



Project Report

Advancing the conservation of sea turtles in India at a national scale through the monitoring of index sites and coordination of coastal management efforts with a network of partners

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

2018-2019

Award No.: F17AP00398

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Citation:
George, R, M. Manohar Krishnan and K. Shanker. 2019. Advancing conservation of sea turtles in India at a national scale through the monitoring of index sites, and coordination of coastal management efforts with a network of partners. Project report submitted to the USFWS. Dakshin Foundation, Bangalore. 49 pages.

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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, the nesting population of leatherback turtles in Little Andaman Island and the Nicobar Islands and the feeding and nesting grounds for green and hawksbill turtles in the Andaman and Nicobar Islands and the Lakshadweep 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 reefs, 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 economic role in fishing and other coastal activities. Sea turtles have also been a 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 their effective conservation.

This project was initiated in 2008 and has since been involved in uniting organizations and individuals that work along the Indian coast on marine turtle ecology and conservation and monitoring key turtle nesting sites in India. A consortium of NGOs (Non-Governmental Organizations) called the Turtle Action Group (TAG) was also formed to work towards sea turtle conservation and coastal ecosystem protection.

From 2008 onwards, 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 responsible for the execution of project activities and formulation of action plans for the project. From 2017, the grant has been administered solely by Dakshin Foundation.

The primary aim of the project is to monitor index nesting sites for sea turtles and 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 utilized 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 organizations 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 organizations in collecting uniform and reliable data are being developed through monitoring protocols and training programmes. This will lead to standardization 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.

We provide below a summary of the activities conducted over the years.

2008 – 2009: Formation of a national level network: The first grant of \$5000 helped facilitate the formation of a network of committed groups and organizations 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 organizations 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 utilized 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 previous years, it was used to conduct workshops, disburse small grants and produce outreach material.

2014 – 2015: Promoting conservation of sea turtles in India at a national scale through a network of partners and index sites: The grant award of \$52,500 was utilized 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: Advancing the conservation of sea turtles in India at a national scale through the monitoring of index sites and coordination of coastal management efforts with a network of partners: The grant of \$52,500 was utilized to continue sea turtle monitoring at Odisha and the Andaman Islands, and to initiate monitoring sea grass meadows in the Lakshadweep islands. It also contributed to the organization of capacity building workshops, disbursement of small grants, and generation of outreach material.

2016 – 2017: Advancing the conservation of sea turtles in India at a national scale through the monitoring of index sites and coordination of coastal management efforts with a network of partners: This year's grant of \$52,580 was utilized to continue sea turtle monitoring at Odisha and the Andaman Islands. It continued the organization of capacity building workshops, disbursement of small grants, and generation of outreach material.

2017 – 2018: Advancing the conservation of sea turtles in India at a national scale through the monitoring of index sites and coordination of coastal management efforts with a network of partners: The grant of \$75,020 was utilized to continue sea turtle monitoring at Odisha, Lakshadweep and the Andaman Islands. It continued the organization of capacity building workshops, disbursement of small grants, and production of outreach material including a children's book by Kartik Shanker.

2018 – 2019: Advancing the conservation of sea turtles in India at a national scale through the monitoring of index sites and coordination of coastal management efforts with a network of partners: This year's grant of \$76,780 was utilized to continue sea turtle monitoring at Odisha, Lakshadweep and the Andaman Islands. It also supported the organization of capacity building workshops, disbursement of small grants, and generation of outreach material.

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 organizations, 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 2018-19 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 to continue the monitoring programme for green turtles and their foraging ecology in the Lakshadweep Islands
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 upload and synthesise relevant data contributed by member organisations on the existing online data portal.
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.
8. To develop and support the establishment of coastal learning centres of the Forest Department in different states.
9. To strengthen a larger regional network in the Northern Indian Ocean region of the IOSEA through a regional level workshop, and hold consultations in addition to inter-regional exposure and exchange programmes for members of the network.

3.

Project Activities and Outcomes

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

1. Monitoring programme for olive ridleys in Odisha

Odisha, with a 480 km long sandy coastline, is a suitable nesting habitat for olive ridley turtles. Over the past decade, activities such as mechanized fishing have resulted in large scale turtle mortality in offshore waters. Other factors that possibly affect their populations are rise in sea levels, 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 in overcoming these threats.

With funding from Marine Conservation Society, U.K., a long-term monitoring programme was initiated by Indian Institute of Science (IISc) and MCBT at Rushikulya rookery, a major olive ridley mass nesting site. 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 ten 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, shoreline 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 temperatures 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, 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 transect 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 were large arribadas in March 2015 and February 2017. Despite significant offshore congregations, mass nesting did not occur at Rushikulya in 2016, but such fluctuations are not unusual. The year 2018 saw two arribadas in one season with a second wave of turtles coming onshore during the mass hatching event. There was no mass nesting observed in 2019, but two minor projects on their foraging behaviour and hatchling performance was carried out. A detailed report can be found in Appendix I.

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. There has been considerable increase in local awareness and interest generated by working in collaboration with the government and local NGOs.

2. Monitoring of olive ridleys and leatherback turtles in the Andaman & Nicobar Islands

A long-term leatherback turtle monitoring project was started in the Andaman and Nicobar Islands by IISc, Dakshin Foundation, Andaman and Nicobar Environment Team (ANET), and MCBT. Since 2008, leatherback turtles 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 Organization (ISRO) and the Space Technology Cell of IISc, a satellite telemetry study was initiated at Little Andaman Island. A total of 10 turtles have been tagged with Platform Transmitter Terminals (PTTs) between 2010 and 2014 (tracks can be viewed at www.seaturtle.org). A detailed report is provided in Appendix II.

3. Monitoring green turtles and their foraging habitats in the Lakshadweep Islands

The Lakshadweep group of islands are a significant foraging area for green turtles in the Western Indian Ocean. While the green turtle populations have been relatively healthy, there has been an increase in conflict with fishing communities, as the latter hold these turtles responsible for destroying sea grass meadows resulting in a decline in fish catch. This threatens to impact

not only long-term conservation of these species but also of their habitats. It is necessary to understand the ecological processes underlying the conflict, and to develop mitigatory measures.

Green turtle feeding populations are found in the lagoons of many islands, including Kavaratti, Kalpeni, Kadmat, Minicoy and Agatti. Large numbers of these turtles have been observed to show inter-island movement to forage and such high densities of turtles overgraze sea grass meadows in these lagoons. Fishermen believe that this reduces fish catch. In continuation of studies by Nature Conservation Foundation (NCF), Mysore, Dakshin Foundation and IISc have initiated a collaborative project to monitor green turtles and their movements on the islands. As part of this project, a proposal was developed to continue monitoring these populations in collaboration with local conservation groups. This project would also be supported partially from MTCA funding and would be integrated with the larger research and conservation programme of the IISc, NCF and Dakshin Foundation in the region. The details of this study are provided in Appendix III.

4. 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 organizations (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.seaturtlesofindia.org/tag). Information on the network's activities, workshop reports, member organizations and their detailed profiles is currently made available here.

Sea turtles of India Website



Talking Turtles blog



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.

5. Building capacities of local community members and government officials

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.

The initial focus of TAG was towards empowering community-based organisations by improving their capacities in raising grants, networking, improving their communication skills and making them self-reliant, in order for them to effectively engage with other networks, stakeholder groups and government agencies.

Turtle Conservation Training workshops for Forest Department Field staff at Andaman and Odisha

ANET and Dakshin Foundation jointly conducted two training workshops at Betapur and Kalara for the North and Middle Andaman Forest Department staff. The workshop in Kalara had staff from Ramnagar, Kalipur, and Lamia Bay.

