REPORT OF THE 4TH MEETING OF THE NORTHERN INDIAN OCEAN MARINE TURTLE TASK FORCE

***hybrid* (Maldives / *online*)**
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Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia

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Opening Ceremony

Following a traditional song, Hawwa Nabaaha Nashid (Maldives Ministry of Environment, Climate Change and Technology) welcomed everyone to Baa Atoll.

Heidrun Frisch-Nwakanma (Secretariat) then welcomed participants to the 4th Meeting of the Northern Indian Ocean Marine Turtle Task Force (NIO-MTTF-4). The IOSEA Marine Turtle MOU has been in effect for more than 20 years, with the aim of facilitating collaboration among States to conserve marine turtle populations and their habitats. The MOU area is divided into four sub-regions; all five countries in the Northern Indian Ocean (NIO) sub-region were represented at the meeting. Ms Frisch-Nwakanma expressed thanks to the Government of the Maldives and the Ministry of Environment, Climate Change and Technology (MECCT) – represented by State Minister Abdulla Naseer and the national focal point, Lisama Sabry – for hosting the event.

State Minister Naseer warmly welcomed everyone to the Maldives, reiterating that marine turtles were essential to the health of ocean ecosystems and flagship species for conservation efforts, and that protecting them was critical given the numerous threats they face. Under the Maldives Red List, launched in 2022, an assessment of all marine turtle species has been carried out with the help of local and other expertise, revealing that effective action was urgently needed to conserve turtles. The Hawksbill Turtle was classified as 'Critically Endangered', the Green Turtle as 'Endangered' and Olive Ridley, Loggerhead and Leatherback Turtles were assessed as 'Data Deficient'. Corals, important feeding grounds for turtles, have also been assessed: 23 of the 39 coral species assessed were classified as 'Critically Endangered'.

A crucial milestone for turtle conservation in the Maldives was the banning of killing and harvesting of turtle species in 1995. Since then, conservation efforts have gone from strength to strength. All turtle species are now protected under the Maldives Environment Protection and Preservation since 2016, and the Government has been working on a management plan for sea turtles. Mr Naseer expressed his appreciation for the work of the Olive Ridley Project (ORP), Marine Savers and the Atoll Marine Centre (AMC), and hoped the meeting would generate fruitful conversations and lead to collaborative conservation efforts.

1. Opening of the Meeting

The Chair of the Task Force, Lisama Sabry (Governmental Member Maldives), formally welcomed everyone to the meeting and invited them to make the most of their stay. Vice-Chair Muralidharan Manoharakrishnan (Non-Governmental Member India) welcomed the opportunity to meet again in person, recalling that the NIO-MTTF had originally been established in the Maldives.

The Chair did a tour-de-table introducing the participants, noting that some people had yet to join.

Tine Lindberg-Roncari (Secretariat) made some housekeeping announcements and outlined the Online Meeting Protocol for the Zoom chat.

2. Adoption of the Agenda and Schedule

The Chair introduced the provisional agenda and schedule, which was adopted without revision (see Annex 2).

3. Outcomes of NIO-MTTF-3

The Chair presented the outcomes of the previous meeting of the Task Force (NIO-MTTF-3), which was held online on 13 and 14 December 2021.

The key issues on the agenda included subregional situations and priorities; pilot projects for collaboration in the region; ghost gear management; use of observers or cameras on board tuna gillnetters; reported impacts of COVID19 on monitoring; and an analysis of knowledge gaps in the NIO.

Recommendations and actions included developing a greater genetic understanding of turtles; using tagging to investigate post-capture survival release; collaborating on the collection of information on work that had already been done in the region; updating the Flipper Tag Series numbers in the list maintained by the Secretariat; promoting more local involvement in turtle conservation activities in the region, including through capacity-building; developing dialogues with academia; and exploring emerging technologies such as Artificial Intelligence (AI). Countries were encouraged to submit a national plan of action for sea turtles to the Secretariat and revise the NIO-MTTF terms of reference.

