Chilika, South Devi (Puri-Konark), Devi, Hukitola and Jatadhar. Due to logistic constraints and lack of permits, Gahirmatha Marine sanctuary and Chandipur could not be covered. The result of the number of turtles encountered in all the sampled locations is shown in Figure 3. The 480 km coastline of Odisha was divided into transect blocks of 40 sq. kms every 48 km. All transects except Rushikulya are 2 km wide and 4 km long. In order to get a finer resolution of estimates, the transect effort in Rushikulya was intensified by surveying 1 km wide and 3 km long transects (Figure 2) The primary design of these transects will be within the confines of stratified random sampling within each sampling block. Along with observations of turtle number, abiotic factors (surface salinity and depth) were also sampled to get a better ecological perspective of these congregations. Location data was collected using a handheld GPS. The purpose of collecting abiotic variables is to create a profile of these and overlay them with the aggregation sites (Figure 6).

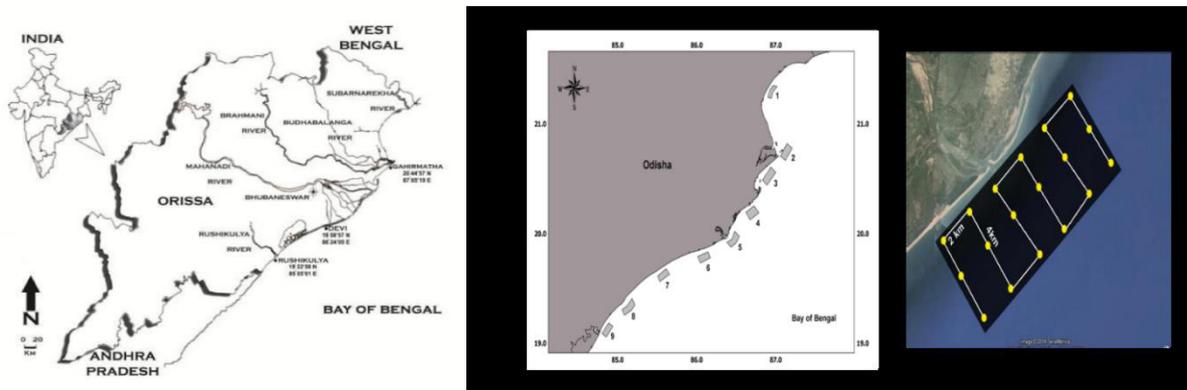


Figure 1. Map of Odisha (left) and map showing transect type carried out at Chilika and Bahuda



Figure 2. Offshore transect in Rushikulya - 1 km wide and 3 km in length.

Due to logistical difficulties only three sites could be surveyed for offshore monitoring, viz., Chilika, Rushikulya and Bahuda. For Rushikulya, offshore surveys were carried out once every month. The average number of turtles sighted has been listed in Figures 3 and 4. The density data were analysed using Distance Software version 6.2.

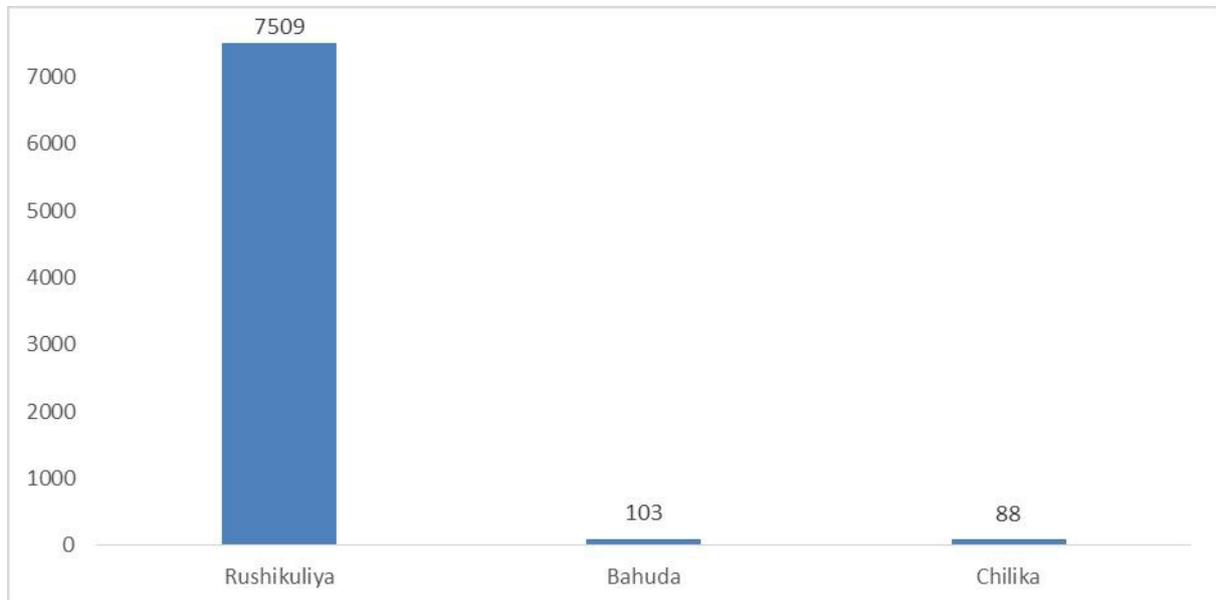


Figure 3. Surfacing turtles observed at different locations in 2016

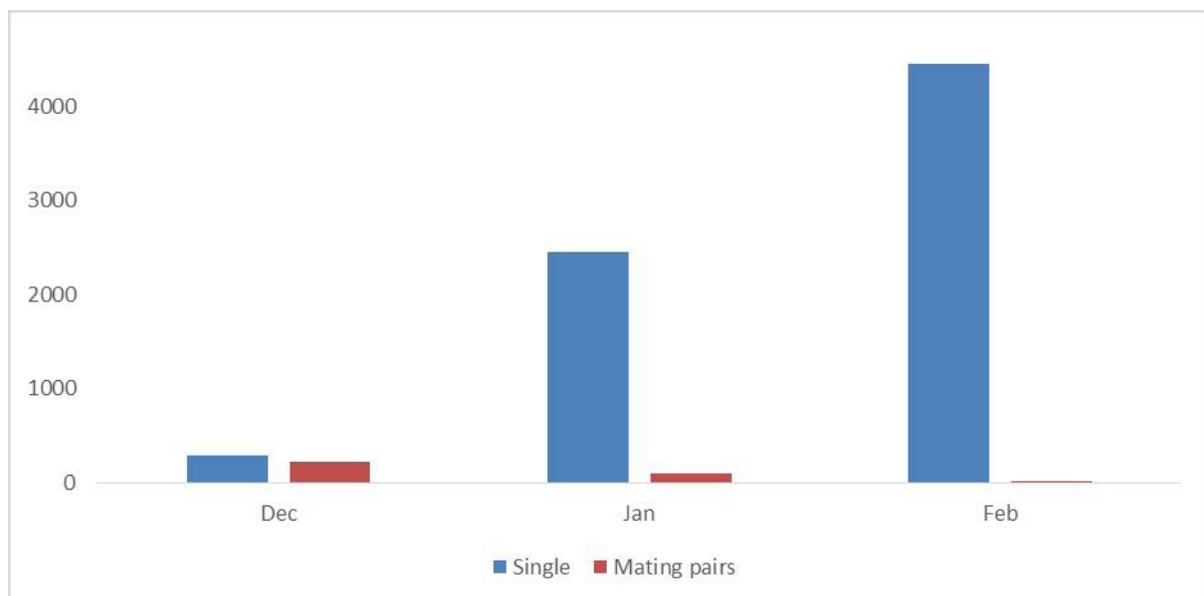


Figure 4. Number of surfacing single and mating pair turtles encountered per month in Rushikulya in 2015 – 2016

A total of 7700 turtles were encountered during surveys over the course of the field season, and these were classified based on whether they were found mating or single (Figure 4). As previously observed, Rushikulya had the highest contribution (n= 7509), while turtle sightings in other locations were relatively low (Figure 3). The summary of the density analysis is given in Table 2.