A field training workshop was conducted on hatchery management and sea turtle research along with Action for Protection of Wild Animals (APOWA) for the Forest Department staff of Puri and Kendrapara divisions at Konark in Odisha in January 2019.

These workshops help build on and refresh the knowledge of the field staff who work on sea turtle projects in the region. The workshops included an introduction to sea turtles, turtle life cycles, different research components, and conservation strategies and needs.

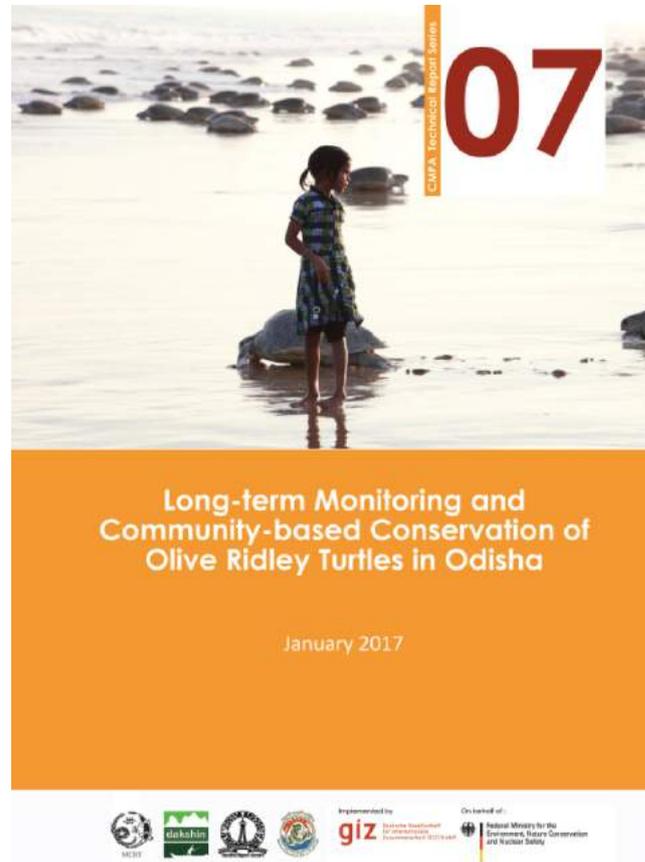
Dakshin Foundation staff conducting workshops with Forest Department personnel in Odisha (left) and Andamans (right)



6. Understanding the potential for sea turtle based ecotourism in India and promoting its application at Rushikulya, Odisha

Most traditional fishing communities are marginalised and poor and often do not have the luxury to practice ‘conservation’ as defined by modern (typically western) conservation biologists unless they can harvest some benefits from it. Involving the community in a meaningful way is thus important. This study, therefore, aimed to understand the reasons for the failure of past efforts at involving the community in conservation, the rationale behind the need for alternative livelihoods and, in particular, the potential of tourism focused on turtles as an alternative livelihood. A report titled *Long-term Monitoring and Community-based Conservation of Olive Ridley Turtles in Odisha* was published as an outcome of the study. The study found that most people in the community were in search of alternative sources of livelihood as a solution to many of their problems, which include access to basic amenities like clean drinking water, sanitation and medical facilities. People also believe that unsustainable fishing practices such as the large-scale fishing has led to a decline in their existing livelihoods.

Tourism can be a supplementary source of livelihood in these communities but not a primary source. Through the course of this study, it was found that local communities viewed conservation activity-related employment as a valuable source of livelihood. The study recommends that efforts should focus towards developing an effective tourism programme that benefits both turtles and communities through elaborate dialogue and discussion between stakeholders, while simultaneously addressing other developmental needs.



7. Disbursing small grants to member organisations

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)**
Students' Sea Turtle Conservation Network (Tamil Nadu)	45,000
Green Life Rural Association (Odisha)	45,000
Sea Turtle Action Programme (Odisha)	40,000
Prakruti Nature Club (Gujarat)	40,000
Action for Protection of Wild Animals (Odisha)	40,000

* Appendix VIII contains details of the projects

** 1 USD ~ 71 INR

8. Developing educational material for sea turtle conservation

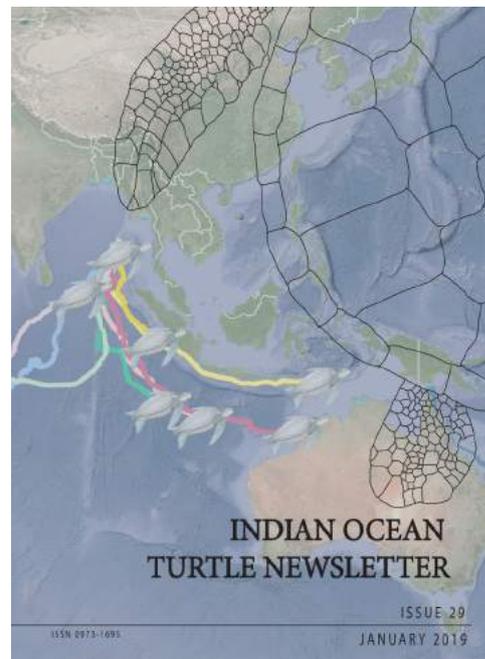
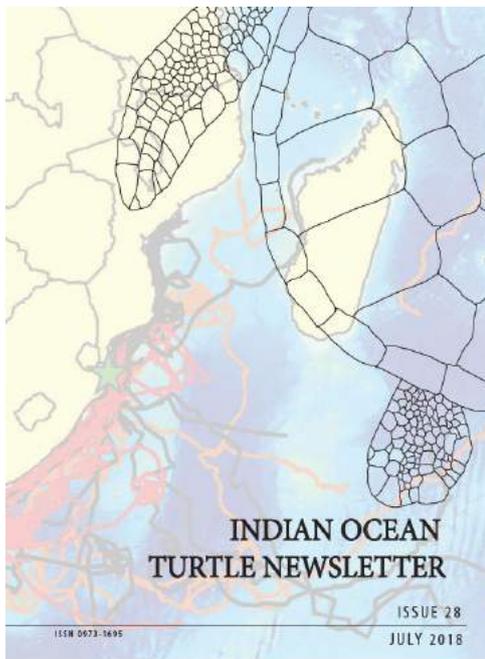
Indian Ocean Turtle Newsletter

The Indian Ocean Turtle Newsletter (IOTN) is a biannual international newsletter dedicated to marine turtle conservation. This was initiated to provide a forum for exchange of information on sea turtle biology, conservation, management and education and awareness in the Indian subcontinent, Indian Ocean region, and south/southeast Asia. The newsletter covers related aspects such as coastal zone management, fisheries and marine biology.