4. Presentations from each Country

Each country presented an update based on a series of questions.

Country Update: Maldives

The Chair, Enas Mohammed (Environmental Protection Agency (EPA)), and Risha Ali Rasheed (Olive Ridley Project; ORP) presented a country update for the Maldives.

New research or conservation projects related to marine turtles and/or their habitats included: citizen science collaborations to collect more consistent data; photo-ID monitoring; capture-mark-recapture population modelling to estimate abundance and demographic patterns; and sea turtle expeditions to establish a population genetics baseline for sea turtle populations in the country.

Ms Mohammed hoped that the first turtle expedition would take place in August 2023. The expedition was a collaboration between EPA and ORP, with additional research capacity provided by staff from MECCT and the Maldives Marine Research Institute. The expedition aimed to study the following objectives: use tagging to gain a better understanding of spatial ecology; study the benthos in specific turtle hotspots; and collect samples for genetics and gut fauna to assess the health of wild populations. Ms Ali Rasheed hoped that the expedition findings would inform local and regional policy and management plans.

Ms Ali Rasheed then highlighted the use of satellite tagging to identify sea turtle migration patterns, diving behaviour, foraging grounds and potential threats. Sea turtle health and behaviour were other areas of focus, with several well-established research programmes in the Maldives.

The first estimate of the potential socioeconomic value of sea turtle tourism in the Maldives had been conducted based on data for 2019 (pre-pandemic).

The first collaborative nesting beach protection project in the Maldives was underway with the training of a Sea Turtle Ranger within the community of L Gaadhoo, one of the most significant Green Turtle nesting sites. Ms Mohammed explained that L Gaadhoo was designated as a protected area (PA) in 2022, including its seagrass beds and reef.

In terms of education and community outreach, Ms Ali Rasheed reported that conservation NGOs were conducting regular training and awareness-raising workshops for stakeholders. Turtle festivals aimed at schools and the wider community were a particular highlight.

The Chair highlighted large infrastructure developments affecting marine turtles and/or their habitats, and the particular impact of dredging, reclamation and coastal modifications such as harbour developments.

The Chair outlined national policies, laws and management frameworks, including: the Strategic Action Plan (SAP) 2019–2023, with activities such as the establishment of Protected Areas (Pas) in habitats that are ecologically significant for sea turtles; the National Biodiversity Strategy and Action Plan, which was about to be revised to align with the Kunming-Montreal Global Biodiversity Framework; the Environmental Protection and Preservation Act and its associated waste management measures, including for plastic management; and the Protected Species Regulation 2021, with guidelines and management plans for sea turtles and stakeholder consultations.

She also highlighted: the National Recovery and Response (NRR), which prioritized PAs and was based on the challenges faced during the COVID19 pandemic; the Single Use Plastic Phase-Out Plan 2020-2023; the PA Regulation; and guidelines for recognizing areas within tourist islands as other effective area-based conservation measures (OECMs). Three areas from tourism islands were chosen as candidates for OECMs.

Emerging threats included: limited government funding, with public revenue focused on basic needs; unsustainable development/encroachment; and climate change. Ms Mohamed highlighted the lack of awareness of and education on conservation; poaching and cultural sensitivities around hunting/harvesting turtles and their eggs; limited resources, especially for monitoring and enforcement; a lack of clarity on the responsibilities of the police; and a ‘parachute science’ mindset. Ms Ali Rasheed added that geographic isolation created temporal and financial challenges and limited local involvement.

The Chair then provided an update on successes and achievements including the conclusion of the Maldives Red List assessment for all five species of sea turtles in the Maldives. This was done with considerable help from experts in the country, especially the ORP. The Green Turtle had been designated as ‘endangered’ and the Hawksbill Turtle as ‘critically endangered’. Leatherback, Olive Ridley and Loggerhead Turtles were found to be ‘data deficient’; this pointed to the need for further research on population trends. She also highlighted the mobilization of resources, including from the GEF Small Grants Programme; the declaration of 79 PAs in the Maldives, which included 29 sea turtle ecosystems; the designation of three atolls as UNESCO Biosphere Reserves; and the relaunch of the National Coral Reef Monitoring Framework.