Table 2: Turtle sighting and density estimation

Parameter	Point Estimate	Standard Error	Percent Coef. Of Variation	95% Percent Confidence Interval	
Density	1.0030	0.0006	0.06	1.0018	1.0041

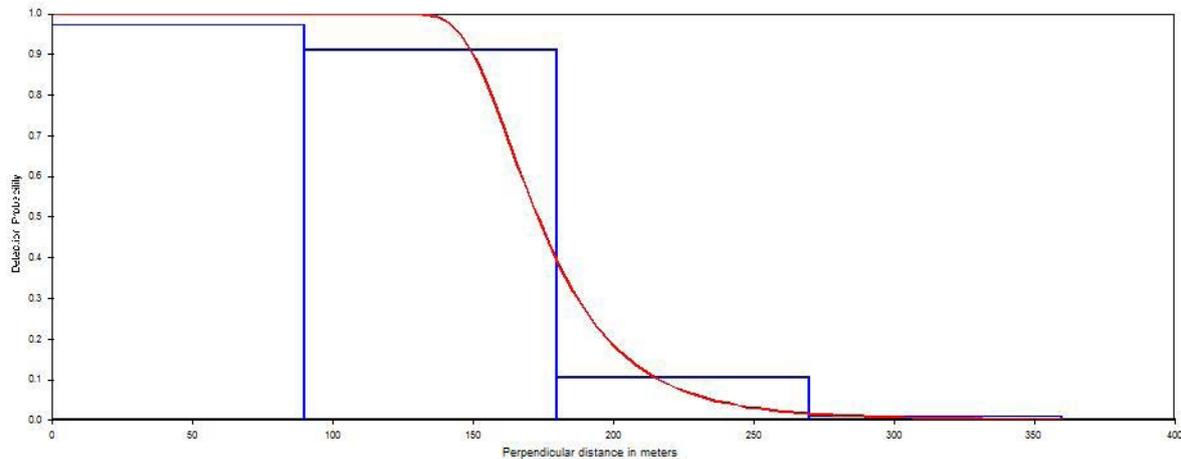


Figure 5.The detection function of turtle sighting vs distance (n=7571). On the Y axis is detection probability and on the X axis is the perpendicular distance in meters.

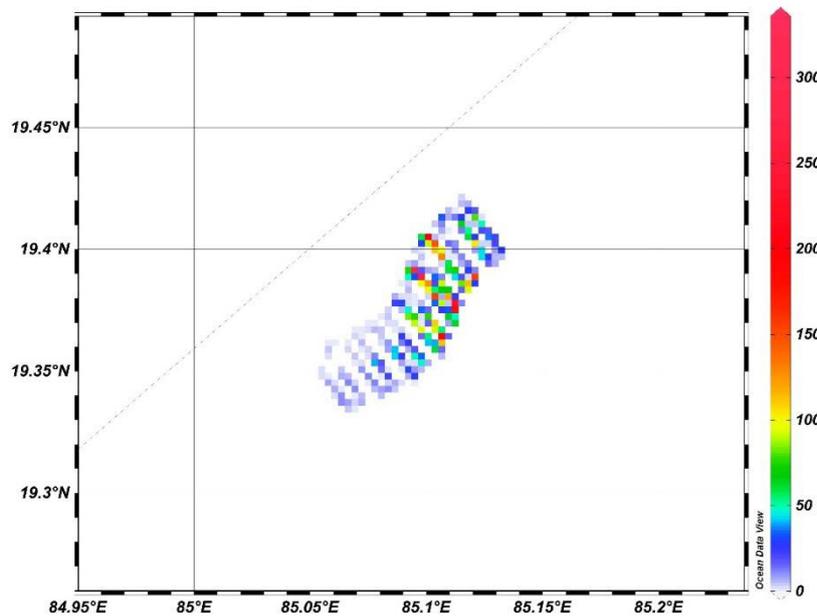


Figure 6. Spatial distribution of turtle congregations in Rushikulya in 2016.

Air and sand temperatures; hatchling sex ratios

In 2015, the lowest sand temperature was observed was ~21°C and the highest was ~32°C. The sand and air temperature recorded at Rushikulya from 2010-2016 is depicted in Figure 7. Hatchlings which were found dead in the hatchery due to natural causes were

collected and sexed using histological procedures since they cannot be distinguished based on morphological characteristics. It was observed that most hatchlings sexed in 2011 were females, whereas 2014 shows more males. In 2016, not a single male hatchling was recorded, in correlation to the temperatures recorded, which exceeded the pivotal temperature of 29°C (Figure 7).