The newsletter aims to reach and serve:

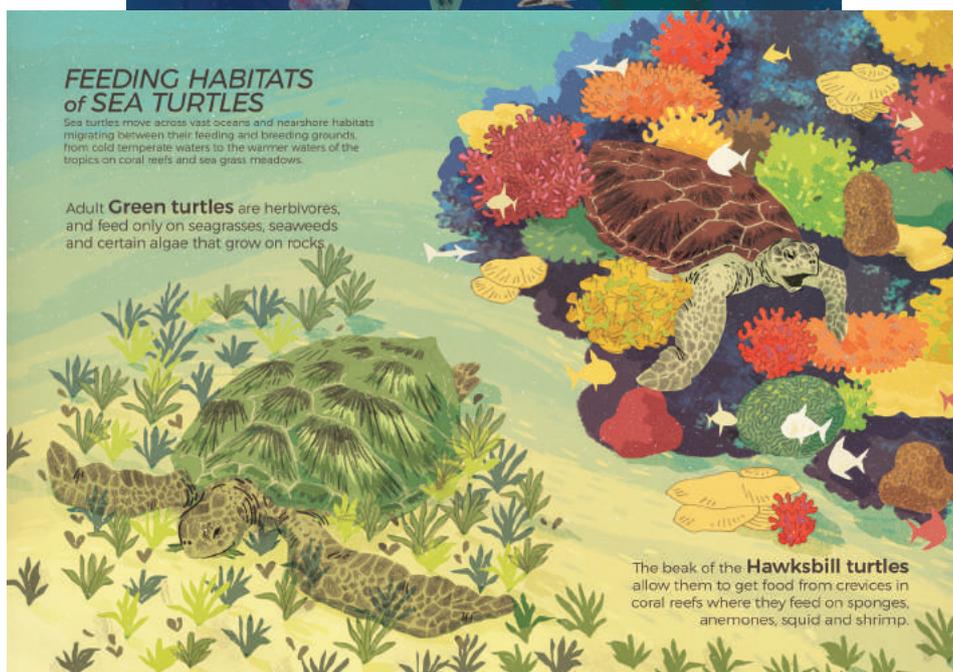
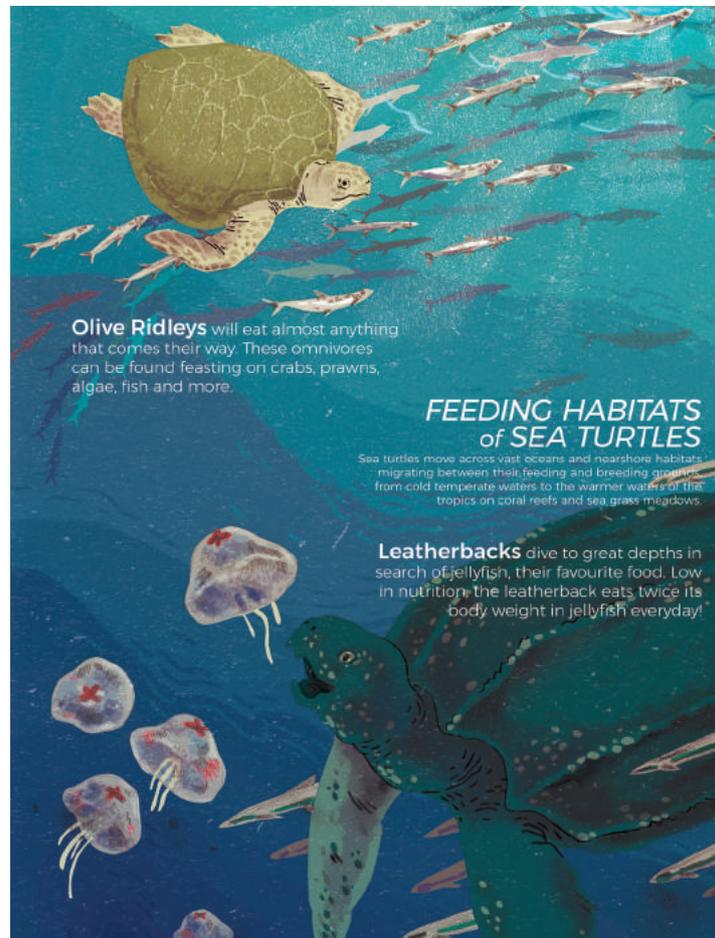
- Central government agencies (Ministry of Wildlife, Fisheries and Environment)
- Coastal government agencies (local Forest Departments, Fisheries Departments)
- Coastal enforcement agencies (Navy, Coast Guard)
- Non-government organisations involved in environment and conservation
- Non-government organisations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

The issues of IOTN published during the reporting period



Educational material for outreach

A set of posters on sea turtle biology and distribution was translated and distributed to TAG members and forest department officials in the state of Maharashtra, on the western coast of India.



9. Design and development of learning centres in collaboration with the Forest Department

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 open day celebrations for ANET along with other materials that were prepared from the projects.

An interactive life size poster of sea turtles displayed at the open day celebrations for ANET (top) along with other materials prepared from the projects (bottom)



4.

Future Plans (2019-20)

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 2019 – 2020 are:

a. Increasing the scope of research-based monitoring at the index-nesting beaches of sea turtles

The index-nesting beaches in Odisha and the Andaman Islands now have established monitoring programmes and have the potential to expand the scope of their research. These could include aerial surveys, stable-isotope analysis, genetics and detailed physiological studies of these populations to further expand on the knowledge of these sea turtle populations.

b. To collectively address issues of common concern

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

i. Standardization of data collection and monitoring techniques: In order to collate data and information collected individually by member organizations, we have developed standardized procedures for data collection and monitoring to enable this information to be shared.

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, urbanization, development of ports, etc.) vary from one location to the next, all members of TAG are individually contesting decisions made at the local scale.

c. Capacity building and involvement and initiation of new community-based enterprises

A primary focus area of the project is capacity building for local forest department officials. 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. We will be partnering with state forest departments to develop site-specific action plans for their conservation programs. We hope to also partner with more local universities at some of the important nesting beaches along the mainland coast to establish long-term engagement with student groups for the monitoring of these populations.

5.

Recommendations

After careful assessment of the outcomes of the network and expectations of member organizations, we make the following recommendations to strengthen conservation efforts for sea turtles in India:

1. Communication should be initiated with the central government through the Ministry of Environment, Forests and Climate Change (MoEFCC) regarding national issues to help the government in effective policy making for sea turtle and marine conservation
2. Interactions of TAG members with other similar regional and global organizations and networks should be increased to improve communication and collaboration.
3. Information on marine turtle status, biology, habitat and conservation techniques should be collated at the regional level. By encouraging discussion, the member organizations can come up with effective solutions to frequently faced problems.
4. Joint awareness programmes need to be conducted with other TAG members, especially within the state by sharing resources, ideas and staff.
5. Network activities can be advertised through media campaigns to attract other similar organizations and to highlight individual organizations' efforts to give them recognition.
6. Collaboration with local stakeholders working on sea turtle conservation and related groups should be encouraged to develop holistic approaches to 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 for carrying out the research, outreach and administrative tasks under the project and lending their constant support as and when required.

We are extremely grateful to the long-term support from the field staff who have been the backbone of our monitoring programs in Odisha and the Andaman Islands and continue to associate with us in the field monitoring as well as local outreach activities.

We are also thankful to the Ministry of Environment, Forests and Climate Change (MoEFCC) 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.

Appendices

APPENDIX I

Monitoring olive ridley turtles in Odisha

Olive ridleys face various threats on the east coast of India. The direct threats to ridleys are predation of sporadic nests by hyenas, jackals, feral dogs, kites and crows. With the introduction of mechanized fishing since the 1990s and incidental capture in shrimp trawls, several thousand olive ridleys die every year due to suffocation in the trawl nets. Odisha is known for its mass nesting beaches for olive ridley turtles – the only mass nesting rookeries outside Central America. It has a coastline of 480km that is largely sandy, thus making it suitable for nesting of turtles. Climate change driven sea level rise and several anthropogenic activities has made the coastline even more vulnerable. Considering the importance of these mass nesting rookeries, it is imperative to monitor the populations in the context of changing climate.