Ms Mohamed continued with regulatory achievements, including strengthened regulatory frameworks and enforcement; long-term data collection through permits to inform decision-making; a greater focus on behavioural change through education (historically, government

management interventions relied on prohibition or bans); and a strong focus on government capacity-building in research.

More details are available in the presentation linked to above.

Scott Whiting (Advisory Committee) asked what the key problems turtles were facing were. Ms Mohamed highlighted entanglement in ghost nets and plastic, and hatchlings being handled or kept as pets. Mr Whiting also asked whether, through citizen science activities, they ever came across flipper tags from other parts of the world. Ms Ali Rasheed explained that only satellite tagging was allowed given the negative public perception of tagging, and that she was not aware of tags found from elsewhere. The Vice-Chair was surprised that tagged turtles were not being spotted given their migratory routes and said a genetic stock assessment would be helpful as he was confident the turtles were part of the same population.

Shoaib Abdul Razzaque (Non-Governmental Member Pakistan) asked about the transparency of data collected through citizen science. Ms Ali Rasheed said the data was published on the ORP website and submitted to the EPA; Ms Mohamed explained that the EPA was hoping to develop a platform and make the data accessible to the public.

Country Update: Pakistan

Mr Razzaque (Non-Governmental Member Pakistan) presented a country update on marine turtle conservation in Pakistan.

New research or conservation projects included: the Ten Billion Tree Tsunami Programme/Green Pakistan Project led by the Ministry of Climate Change and provincial wildlife departments; monitoring of Green Turtle nesting sites at Daran Beach (Jiwani) and Hawksbay Beach (Karachi) along with the safe releases of the hatchlings into the sea; the Sustainable Fisheries Entrepreneurship Project (SFEP) Phase III (funded by Engro Foundation, Pakistan), cetacean bycatch assessment project (funded by WWF-Australia), Ocean Clean, a scoping study conducted as part of the Ocean Cleanup Project, and, Monitoring of nesting sites of Green Turtles at Hawks Bay and Jiwani Beach, Karachi as regular fundraising and awareness raising ongoing activities led by WWF-Pakistan.

Large infrastructure developments were reported in two marine turtle hotspots, Hawksbay-Sandspit Beach, Karachi (Sindh), and Daran Beach (Balochistan), the main Green Turtle nesting grounds in Pakistan.

Marine turtle species were protected under national law and international conventions. In addition, the National Biodiversity Strategy and Action Plan included provisions for the conservation of marine ecosystems.

Projects aimed for a holistic approach, promoting sustainable fishing practices and reducing the negative impact of overfishing on marine ecosystems; training on data collection and reporting; training and training materials on safe handling and release; coastal cleanups; etc.

Finally, Mr Razzaque shared the details of a fisher training session with coastal fishers of the SFEP-III project and fisheries representatives from the Sindh Fisheries Department (SFD) and Marine Fisheries Department (MFD) in Karachi on using a Fisheries Data Collection Mobile Application (App). The App covered all the different types of data that small-scale fisheries were required to report to the IOTC. Basic analysis of the monitoring data provided information on the composition of species of catch and bycatch by coastal fisheries. The Fisheries Department has advised that it wanted to take the App forward and scale it up.

More details are available in the presentation linked to above.

Ms Mohamed asked whether there were any return schemes for ghost gear. Mr Razzaque said that there were no dedicated activities for this, but that some fishers collected and disposed the ghost gear, which was then recycled at village-level local shops. These collected ghost gears were either reused by fishers for the repair of their fishing gear or were sent to other small businesses for recycling; WWF-Pakistan supported and subsidized existing practices where possible.