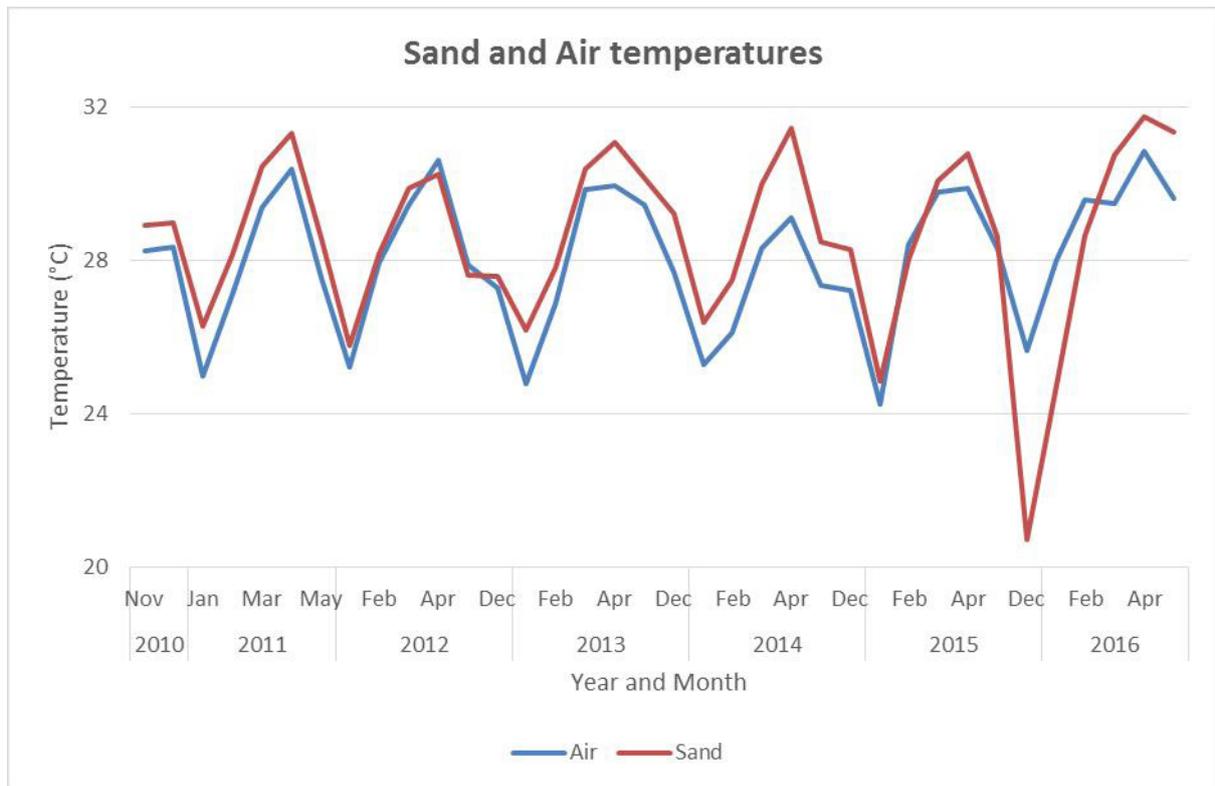


Figure 7. Air and Sand temperatures recorded at Rushikulya from 2010 – 2016 (Dec-May)

Local involvement:

A majority of the NGOs working along the Odisha coast are community based and employ local youth in carrying out their activities. They are trained in the latest *arribada* population census techniques. However, despite their interest and enthusiasm, many individuals from local NGOs are also forced to seek alternate options to secure a steady income (particularly during the non-nesting season). Therefore, projects are being initiated like coastal monitoring and beach profile data collection which would keep them involved all through the year. By developing skills in sea turtle monitoring, individuals from local community based NGOs have managed to find employment in sea turtle research and monitoring programmes carried out by academic research institutions and by the forest department. This has helped create synergy not just between NGOs and academic organisations, but between NGOs and the forest department as well. As a result of this sustained partnership over the past 5 years, it has been possible to involve a considerable number of field staff from the local communities and organisations in the

arribada census and in collecting scientific data on sea turtle mortality and nest temperatures. A further step would be to initiate community based eco-tourism for income generation for these groups.

The local NGOs involved are: Orissa Marine Resources Conservation Consortium (OMRCC), Rushikulya Sea Turtle Protection Committee (RSTPC), Sea Turtle Action Program (STAP), Green Life Rural Association (GLRA), Action for Protection of Wild Animals (APOWA), Podampetta Ecotourism and Olive Ridley Protection Club (PEORPC) and Alacrity.

APPENDIX I (b)

Monitoring leatherback turtles in the Andaman & Nicobar Islands

Introduction

The leatherback turtle (*Dermochelys coriacea*) is the only extant species of the family Dermochelyidae. Leatherback turtles are the largest of living sea turtles, growing up to 2 metres and weighing as much as 900 kg. It is also the only sea turtle that lacks a bony shell. The adult leatherback is also the widest-ranging reptile migrating longer distances than all other sea turtles. It is found in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. The leatherback, previously listed as Critically Endangered, is now listed as Vulnerable by the IUCN and under Schedule I of the Indian Wildlife Protection Act (1972). There is great concern over the declines in nesting populations of this species throughout the world, especially in the Pacific. The Malaysian rookeries have undergone a well-documented decline from approximately 5000 nests per year in the 1960s down to less than 10 nests per year in the 2000s. Based on the lessons learned from the population declines in the Pacific and Southeast Asia, it is imperative to understand the nesting trends of leatherback turtles in the Andaman and Nicobar Islands and where these turtles migrate and the threats they face throughout their range.

Information on leatherback populations from India is still very patchy. Though there are earlier records of sporadic leatherback nesting from the Indian mainland, current nesting populations are entirely restricted to the Andaman and Nicobar Islands. The first confirmation of leatherback nesting in the region came from Satish Bhaskar at Jahaji beach, Rutland. Currently, very little is known about the status of leatherback populations from Indian waters, barring the work by the Andaman and Nicobar Environment Team (ANET) on Great Nicobar Island, and the collaborative efforts of the Forest Department, Centre for Ecological Sciences (CES), Indian Institute of Science, Bangalore, Dakshin Foundation and ANET on Little Andaman Island.

Many prime nesting sites for leatherback turtles in the Andaman and Nicobar Islands were severely affected by the December 2004 earthquake and the subsequent tsunami. Not much was known about the impacts of this calamity on the populations of leatherbacks here. Further, there was no information on the turtles once they left the coast of Andaman and Nicobar Islands, especially on their migratory patterns, feeding and foraging behaviour, breeding/mating aggregations and many other parts of their life cycle. Recently, new approaches using satellite telemetry and molecular genetics have been used to gain insights into some aspects of the leatherback's life cycle.

In December 2007, a rapid survey of the South Bay and West Bay beaches was carried out. It was found that some parts of the beach had recovered considerably and leatherback tracks and nests were observed. Subsequently, a project was initiated to monitor leatherback turtle nesting at South Bay in January 2008.

Objectives and Methods

Every year, a camp has been established on the South Bay beach and monitoring of leatherback nesting has been carried out roughly between the months of January and March. Since 2010, a camp has been established on the West Bay beach for monitoring. Monitoring efforts have concentrated on West Bay ever since.

The objective of the surveys was to continue the long-term monitoring of leatherback nesting in South and West Bay, Little Andaman Island through a capture-recapture programme. Given the lack of knowledge of these populations, long-term spatio-temporal monitoring of leatherbacks using conventional tagging, satellite telemetry and genetic analysis was imperative. Therefore, the project was initiated in 2008 with the objective of monitoring the post-tsunami leatherback nesting recovery.

Over the years, the objectives have evolved to continue the long-term monitoring of leatherback nesting in South and West Bay, Little Andaman Island. Intensive surveys have been carried out to monitor tag recaptures of leatherback turtles from previous seasons. In addition, we intend to continue the satellite telemetry studies by tagging more leatherback turtles as well as the habitat monitoring component by collecting data on the profiles of the nesting beaches in South and West Bay to understand the effect of physical changes to the nesting beaches on leatherback nesting.

The surveys were carried out in collaboration with the Forest Department, Andaman and Nicobar Islands and in coordination with ongoing research activities in the region.