The long-term monitoring camp for olive ridleys began in December with beach profiling and mapping, and offshore boat transects. Daily beach walks were conducted to observe for nesting and mortalities as well as setting up of the hatchery in association with the Odisha state forest department. Annually, a few nests are relocated from the beach to the hatchery and data loggers are put into the nests to monitor the incubation temperatures. In January 2019, offshore transects were carried out at different locations of the Odisha coast i.e. Bahuda, Chilika and Rushikulya. In the first week of February, an increase in nesting turtle was observed. A training workshop on techniques was organized in collaboration with Odisha forest department and teams were assigned to the beach segments for the commencement of the nesting turtle counts. Belt transects of 5, 10 and 20 m were planned this year to assess the accuracy of the estimates derived from varying strip widths. Though the arribada failed to occur at Rushikulya this year, the annual training workshops serve as a refresher course for the field staff.

Arribada monitoring

Mass nesting events at the Rushikulya rookery were not monitored using standardised methodology before 2007. Since 2008, IISc 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 2007 to 2017. **Table 2** gives a day-wise estimates of nesting turtles in 2018 at Rushikulya.

This year, the team planned the monitoring using differential strip widths to examine the efficiency of deriving estimates keeping sampling protocols amenable to field conditions. Earlier monitoring programmes and research organizations have been using a strip width of 20 m at the mass nesting sites in Odisha instead of the prescribed 2 m as proposed by the IUCN MTSG. It was observed that the 5 m strip widths tend to overestimate the nesting numbers in comparison to the 20 m strips.

Table 1. Estimated numbers of nesting turtles at Rushikulya during arribada (2007- 2017)

Year	Estimated Nesting Number
2007	No arribada
2008	70985.9
2009	71645.1
2010	99887.3
2011	151828.5
2012	42931.1
2013	142550
2014	14849
2015	170939
2016	No arribada
2017	405783.9

*Expected overestimate due to shorter strip widths in comparison to previous years

Table 2. Estimated numbers of nesting turtles during arribada 2018 at Rushikulya

	5m	10m	20m
Day 1	39333.33	38848.48	29515.15
Day 2	45090.91	37090.91	29742.42
Day 3	62060.61	61545.45	50242.42
Day 4	33272.73	30000.00	23893.94
Day 5	23818.18	22121.21	17681.82
TOTAL	203575.76	189606.1	151075.8

The estimates that have been derived from 2018 make it evident that the larger strip width of 20 m that was used in the past potentially underestimates the nesting numbers while smaller strip widths are prone to overestimates. This calculation would be crucial while comparing earlier nesting estimates that have come from the region to derive a more accurate enumeration procedure.

Monitoring of hatchlings

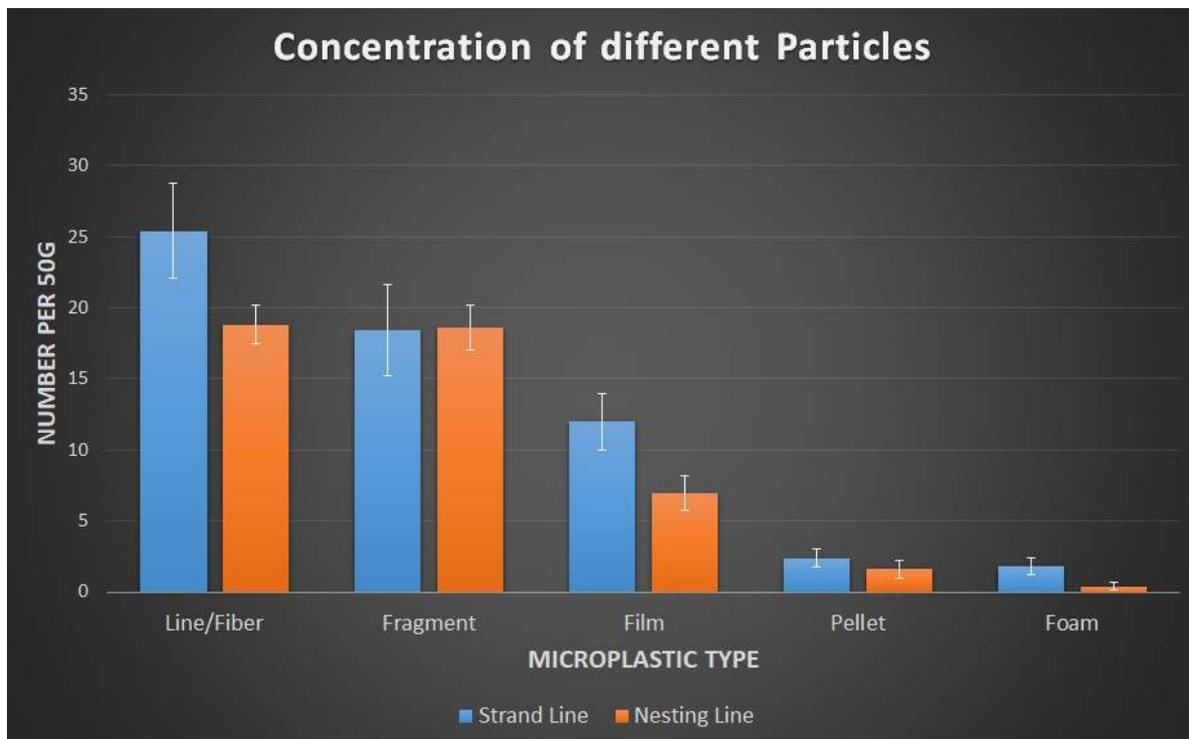
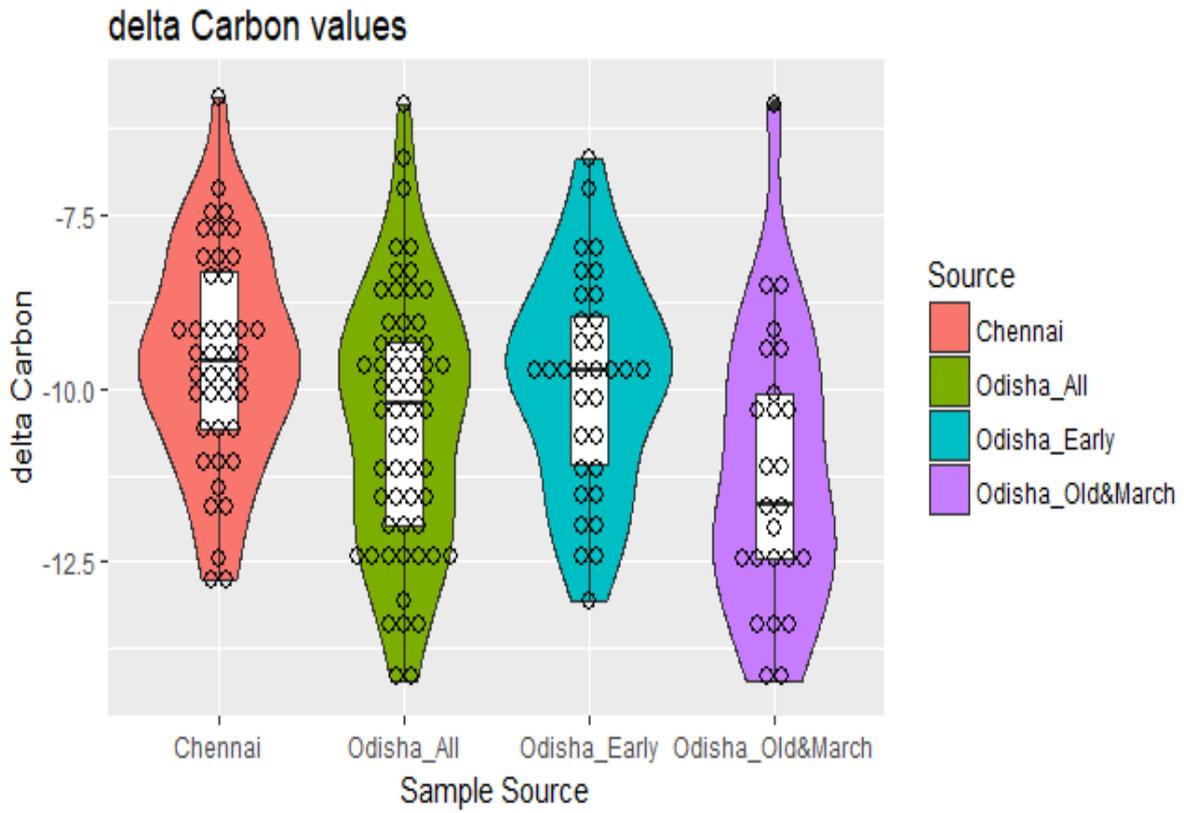
Data loggers were deployed to record air and sand temperatures in hatcheries built by the Orissa Forest Department to record hatchling sex ratios.

Effect of nest environment on olive ridley hatchlings

Nest environment influences various life history parameters in sea turtles such as embryonic development, gas exchange, sex determination, hatchling morphology and physiology, etc. With increasing sand temperatures around the world, sea turtle hatchlings face an imminent threat in the form of reduced size and locomotor ability due to high nest temperatures, leaving them vulnerable to predators on land and sea. This study looked at the effect of nest environment, especially temperature, on hatchling morphology and fitness. A few nests from Rushikulya and Chennai were chosen as samples. In order to understand the influence of different temperature ranges, the nests were sampled across different months of the nesting season to include early, mid and late season nests. On emergence, hatchlings from each of these nests were measured for various morphological parameters such as carapace length, flipper length, neck length and scute number as well as fitness parameters such as crawl speed, self-righting ability and righting propensity score. On analyzing the data, it revealed that temperature has a significant effect on hatchling size and locomotor performance. Higher sand temperatures led to reduced hatchling size which in turn led to lower hatchling fitness. Temperature also influenced the hatchling fitness independent of hatchling size. However, the results varied between Rushikulya and Chennai hatcheries, suggesting that there could be various site-specific factors influencing the fitness of the hatchlings.

Nesting Habitat and Foraging Pattern

We compared the carbon isotope ratios in bone tissue of olive ridley sea turtles in Chennai, Tamil Nadu and Rushikulya, Odisha. Physical beach characteristics such as slope, sand moisture, sand size and sand salinity for different beaches in Rushikulya were compared and microplastic concentration in the main arribada beach sediment was determined. The carbon isotope ratio of samples from Chennai and Rushikulya turtles were found to be significantly different from each other, signifying a probable difference in their foraging areas. Beach characteristics of different nesting areas of Rushikulya rookery were not significantly different. We did not find significant difference between arribada and solitary nesting beaches. Sediments of the main arribada beach were found to have high concentrations of microplastic.



Monitoring offshore congregations of olive ridleys on the Odisha coast

IISc 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 sites included in the survey are Bahuda, Chilika, South Devi (Puri-Konark), Devi, Hukitola and Jatadhar (Figure 2).

The 480 km coastline of Odisha was divided into transect blocks of 40 sq. kms. 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 numbers, abiotic factors (surface salinity and depth) were also sampled to understand ecological correlates of these congregations. Due to logistical difficulties, only three sites, viz., Chilika, Rushikulya and Bahuda, were surveyed for offshore monitoring this season and the data is yet to be analyzed.

Figure 1. Map showing transect design



Figure 2. Map showing different survey locations



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 organizations, but between NGOs and the forest department as well. As a result of this sustained partnership over the past five years, it has been possible to involve a considerable number of field staff from the local communities and organizations 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 with the programme are Orissa Marine Resources Conservation Consortium (OMRCC), Rushikulya Sea Turtle Protection Committee (RSTPC), Sea Turtle Action Program (STAP), Green Life Rural Association (GLRA) and Action for Protection of Wild Animals (APOWA).

Local sea turtle monitoring staff at Rushikulya, Odisha



APPENDIX II

Monitoring leatherback turtles in the Andaman & Nicobar Islands

The leatherback turtle is the only extant species of the family Dermochelyidae. Leatherback turtles are the largest of living sea turtles, growing up to 2 m and weighing as much as 900 kg. 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 Wild Life Protection Act (1972). There is great concern over the declines in nesting populations of this species throughout the world, especially the Pacific. The Malaysian rookeries have undergone a well-documented decline from approximately 5000 nests per year in the 1960s 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 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. Currently, 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 Andaman and Nicobar Islands Forest Department, Centre for Ecological Sciences (CES)-Indian Institute of Science, Bangalore, Dakshin Foundation and ANET on Little Andaman Island (Figure 3).

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. Further, there was no information on the turtles once they left the coast of the Andaman and Nicobar Islands, especially with respect to 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. 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, and efforts have focused on West Bay 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 to understand leatherback nesting patterns post-tsunami. 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 nesting leatherback turtles through the seasons.

South Bay and West Bay nesting beaches have been monitored each season from 2008-18 (Figure 4). However, surveys at South Bay had to be restricted to daylight hours since 2010 as night surveys of the nesting beach were logistically constrained due to the presence of large river openings (Benyabol & Tothibue) and the presence of saltwater crocodiles. The monitoring efforts have since been concentrated at West Bay through night surveys since then. No turtles were tagged with external or PIT tags from 2014 to 2018 due to lack of permits.

Figure 3. Map of Little Andaman Island

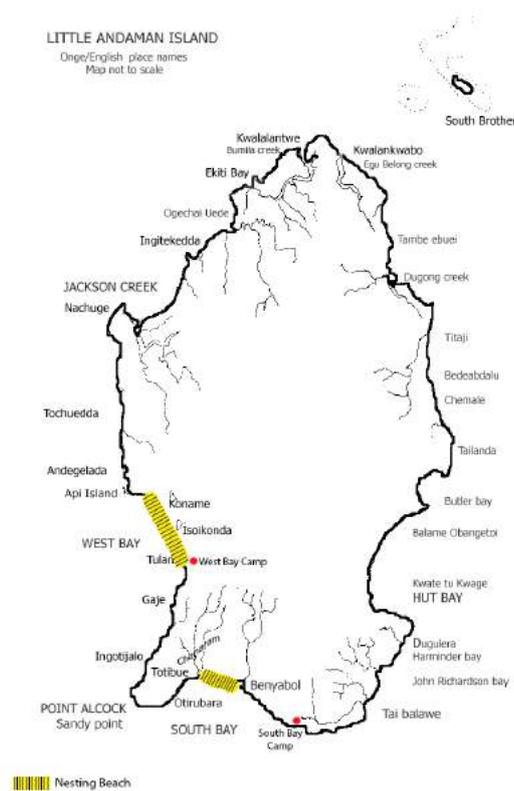
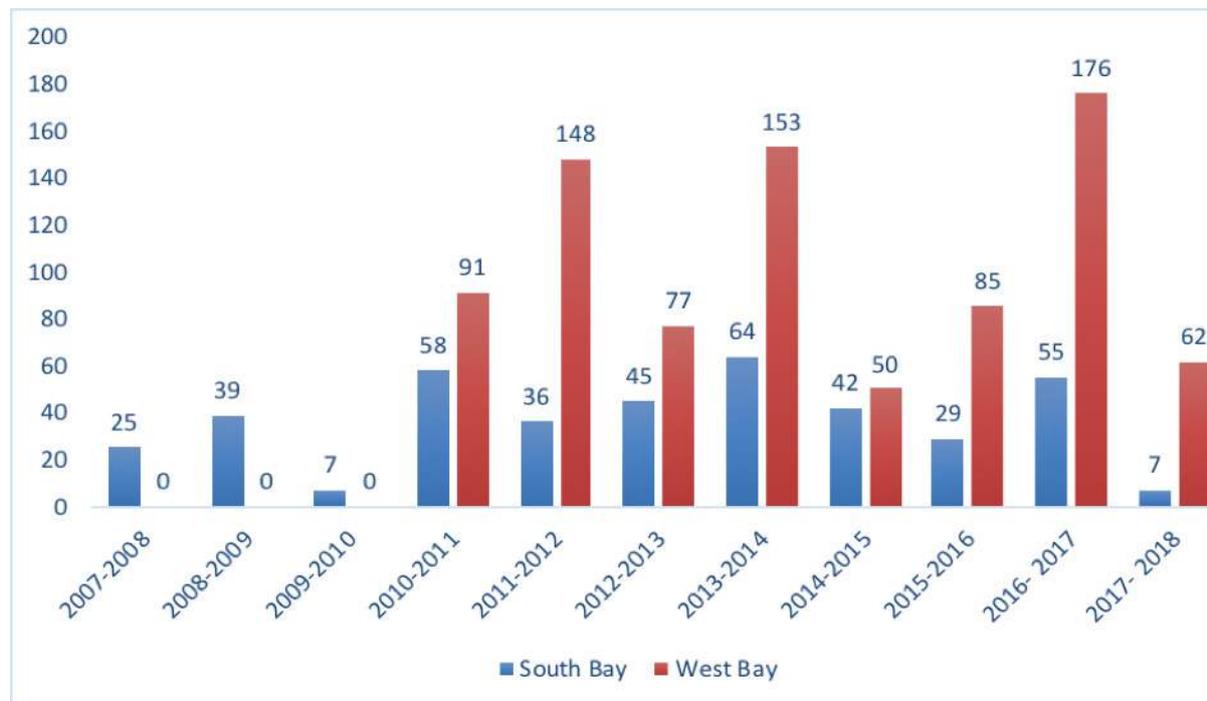