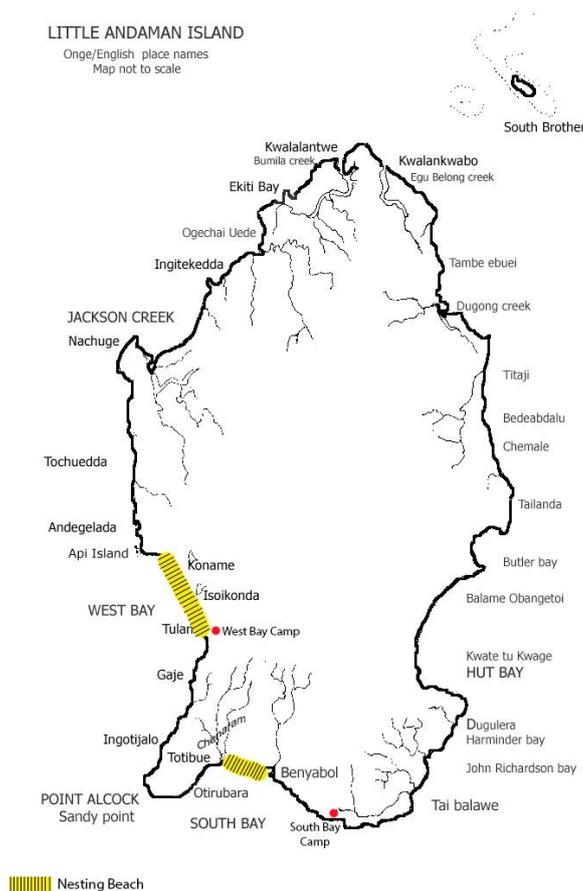


Figure 1. Map of Little Andaman Island

Results

The South Bay nesting beach was monitored through night surveys from 2008-2010. However, surveys had to be restricted to daylight hours since 2010 as night surveys of the nesting beach were logistically daunting due to the presence of large river openings (Benyabol & Tothibue) and the presence of saltwater crocodiles in them. Since 2010, monitoring efforts have concentrated on West Bay and have been primarily through night surveys. The monitoring indicates that leatherback nesting on beaches of Little Andaman Island has recovered substantially after the 2004 tsunami and seems stable with some fluctuations (Table A).

Within season recaptures indicate a minimum-nesting interval of 8 days, and across-season recaptures indicate a remigration interval of 3 years (Table B). The turtles recaptured during the 2013-2014 nesting season were initially tagged during the 2010-2011 nesting season and the turtle recaptured during the 2014-2015 nesting season was initially tagged during the 2011-2012 nesting season. During the 2015-2016 nesting season, two turtles were recaptured, which were tagged during the 2010-2011 and 2011-2012 nesting seasons respectively.

All the turtles were recaptured on the same nesting beach that they were initially tagged on. No turtles were tagged with external or PIT tags since 2014 due to lack of permits.

Table A. Leatherback Nests and Predation Patterns

Year	Total Number of Nests		Percentage of Nests Predated	
2007-2008	25*		32*	
2008-2009	39*		20*	
2009-2010	7*		28*	
2010-2011	South Bay	West Bay	South Bay	West Bay
	58	91	24	58
2011-2012	South Bay	West Bay	South Bay	West Bay
	36	148	50	30
2012-2013	South Bay	West Bay	South Bay	West Bay
	45	77	40	20
2013-2014	South Bay	West Bay	South Bay	West Bay
	64	153	54	33
2014-2015	South Bay	West Bay	South Bay	West Bay
	42	50	42	52
2015-2016	South Bay	West Bay	South Bay	West Bay
	29	85	58	36

* Only South Bay was monitored during 2007 to 2010.

Table B. Leatherback tag and recaptures

Year	Leatherback Turtles Tagged and Recaptured	
2007-2008	6 (3)	
2008-2009	7 (4)	
2009-2010	2 (1)	
2010-2011	South Bay	West Bay
	6 (2)	23 (20)
2011-2012	South Bay	West Bay
	0	20 (16)
2012-2013	South Bay	West Bay
	0	12 (13) [1]
2013-2014	South Bay	West Bay
	2 [1]	19 (24) [2]
2014-2015	South Bay	West Bay
	0	0 [1]
2015-2016	South Bay	West Bay
	0	0 [2]

() Represents the number of tagged turtles recaptured within the season and not the number of individuals recaptured (certain individuals were recaptured multiple times within a season)

[] Represents recaptured turtles tagged during the previous nesting seasons.

APPENDIX I (c)

Current status and distribution of threatened leatherback turtles and their nesting beaches in the Nicobar group of Islands

Between 2nd March 2016 and 18th April 2016, a team of three surveyed the entire Nicobar group of islands to understand the recovery of the previously known nesting beaches, identify new nesting beaches and current nesting intensities on these beaches. Out of the 21 islands in the Nicobar group, three islands (Pigeon Island, Kabra Island and Isle of Man) did not have any sandy beaches and three islands (Trak Island, Meroe Island and Batti Malv Island) were not accessible due to unfavorable sea conditions.

Local fishing boats were used to access islands and when a sandy beach was encountered, the team carried out surveys by foot during the day. No night patrols were carried out in any islands.

All nests were examined for signs of predation based on tracks and signs. No nests were excavated to quantify the extent of predation. Wherever possible, the identity of the predator was established.

In collaboration with the Andaman and Nicobar Forest Department, a training workshop was conducted for the staff at Campbell Bay, Great Nicobar Island. The workshop was attended by frontline staff (daily labourers, permanent labourers, forest guards and rangers) of the Great Nicobar division. They were trained on hatchery management protocols, in situ and ex situ conservation practices, biometric data collection and general monitoring protocols.

The workshop was well received particularly by the field staff managing the three hatcheries in this region and the Divisional Forest Officer (DFO), Nicobar Division, requested for a similar workshop to be conducted before the start of the 2016-2017 nesting season.

Results

Fifteen out of the twenty-one islands of the Nicobar group were surveyed for sea turtle nests. A total of 2140 nests were recorded in 12 islands (Table 1). The highest number of nests recorded for all the four species were on the Great Nicobar Island followed by the Little Nicobar Island.

Several beaches of Great Nicobar and Little Nicobar Islands have been reported as important nesting sites for leatherback turtles. The important nesting sites include Galathea, Alexandria and Dagmar Bay on the Great Nicobar Island and Pulo Kiyang and Bahua. The latest surveys reveal that most of the beaches have formed again in these regions and leatherbacks continue to nest in high numbers.



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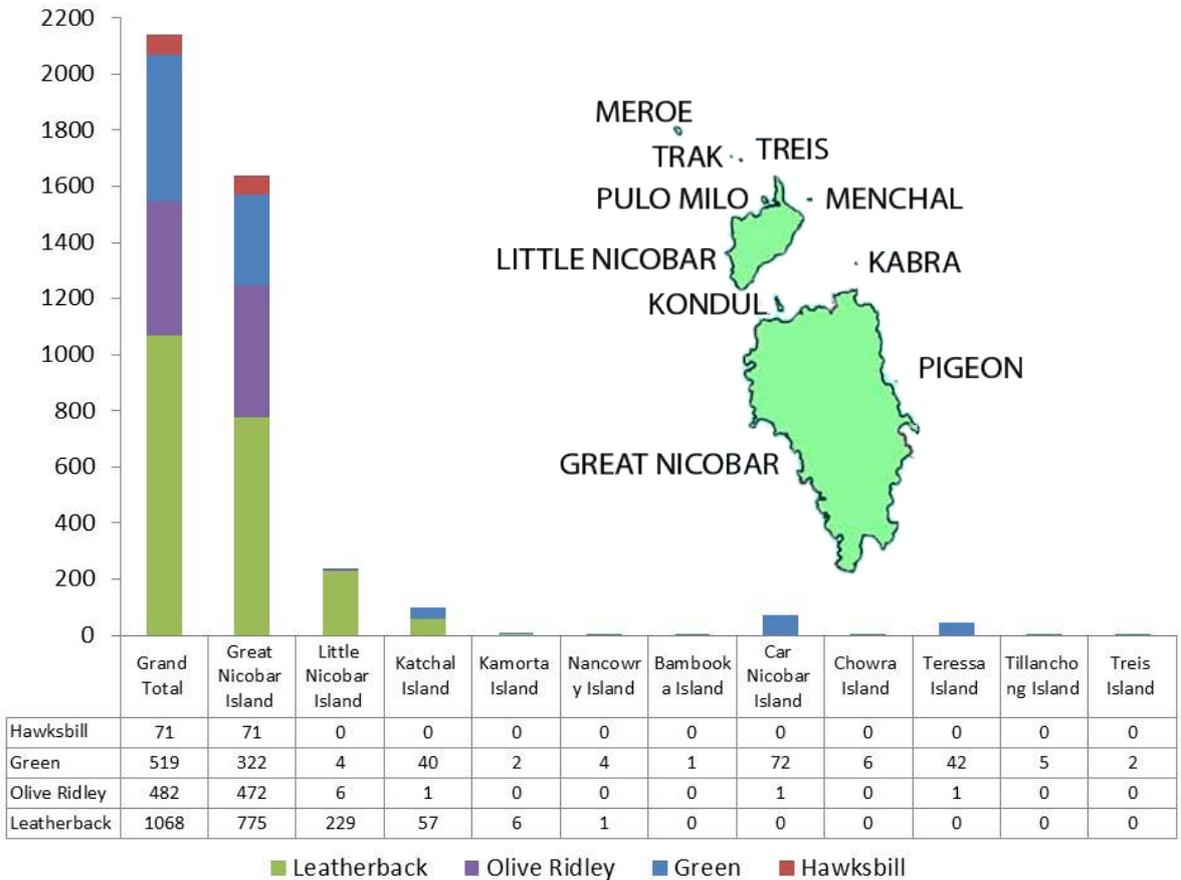


Figure 1. Sea turtle nesting data and distribution for the Nicobar Islands

APPENDIX I (d) Island Life

As part of the education and outreach component of the leatherback project, three schools were chosen for a photo exhibition and interaction titled 'Island Life' in Calcutta, New Town School, Frank Anthony Public School and Mahadevi Birla World Academy.

Each school had a photo exhibition followed by an interaction with the students. All the students from each school had the opportunity to visit the photo exhibition and a select few had the opportunity to attend the talk/interaction which took place at the end of the day. The one-hour interaction consisted of a PowerPoint presentation with questions and answers at the end. The programme was also conducted for the general public, wherein 25 people attended the talk and 100 people visited the photo exhibition. In total, about 200 people attended the interaction and around 1500 people visited the photo exhibition.

This was treated as a pilot programme and we are looking to replicate the same for other cities and schools in the future. In addition, we propose to carry out extensive education and outreach programs for local communities, the SCUBA diving community and conduct capacity building workshops for the Forest Department staff in North & Middle Andaman and the Great Nicobar Island.



Figure 1: Schoolchildren taking in the exhibits

APPENDIX I (e)

Assessing the potential of ecotourism as an alternative livelihood for local communities in Rushikulya, Odisha

Introduction

Rushikulya is one of the few sites in the world that hosts an *arribada* and a significant population in its coastal communities, most of whom are dependent on fishing for their livelihood. The no-fishing zones imposed during *arribadas* as well as the frequent damage caused to fishing nets by turtles pose a conflict to the fishers interests, making it necessary to provide them with alternative livelihoods. This way, communities can be equipped with skills which ensure long term returns rather than short-lived compensatory measures.

Sea turtles are charismatic creatures which are considered especially attractive for ecotourism (Campbell & Christy, 2006). Tourists flocking to Rushikulya to witness the *arribada* in large numbers could have serious impacts on turtles and the community if unmanaged. A haphazard form of tourism has been present in Rushikulya for many years. Harnessed the right way, it could potentially be a lucrative supplementary livelihood option for the local communities while managing tourism to reduce impacts on turtles. The type and scale of tourism should keep in mind the sensitive nature of the ecosystem and lack of exposure of the coastal communities. This site requires a more responsible form of tourism than conventional tourism and the exact form of it should be agreed upon by the various stakeholders.

There have been attempts in the past to harvest benefits out of tourism by different agencies including the forest department, the Integrated Coastal Zone Management (ICZM) and some opportunistic ones by the community itself. None however have had a lasting impact. One of the major reasons for failure of these top-down initiatives is the lack of understanding of how the community works and their relationship with the turtles. This understanding can only be born out of dialogue and engaging with the community. It is imperative to understand the dynamics between the different stakeholders if they are to work together. The opinions and perspectives of those involved should be understood to gain a better understanding to make such a programme work.

Objectives and methods

This study aimed to determine the different stakeholders in this landscape, their roles, and the extent of their involvement. It sought to understand the governance and power dynamics in these communities, and their relationships with sea turtles. Finally, it aimed to identify their needs, and their perceptions of ecotourism as an alternative livelihood.

Data collection was carried out using qualitative methods such as semi-structured interviews, field notes, questionnaires, informal discussions, and passive observation of meetings in the community and between stakeholders. Data was coded and analysed in Microsoft Excel, using an inductive approach resulting in broad, exploratory themes. Descriptive statistics were also employed.

Results and discussion

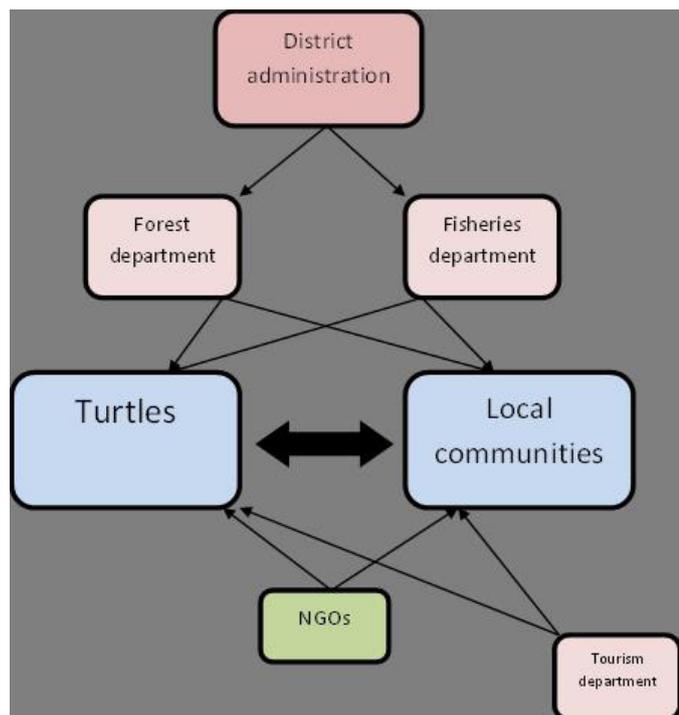
A total of 142 semi-structured interviews were conducted in a field season of about 5 months (December 1st 2015 to April 23rd 2016). Interview respondents included community members (103), government officials (18), researchers (9), NGO representatives (8), tourists (13), and other relevant actors (4).

Interviews with local community members revolved around their perspectives on village governance, village problems, turtle conservation and its effect on the community, beliefs and values associated with turtles, alternative livelihoods and in particular turtle centred tourism and its management. Such interviews were undertaken in 5 villages.

Government officials interviewed included members of the forest department (6), district administration (4), tourism department and fisheries department (3 each). Other key informants included a policy consultant, a tour operator of a popular tourism agency in Odisha and 2 journalists.