Figure 4. Leatherback nesting patterns in South and West Bay



Monitoring

The current monitoring programme at the beaches of South and West Bay, Little Andaman Island aims to understand trends in leatherback nesting at the site and the threats they face and changes in their nesting habitats. These beaches serve as index beaches for monitoring leatherback populations in the islands. Annual surveys of the nesting sites at Great and Little Nicobar Islands will help in assessing the status of these beaches and the abundance of leatherback nesting at these sites. Monitoring throughout the season helps provide insights into predation patterns, hatching success and emergence success of nests laid at these index beaches.

Since 2008, a long-term monitoring camp has been established in Little Andaman Island, focusing on tagging, habitat monitoring, satellite telemetry and populations genetics. The two index beaches, South and West Bay, were monitored from 27th December 2017 to 27th February 2018. During the monitoring period, a total of 63 and 7 leatherback nests were encountered in West Bay and South Bay respectively. During the season, 5 nesting females were tagged and one previously tagged turtle from 2014 was encountered in West Bay. The findings of the long-term monitoring programme in Little Andaman Island indicates a healthy nesting population. Rapid surveys conducted in 2016 in the Nicobar Islands also confirmed the recovery of previously known nesting beaches and nesting numbers comparable to earlier reports from Great and Little Nicobar Islands. The leatherback, with over 1000 nests per season across the islands, is a significant nesting population in the South Asian region.

Satellite telemetry

Since 2010, 10 turtles have been tagged with satellite transmitters but only 5 of these turtles provided data for more than 100 days. Only three turtles have transmitted extensive data where we have been able to identify their foraging grounds.

While we have some insights into the post-nesting movement patterns of leatherbacks in the Indian Ocean, more satellite telemetry studies need to be carried out in subsequent years to assess if there are other migratory routes taken by the turtles nesting in Little Andaman. A better sample size will also help us assess their exposure to fishery related threats in the high seas. Supporting funds will be raised during the upcoming seasons.

Population Genetics

Genetic studies are underway to assess the stock to which the Andaman and Nicobar leatherback turtles belong. Supporting funds will be raised for the same.

Capacity building and training

The long-term conservation and management of leatherback turtles in the Andaman and Nicobar Islands depends on the involvement and support of local civil society and government. Since the leatherback turtle nesting beaches are currently in areas not accessible to the general public, the main focus of training is the forest department field staff. In addition, awareness programmes can inform the public about leatherback turtles and their value as a natural heritage of the islands.

The forest department officers and field staff at various sites have been supportive and dedicated to sea turtle conservation efforts. In 2018, capacity building programmes such as training workshops were conducted for forest department personnel from North and Middle Andaman in Kalara and Betapur. The workshop in Kalara had staff from Ramnagar, Kalipur and Lamia Bay.

In addition, several capacity building programmes were conducted in North, Middle and South Andaman for the field personnel working in sea turtle projects from the Forest Department, Andaman and Nicobar Islands. These workshops equipped the field personnel with standardized protocols for data collection and also improved existing conservation programmes across the islands. Lectures were also delivered on “Sea Turtle Conservation” during the refresher course conducted at the Forest Training Institute, Andaman and Nicobar Islands, for the Rangers and Forest Guards.

APPENDIX III

Monitoring green turtles and their foraging habitats in the Lakshadweep Islands

The lagoons of the Lakshadweep Islands are important foraging grounds for green turtles. These shallow lagoons house various seagrass species which form the diet of the green turtle. In the last decade, there has been an increase in green turtle numbers in the lagoons. This has led to overgrazing of seagrass meadows and drastically reduced seagrass abundance and biomass. These meadows also serve as breeding habitats for various fish species and a reduction in seagrass availability has been perceived to cause a decline in associated fish numbers. Consequently, fishers have developed some resentment towards turtles. Many fishers also endorse measures such as culling to manage the situation. This has led to direct and indirect conflict between fishers and turtles.

Despite being a source of this conflict, green turtles in the Northern Indian Ocean remain a poorly studied population. Past studies in the region have highlighted their role as ecosystem engineers, their part in the turtle-fisher conflict, and their dietary components. However, in order to manage this population and plan for seagrass recovery, information on their demography, distribution and foraging behaviour is important. Moreover, it is crucial to develop ways to reduce the turtle-fisher conflict, which if allowed to persist could be detrimental to the green turtle population.

The objectives of the study were to understand the demography and distribution of the green turtle populations found in the lagoons in Lakshadweep and to examine their diet. It also aimed to investigate the extent of the conflict between fishers and turtles and ways to mitigate it. Additionally, experimental approaches and their effectiveness to increase densities of seagrass beds are being explored towards the conservation of these habitats.

The islands of Agatti, Kadmat and Kalpeni were chosen because high densities of green turtles have been known to occur in these islands at various points of time. Previous studies reported turtle-fisher conflict from Agatti while the fishers in Kadmat were indifferent. Kadmat and Kalpeni were chosen for their previously reported high turtle densities, and Agatti was chosen as a site with low turtle densities at this time.

A total of 8 and 12 boat transects were conducted in Agatti and Kadmat (1 km long). In both islands, the turtle encounters were low. Turtles were mainly observed in the northern part of the lagoons. The lagoon was divided into grids of 500x500m of which centers of 28 grids were randomly chosen using QGIS for the entire lagoon to survey for seagrass presence. The centers of these grids were surveyed for substrate in four directions: North, South, East and West by snorkeling.

Seagrass surveys in Agatti showed presence of patches of *Thalassia*, *Cymodocea*, *Syringodium* and *Halophila sp.* whereas only *Cymodocea* and *Thalassia* were seen in Kadmat (Figure 5). Additionally, the eastern side of Agatti was observed to have *Cymodocea* growing in shallows near the beach where a few turtles were also observed during beach surveys.