Players involved and their roles

Figure 1: The size of the boxes reflects the magnitude of power and involvement of the stakeholder. The distance, as depicted by the arrows represents closeness of relationship and extent of influence. Longer the arrow, lesser influence of one on the other



Understanding the community

A range of problems were brought up by the community members in the interviews. These were grouped into four categories:

- Development related problems – This includes complaints about water, electricity, medical facilities, lack of roads, etc. These were reported by the highest number of respondents
- Fishing related – this includes complaints about catch reduction, having to sleep hungry because of unavailability of fish, fishing related mortality, etc.
- Government aid related – complaints about unfairness in distribution of items given for compensation, no response to complaints, etc.
- Turtle related – Inconvenience caused due to turtle presence. This includes net damage, fishing restrictions, destruction of fish left to dry on the beach, being harassed on account of turtles by officials, etc.

Of these 4 categories of problems, turtle related grievances were least mentioned.

Turtles in Rushikulya

A majority (89%) of the respondents felt that the turtle population at Rushikulya has increased. A large number (36%) of respondents attributed this trend to the sea turtle conservation efforts ongoing at the site. A significant proportion (28%) said they didn't know why, while 23% believed it was due to a high rate of reproduction.

Fishing-related mortality was the most cited threat to sea turtles at Rushikulya (39%), but about 18% respondents believed sea turtles at Rushikulya were not threatened at all. Predators were perceived as the second largest threat (16%).

Current conservation activities

Patrolling of the nesting beach happens every night by village members hired by the forest department, World Wildlife Fund (WWF) and field researchers working with Indian Institute of Science and Dakshin Foundation. This patrolling is to fend off nest predators and possible poachers and to monitor the turtle numbers. The entire mass nesting area is fenced off to further discourage predators. Off-shore patrolling is carried out by the Forest Department, which currently maintains 2 speed boats and 2 trawlers on hire.

The other major step in protecting the turtles off shore is the fishing ban that is active from November 1st to May 31st. Officials of the forest department and fisheries department unanimously feel that the ban has been effective in protecting turtles. The Divisional Forest Officer (DFO) of the Behrampur division, Ganjam district, the district

Rushikulya is a part of, believes there has been decrease in mortality because of better implementation during mating of the olive ridley in the last few months of 2016.

Tourism as an alternative livelihood

The fisheries department delved into the rationale behind the need for an alternative livelihood. They were of the opinion that there is a need for an alternative livelihood not necessarily because of conflict with turtles, but due to reduction in catch brought in by the fishers, which has also been a cause for the migration of several fishers to other states in search of income.

The forest department and tourism department feel the short duration and seasonal nature of the *arribada* is the primary reason why it cannot be an alternative livelihood source for the locals. The overall sentiment was that ecotourism was a means to provide better access to tourists to enable them to experience this natural phenomenon and not necessarily to provide an alternative livelihood to local communities.

“The problem is most of these nature enclaves are in the control of forest dept and that needs to change. If you want to conserve nature you have to create a whole army of nature lovers who will protect it”.

- *Director, Tourism Department of Odisha*

Mainstreaming tourism will mean involving more stakeholders and creating better linkages between them. At present, the fisheries department has the least engagement with the turtle-related tourism, with the forest department having the largest stake.

Recommendations

This draft demonstrates the kind of results such a study can elicit. On completion of analysis, a suitable set of recommendations will be outlined which will include contributions from all major stakeholders in Rushikulya. This kind of understanding is essential in designing effective policies. The final report will offer a deeper understanding of the cultural, economic, political, and social framework of the community which is essential for the success of such a venture (Senko et al., 2011).

References

Campbell, L.M. & Christy, S. (2006) What Makes Them Pay ? Values of Volunteer Tourists Working for Sea Turtle Conservation, *Environmental Management*, 38(1), 84–98.

Senko, J. et al. (2011) People helping turtles, turtles helping people: Understanding resident attitudes towards sea turtle conservation and opportunities for enhanced community participation in Bahia Magdalena, Mexico, *Ocean and Coastal Management*, 54(2), 148–157.

APPENDIX I (f)

Foraging ecology of green turtles in the Lakshadweep islands

The islands in the Lakshadweep archipelago have shallow lagoons with suitable conditions for seagrass species. The densities and species diversity of the seagrass vary across these atoll lagoons and are typically dominated by *Thalassia hemprichii* and *Cymodocea rotundata*. The green sea turtle (*Chelonia mydas*) is a mega-herbivore which mainly feeds in seagrass meadows in shallow waters of tropical and sub-tropical oceans around the world. Green turtles consume large quantities of seagrass, as plant material is a poor source of nutrition, and they require high densities of seagrass shoots to sustain themselves. Grazing by green turtles changes the over-ground biomass of seagrasses, increasing growth rates of seagrass shoots. These changes have a cascading effect on several juvenile and adult herbivorous fish species which use seagrass meadows.

Recent years have seen an increase in the green turtle population in the Lakshadweep islands. Green turtles share lagoon space with several fish species inhabiting seagrass beds. This has resulted in two types of conflict with local fishermen. First, there is direct conflict as green turtles damage fishing nets. Second, there is indirect conflict due to the belief that increasing number of green turtles has reduced fish catch over the years. There is some proof that sustained herbivory by green turtles has led to a loss in structure and productivity of seagrasses, negatively affecting fish communities. This situation has led to challenges for green turtle conservation in the Lakshadweep islands, via conflict with fisher folk through direct and indirect mechanisms.

An understanding of green turtle feeding ecology is integral to their conservation and management, and thus, a thorough understanding of their diet should be an important component of any recovery effort. Recognizing differences in diet between populations



Figure 1: Green turtle

in different feeding areas permits appropriate management at each seagrass site. Seagrass features such as shoot density, species diversity, species abundance, patch size, canopy height and grazing levels were compared with green turtle abundance across island lagoons.

In addition, green turtle diet composition was explored using microhistological analysis of their faecal matter. The frequency of occurrence of species-specific leaf tissue in green turtle faecal samples was found to be concordant with the relative seagrass density for each island. Questions related to the shifts in green turtle diet selection are currently being addressed. The disappearance of seagrass meadows in the Lakshadweep islands might have an effect on green turtle diet preferences. As a result of high green turtle grazing pressure, areas which were once vast seagrass beds are now covered with profuse algal growth in the islands surveyed. The survey includes mapping the seagrass distribution across the island lagoons, and investigating the diet selection in green turtles by microhistological analysis of green turtle faecal matter.