Questionnaires were used to collect initial information from lagoon fishers. 10 fishers from each island were surveyed in Agatti and Kadmat. Snowball sampling was used to determine interviewees. Surveys with the lagoon fishers showed that there is currently very little to no resentment towards turtles in Agatti and Kadmat. Their only grievance was the occasional capture of turtles in their nets which resulted in destruction of net or release of turtles by lifting the net. Some fishers mentioned that they check their fishing site for presence of turtles before casting nets. Older fishers recounted how turtle numbers were higher in the past but eventually decreased due to lack of seagrass in the lagoon. Some believe that green turtle numbers went up due to a ban on hunting and a change in boat type preference from wooden boats to fibre boats. Green turtles were previously caught to obtain fat for oil extraction, where the oil was used for caulking wooden boats. Some mentioned using turtle eggs and carapace to make medicine for piles and burns respectively.

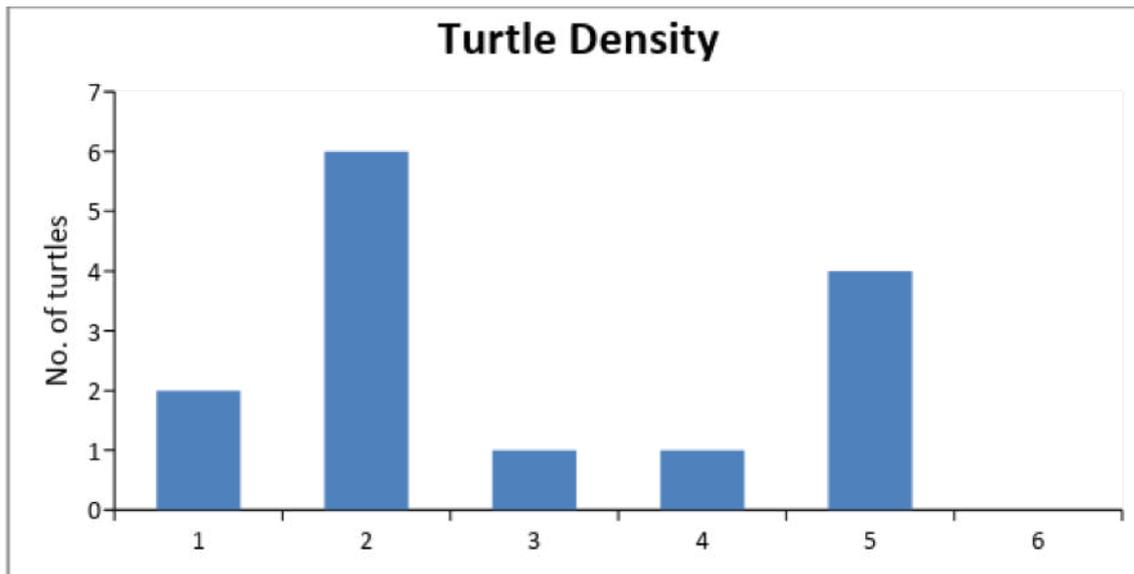


Figure 5. No. of turtles observed in Agatti and Kadmat by boat transects

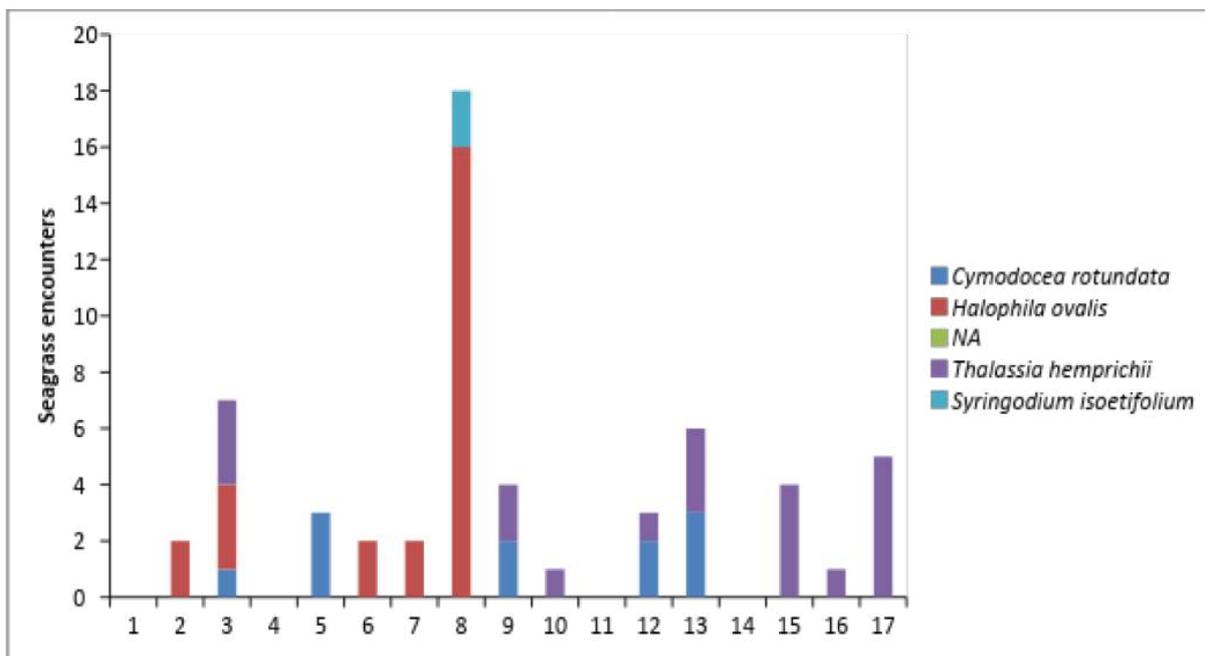


Figure 6. Seagrass surveyed in Agatti and Kadmat by snorkelling



Figure 7. Scattered patches of *Thalassia* sp. in Kadmat



Figure 8. Observed fishing sites and turtle sighting points in Agatti

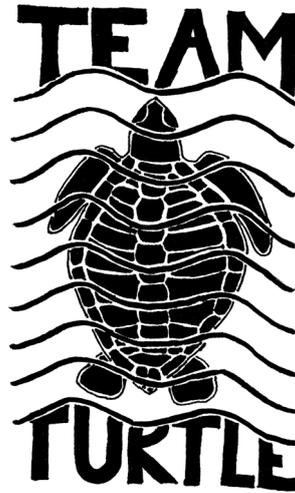


Figure 9. Observed fishing sites and turtle sighting points in Kadmat

Future plans

During the next season, we will initiate a flipper tagging program which will be crucial in understanding the turtles' demography and distribution. Collection of skin tissue and carapace samples will provide details on genetic structure and past and present dietary components respectively. Moreover, exclosure cage experiments will be tested to conserve seagrass and associated fishes. Collectively, these methods will be important in understanding green turtle ecology, seagrass conservation and conflict management.

APPENDIX IV



Field staff and project personnel

Sea turtle monitoring



Alissa Barnes



Ridhi Chandarana



Meenakshi Poti



Sadhwi Sindura



Mugdha Kulkarni



Chetan Rao



Nupur Kale



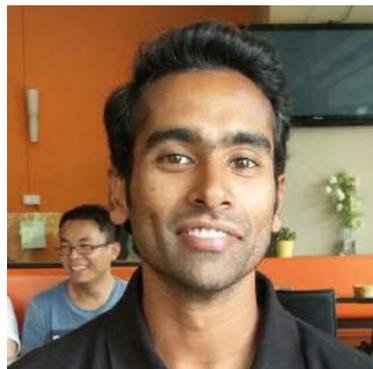
Amrit Kumar Mishra



Sajan John



Ema Fatima



Adhith Swaminathan



Divya Karnad



Hariprasath. R



Chandana Pusapati



Mohit Mudliar



Avik Banerjee

Project Coordinators



Kartik Shanker



Naveen Namboothri



Muralidharan M

Turtle Action Group



Terenia Berlie



Seema Shenoy



Mallika Sardeshpande



Rutuja Dhamale



Smrutica Jeetendranath



Amrita Tripathy



Rhea George



Prakriti Mukerjee

**Madras Crocodile Bank
Trust**



Zahida Whitaker



Mohan Murugaiyan



Pavithra Munusamy



Manish Chandi



Gowri Mallapur

Odisha field personnel



Bipro Behera



Kedar Rao



Surendra Behera



Shankar Rao



Judishtir Behera



Sriramulu



Magata Behera



Mahendra Nayak



Dhambru Behera



Madhusudan Behera

Andaman and Nicobar Islands field personnel



Sushil Lakra



Saw Berny



Saw Willy



Saw Colombus



Sabien Horo



Saw Watha (Agu)



Saw Kenik



Saw Samson



Saw Mumong



Sandeep



Saw Darius



Saw Isaac



Saw Thesorow

APPENDIX V

Other achievements by project personnel

IUCN-Marine Turtle Specialist Group

Adhith Swaminathan and Muralidharan M. who were inducted into the MTSG of IUCN and are currently involved in collating information on marine turtles in the Northern Indian Ocean to submit the Regional Vice-Chairs. They both authored a national chapter to MTSG Annual Regional Report.

Regional training workshop for leatherback monitoring camp in Indonesia

In December 2018, Dakshin Foundation was invited to train the staff of a collaborative leatherback project between the Turtle Foundation and the Ministry of Marine Affairs of Indonesia in Sipura Island, Indonesia. Adhith Swaminathan, who has been leading the leatherback monitoring program in the Andamans, visited the field project at Sipura and helped in developing a tagging protocol. The staff were also then trained to tag leatherback turtles with external and PIT tags.

During the field visit, two leatherbacks were observed, and external and PIT tagging procedures were demonstrated to the entire team. The protocol included standardized methods that are to be followed by the groups in the leatherback nesting beaches along the Andaman, Nicobar and Sumatra island chain.



APPENDIX VI
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	Naythal
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 (RSTPC)
Odisha	Sea Turtle Action Program (STAP)
Tamil Nadu	Students' Sea Turtle Conservation Network (SSTCN)
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

Core Committee members of TAG

Odisha - Mr. Mangaraj Panda

Andhra Pradesh - Mr. Pradeep Kumar Nath

Tamil Nadu - Mr. Harish

Kerala - Mr. Sudheer Kumar P.V.

Karnataka - Mr. Jeevan

Maharashtra - Mr. Bhau Katdare

Gujarat - Mr. Dineshgiri Goswami

Islands - Mr. Adhith Swaminathan

Members organisations of the Turtle Action Group



APPENDIX VII

TAG Members Profile

1. Andaman & Nicobar Environment Team (ANET): Andaman and Nicobar islands
Unique in being the only organisation 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 Udipi 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 organisation 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 in 1971, 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 organised 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, another 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 Chettuwai, 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.

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 VIII

Small Grants Program 2018-2019

A part of the MTCA project fund is disbursed as small grants. The small grants programme was started in 2010. It provides financial support to local NGOs actively involved in sea turtle conservation, demonstrating commitment to their projects. This year, a total of INR 2,10,000 has been disbursed to five organizations as follows:

State	Organisation	Amount (INR)	Project title
Tamil Nadu	Students' Sea Turtle Conservation Network	45,000	Symposium on Sea turtle Conservation and Sustainable Fishing & Sea turtle conservation and awareness creation in Chennai
Odisha	Green Life Rural Association	45,000	Community Based Sea Turtle Conservation along Devi Coast, Odisha
Odisha	Sea Turtle Action Programme	40,000	Capacity building and training of volunteers and personnel engaged in sea turtle protection in the Devi river mouth
Odisha	Action for Protection of Wild Animals	40,000	Children for Conservation of Olive Ridleys.
Gujarat	Prakruti Nature Club	40,000	Research Activities and Awareness Building

*1 USD ~ 71 INR

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. TAG is now coordinated by a dedicated team of members from Dakshin Foundation who provide administrative support to the network.

APPENDIX IX

Statement of Expenditure



Dakshin Foundation
www.dakshin.org

STATEMENT OF EXPENDITURE

For the period from: 01/10/2018 to 30/09/2019

Project Title: Advancing the conservation of sea turtles in India at a national scale through the monitoring of index sites, and coordination of coastal management efforts with a network of partners.

Investigator: Naveen Namboothri

Item (Description)	Sanctioned Amount	Expenditures	Sanction Balance	Applicant	Other Sources
Salaries	\$ 37386.48	\$ 37386.48 ¹	\$ 0	\$2,000.00	\$7,000.00 ²
Travel	\$ 7971.44	\$ 7971.44	\$ 0	\$1,000.00 ³	\$5,000.00 ⁴
Activities of Partners	\$ 3225.42	\$ 3225.42	\$ 0	\$0.00	\$5,000.00 ⁵
Production of Outreach material	\$ 8981.46	\$ 8981.46	\$ 0	\$1,000.00 ⁶	\$8,000.00 ⁷
Training and workshops	\$ 5853.59	\$ 5853.59	\$ 0	\$0.00	\$14,000.00 ⁸
Equipment	\$ 2311.91	\$ 2311.91	\$ 0	\$1,500.00 ⁹	\$4,000.00 ¹⁰
Consumables	\$ 784.97	\$ 784.97	\$ 0	\$0.00	\$2,000.00 ¹¹
Communication	\$ 898.35	\$ 898.35	\$ 0	\$1,500.00 ¹²	\$1,000.00 ¹²
Field station rent and maintenance	\$ 2386.38	\$ 2386.38	\$ 0	\$3,000.00 ¹³	\$1,000.00 ¹³

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Dakshin Foundation
www.dakshin.org

Institutional overheads (@10%)	\$ 6980.00	\$ 6980.00	\$ 0	-	
Total	\$ 76780.00	\$ 76780.00	\$ 0	\$10,000.00	\$47,000.00

Naveen Namboothri
Director



Raji Avy
Manager- Finance, Admin and HR

- 1 – Based on the revised research scholar pay scales assigned by the Central Ministry
- 2 – Salary support for Project supervisors Naveen Namboothri from Dakshin Foundation, Bangalore & Kartik Shanker from the Ashoka Trust for Research in Ecology and the Environment
- 3 – Travel support from MCBT
- 4 – Travel support from Indian Institute of Science and Dakshin Foundation
- 5 – Contributions from the Andaman and Nicobar Environment Team (ANET) and Dakshin Foundation
- 6 – In kind contributions from MCBT towards production of outreach material Andaman and Nicobar Islands
- 7 – Support for the Indian Ocean Turtle Newsletter and other materials from Dakshin Foundation
- 8 – Support from Dakshin Foundation and local government agencies for training and workshops
- 9 – In kind support (equipment, material, etc.) from MCBT
- 10 – In kind support (equipment, material, etc.) from Indian Institute of Science and partner organisations
- 11 – Support for general consumable resources from MCBT and Indian Institute of Science and Dakshin Foundation
- 12 – Support for communication expenses from MCBT and Indian Institute of Science and Dakshin Foundation
- 13 – Support for field stations from Indian Institute of Science and Dakshin Foundation

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Cover photo: A leatherback hatchling from the Andaman and Nicobar Islands, India

by Adhith Swaminathan