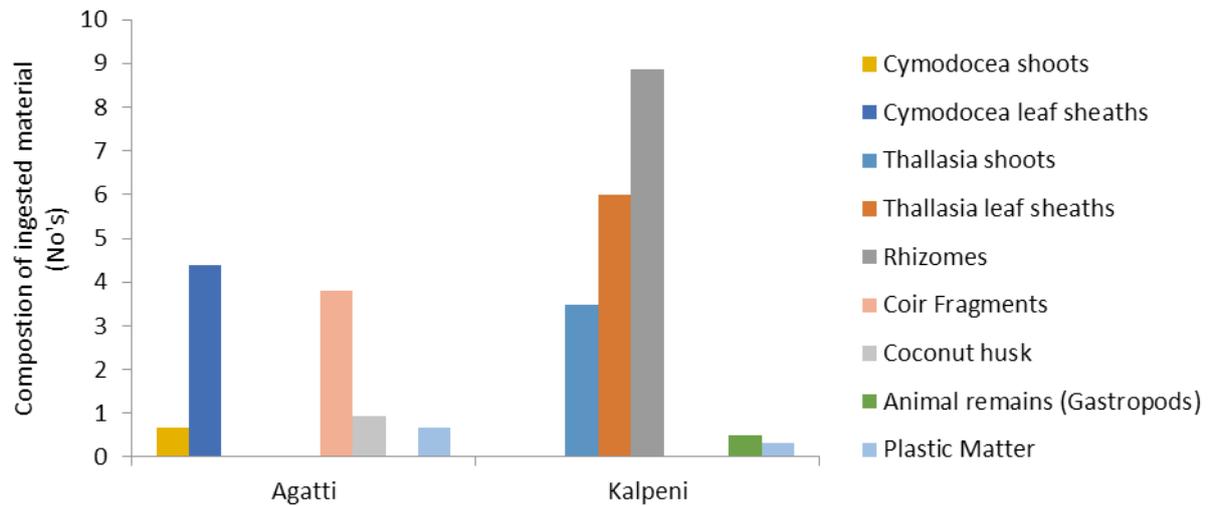
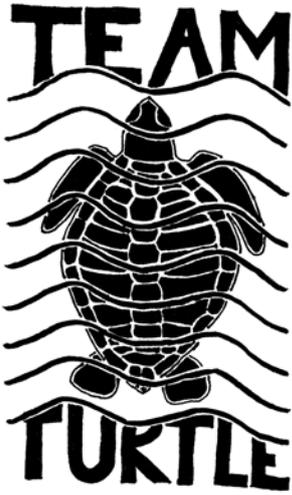


Figure 2: Green turtle diet composition

APPENDIX II



A t-shirt was made to celebrate 8 years of tracking sea turtles along the Indian coast. The t-shirt is available for sale to non-project persons, and proceeds will go to sea turtle monitoring.



Field staff and project personnel

Sea turtle monitoring



Alissa Barnes



Ridhi Chandarana



Ema Fatima



Sajan John



Nupur Kale



Divya Karnad



Mugdha Kulkarni



Amrit Kumar Mishra



Meenakshi Poti



Chetan Rao



Sadhwi Sindura



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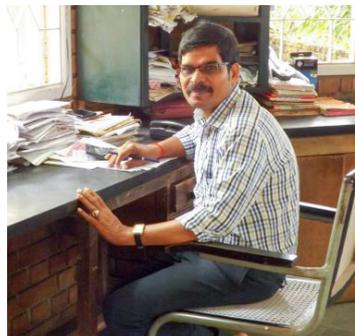


Amrita Tripathy

Madras Crocodile Bank Trust



Zahida Whitaker



Mohan Murugaiyan



Pavithra Munusamy



Manish Chandi



Gowri Mallapur

Odisha field personnel



Bipro Behera



Dhambru Behera



Judishtir Behera



Madhusudan Behera



Magata Behera



Surendra Behera



Kedar Rao



Mahendra Nayak



Shankar Rao



Sriramulu

Andaman and Nicobar Islands field personnel



Saw Berny



Saw Colombus



Saw Darius



Sabien Horo



Saw Isaac



Saw Kenik



Sushil Lakra



Saw Mumong



Saw Samson



Sandeep



Saw Thesorow



Saw Watha (Agu)



Saw Willy

APPENDIX III (a)

Member Organisations of TAG

State	Name of Organisation
Andaman & Nicobar Islands	Andaman and Nicobar Environment Team (ANET)
Andhra Pradesh	Visakha Society for the Protection and Care of Animals (VSPCA)
Andhra Pradesh	Manthini Ujwala Welfare Society
Gujarat	Prakruti Nature Club (PNC)
Gujarat	Green Future Foundation
Karnataka	Field Services and Intercultural Learning (FSL)
Karnataka	Canara Green Academy (CGA)
Kerala	Green Habitat
Kerala	Naithal
Lakshadweep	Lakshadweep Marine Research and Conservation Centre (LMRCC)
Maharashtra	Sahayadri Nisarga Mitra
Odisha	Action for Protection of Wild Animals (APOWA)
Odisha	Alacrity
Odisha	Green Life Rural Association (GLRA)
Odisha	Orissa Marine Resources Conservation Consortium (OMRCC)
Odisha	Podampeta Ecotourism and Olive Ridley Protection Club (PEORPC)
Odisha	Project Swarajya
Odisha	Rushikulya Sea Turtle Protection Committee (RST-PC)
Odisha	Sea Turtle Action Program (STAP)
Tamil Nadu	Students' Sea Turtle Conservation Network (SST-CN)
Tamil Nadu	TREE Foundation

National level organisations and research institutions that support TAG

- Centre for Ecological Sciences, Indian Institute of Science
- Dakshin Foundation
- Greenpeace – India
- International Collective in Support of Fishworkers
- Madras Crocodile Bank Trust

- Wildlife Institute of India
- Wildlife Protection Society of India

APPENDIX III (b)
Core Committee members of TAG

Odisha - Mangaraj Panda
Andhra Pradesh - Pradeep Kumar Nath
Tamil Nadu - Harish
Kerala - Mr. Sudheer Kumar P.V.
Karnataka - Jeevan
Maharashtra - Bhau Katdare
Gujarat - Dineshgiri Goswami
Islands - Adhith Swaminathan

Members organisations of the Turtle Action Group



APPENDIX III (c) TAG Members' Profiles

1. Andaman & Nicobar Environment Team (ANET): *Andaman and Nicobar islands*
Unique in being the only organization based on an island. Andaman and Nicobar islands are prime nesting sites for sea turtles of all four species that occur in India, namely green, hawksbill, olive ridley and leatherback.

2. Visakha Society for Protection and Care of Animal (VSPCA): *Andhra Pradesh*
Through its innovative awareness programs, VSPCA intends to educate the masses and build a strong and lasting bond between animals and human societies. They have field related expertise, necessary for effective conservation of sea turtles.

3. Prakruti Nature Club (PNC): *Gujarat*
PNC works along the Saurashtra and Gujarat coast. Their main focus is on protection of sea turtles, their nests and habitats, whale sharks and other sea creatures. Having an excellent relationship with the forest department, they hope to contribute through the collection and distribution of information and data related to turtles.

4. Canara Green Academy (CGA): *Karnataka*
CGA's main mission has been conservation of turtles, mangroves and medicinal plants. Along with the Karnataka Forest Department, they have established 40 sea turtle breeding centres all over the Karnataka coastline. Potential sea turtle nesting beaches have been identified and both ex-situ and in-situ conservation are carried out, depending on the security of the nests identified.

5. Field Services and Inter-Cultural Learning (FSL India): *Karnataka*
They have been successful in creating awareness among fishermen community along 60km of North Udupi district of Karnataka state. They are unique in placing international volunteers in local community projects to support sustainable development and to bring inter-cultural dimensions to community projects.

6. Lakshadweep Marine Research and Conservation Centre (LMRCC): *Lakshadweep*
The organization established by a group of islanders, is the first that has a primary focus on community based marine conservation. Lakshadweep has a significant population of endangered green and hawksbill turtles. LMRCC work with the local community, school students, fishermen and the Forest Department to reduce the threats to these ocean ambassadors through education and awareness programs.

7. Sahyadri Nisarga Mitra (SNM): *Maharashtra*
They work towards conservation, awareness and research of the region's biodiversity, focusing on conservation of marine turtles, white-rumped vultures and Indian swiftlets.

8. Action for Protection of Wild Animals (APOWA): Odisha

APOWA believes in finding solutions to animal welfare and conservation challenges that provide lasting benefits for animal and community. They have ten years of experience in sea turtle conservation in Odisha through research, conservation and action. Their work is carried out in the buffer zone of Gahirmatha sea turtle rookery site, world's largest olive ridley mass nesting site.

9. Alacrity: Odisha

Amongst several others, their sea turtle activity involves imparting awareness to fishing community residing within the periphery of the Gahirmatha area. They have also developed 'eco-development' groups, with 60 so far, within the region, for conservation of natural resources including mangrove forests.

10. Podampeta Ecotourism and Olive Ridley Protection Club: Odisha

They address various threats to the nesting turtles by carrying out awareness programs that inform people in nearby villages regarding the importance of turtles to the coastal ecosystem and the illegality of such activities.

11. Rushikulya Sea Turtle Protection Committee (RSTPC): Odisha

With the primary aim to help conserve olive ridley turtles and safeguard their nesting beaches along the Rushikulya coast, they began to monitor the nesting population and assist in the release of hatchlings during mass hatching. They also collect data on tagged turtles, recapture studies, distribution of mating congregations, satellite transmitter ranging studies and monitoring hatchling mortality rates.

12. Students' Sea Turtle Conservation Network (SSTCN): Chennai, Tamil Nadu

Sea turtle conservation began when a few dedicated wildlife enthusiasts began walking the beaches of Chennai to document the status of and threats to sea turtles. The group has been mainly organized and operated by students from colleges and even schools and a few young working adults. The motive has always been conservation and awareness creation.

13. TREE Foundation: Chennai, Tamil Nadu

It involves the fishing community youth (Sea Turtle Protection Force- STPF) in a sea turtle protection and conservation program in South India. Education and creating awareness at the community level is an integral part of their conservation program.

14. Green Mercy: Andhra Pradesh

An NGO based in Srikakulam. They carried out intensive surveys, giving a better picture of marine turtle status on the coast of Andhra Pradesh. They have contributed to the conservation of marine and coastal life by holding consultative meetings with fisherfolk and local communities.

15. Sea Turtle Action Program (STAP): Odisha

This is an NGO based at Devi, a former mass nesting site in Odisha. They work on sea turtle protection and community empowerment.

16. Green Life Rural Association (GLRA): Odisha

GLRA was formed in 1993, by a group of thirteen committed village youth who were then working on the Wildlife Institute of India's sea turtle project. Members of GLRA also worked in Operation Kachhapa when it was launched, at the time as a joint operation with the Forest Department and Wildlife Protection Society of India. GLRA's activities are focused in the Devi river mouth region.

17. OMRCC: Odisha

It brought together divergent groups comprising of conservationists, biologists and fisherfolk to meet and interact, which would be beneficial to both conservation as well as livelihoods. They continue to work on the ongoing olive ridley project in Odisha.

18. Green Habitat: Kerala

Green Habitat came into form in 2002 as an independent organisation. The organisation pilots activities for wildlife and environmental conservation in Chavakkad taluk in Kerala. Their areas of focus include the mangroves of Chettuwei, nesting turtles of Chavakkad beach, birds of Enamakkal Kole Islands and house sparrows among others. A major part of their efforts at conservation is directed towards environmental awareness and education among local communities in the area.

19. Naithal: Kerala

It is an NGO based in Kasargod district of Kerala that works on coastal information, conservation and action. It was established in 2001 by a group of local enthusiasts. They have worked on sand mining issues and work extensively on sea turtle conservation.

20. Project Swarajya: Odisha

Project Swarajya works primarily with human rights in the tribal communities of Odisha. However, they have been active in sea turtle conservation for many years and have organised workshops to promote TEDs among trawlers. They also work on horseshoe crabs and mangrove ecosystems in Odisha.

More information about the TAG members can be found in the 13th and 14th issues of IOTN. The links to the issues are: IOTN- 13: <http://www.iotn.org/iotn-13.php> and IOTN- 14: <http://www.iotn.org/iotn-14.php>

APPENDIX IV
Small Grants Program 2015-2016

A part of the MCTA project fund is disbursed as small grants through Madras Crocodile Bank Trust. The small grants programme was started in 2010. The Small Grants programme provides financial support to local NGOs actively involved in sea turtle conservation, demonstrating consistency and commitment in their projects. This year, a total of INR 1,21,800 has been disbursed to four organizations as follows:

State	Organization	Project title
Odisha	Green Life Rural Association	Community-Based Sea Turtle Conservation along Devi Coast, Odisha
Andhra Pradesh	Manthini Ujwala Society	Awareness training for Conservation of Sea Turtles and its importance
Andhra Pradesh	Visakha Society for Protection and Care of Animals	Outreach and Awareness
Tamil Nadu	Students Sea Turtle Conservation Network	Sea Turtle conservation in Chennai coast and Awareness Creation in coastal Tamil Nadu

Increased capacities of independent groups ensure greater benefits to the network as a collective. Financial support to individual efforts of member organisations in the nature of small grants can help sustain their interest and participation in the network, in addition to achieving the overall conservation objectives of the network. As a facilitating organisation, this demonstrated need has necessitated MCBT and partner organisations to commit additional resources towards meeting long term network objectives within the broader scope of sea turtle conservation and habitat protection. With the support of Dakshin Foundation, TAG is now coordinated by a dedicated team of members from both organisations who provide administrative support to the network.

APPENDIX V

Audit Report 2015-16

MADRAS CROCODILE BANK, KUSI VADANEMWELI VILLAGE, MAHABALIPURAM					
CONSOLIDATED INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31/03/2016					
PREV. YR.	EXPENSES	AMOUNT(Rs.-p)	AMOUNT(Rs.-p)	PREV. YR.	INCOME
PREV. YR.	FEED AND REPTILE RELATED EXPENSES	AMOUNT(Rs.-p)	AMOUNT(Rs.-p)	PREV. YR.	AMOUNT(Rs.-p)
3,151,881	Feed Expenses - Reptile	3,843,334	13,126,145		13,740,205
920,834	Maintenance of Sheds	2,442,031			
1,643,672	Pit Maintenance	83,242			90,000
114,279	Certification Fees	17,323			
78,930	Lab / Veterinary Expenses	53,963			702,860
22,409	Water Supply				
198,069	Frontage				
78,738	Crocodile Transportation		8,632,730		789,828
					3,462,084
					2,678,979
					44,000
					12,158
					3,517,354
					71,000
					279,350
					227,604
					45,000
					3,521,692
					2,000,000
					301,321
					2,400,000
					196,412
					515,053
					1,019,820
					629,225
					22,545,790
					136,977
					483,381
					620,358
					40,365
					918,033
					881,610
					1,068,135
					9,350
					2,917,493
					1,173,055
					26,280
					15,000
					41,038,181
27,080,972	Carried Forward	21,866,489	47,074,543	47,074,543	41,038,181



*For more information on the Turtle Action Group visit
www.seaturtlesofindia.org/tag*

Cover illustration: Back logo for Team Turtle t-shirt
Illustration by: Prabha Mallya