Lalith Ekanayake (Non-Governmental Member Sri Lanka) asked about progress with LED trials in relation to bycatch. Mr Razzaque said they had conducted trials on the east coast of Pakistan and preliminary evidence showed that LED lights could increase the target catch but the effect on turtle bycatch was mixed perhaps due to turbidity (although one of the trials reported no bycatch). Fishers supported their use as they helped to catch large quantities of Spanish mackerel – commercially important and seasonally targeted fish. These trials needed to be scaled up.

Ms Mohammed asked about the conflict management sessions. Mr Razzaque explained that he was not directly involved but that the team of sociologists had focused on social, financial and conflict management, and record-keeping of fisherwomen meetings, as part of a project on social mobilization and capacity-building training.

Country Update: Sri Lanka

Rekha Sanjeewani Rajasinghe (Governmental Member Sri Lanka) and Mr Ekanayake (Non-Governmental Member Sri Lanka) presented a country update for Sri Lanka. Ms Rajasinghe explained that the Department of Wildlife Conservation (DWC) had legal authority under the Fauna and Flora Protection Ordinance (FFPO), with a mandate to establish protection, conservation and sustainable use of marine and coastal resources. All sea turtle species were protected under the FFPO. The Marine Unit had been established in 2015, and 9 MPAs and 19 marine-associated PAs were now in place.

Research or conservation projects included: the collection of data by DWC on turtle nesting in four MPAs since 2013 (analysis of nesting data showed that the Olive Ridley was the most frequent visitor to Kumana National Park and Bundala National Park, and the Green Turtle to Rekawa Sanctuary); the imminent declaration of eight more MPAs; a proposed survey of turtle nesting in all MPAs in Sri Lanka; and a proposed extensive monitoring and research programme for sea turtles, including a satellite monitoring/tagging system and an analysis of genetic diversity.

More details are available in the presentation linked to above.

Mr Ekanayake reported that Sri Lanka had received funding to trial LED lights (as a method for mitigating bycatch) and was keen to connect with Pakistan for advice and guidance. Mr Razzaque (WWF-Pakistan) would be happy to share their LED protocols and send some lights to Sri Lanka.

The Chair emphasized that there was a need for regional collaboration in relation to plastics, particularly as turtles were migratory species.

Ms Mohamed asked when the Olive Ridley nesting season was in Sri Lanka and if there were nests throughout the country. Mr Ekanayake explained that 90 per cent of nests in Sri Lanka

were for Green Turtle and that the Olive Ridley nesting season was from October to March. Ms Mohamed further asked how they addressed egg harvesting. Ms Rajasinghe said principally through legal action and Mr Ekanayake also described a highly successful project started in 1996/7 that had provided incentives to poachers to become nest protectors (with in-situ nests protected 24/7). With the development of ecotourism, nest protectors have become licensed turtle guides, providing financial support for about 20 families. The issue now was that there was too much tourism and that there was a need for controls. Ms Mohamed asked if the money from selling eggs was higher than the salary of a turtle guide; Mr Ekanayake said the salaries were much lower, but that people were aware that poaching was illegal, with high fines and jail sentences.

Country Update: Bangladesh

Mohammed Zahirul Islam (Non-Governmental Member Bangladesh) presented a country update for Bangladesh. Green and Olive Ridley Turtles were common in Bangladesh, with most nesting on the south-east coast. The current focus of sea turtle conservation was on this area. Foraging Hawksbill Turtles had been observed and sometimes stranded in ghost nets in near-shore waters. There had been some development, including for tourism, on the coast, and a decline in nesting as a result.

New research or conservation projects included: a satellite tagging programme started in 2012, funded through the World Bank and the Bangladesh Forest Department. The data showed that most turtles migrated along the Indian coast; one travelled to Sri Lanka and a Green Turtle travelled to Myanmar and did not return. Other activities included: nest conservation and hatchling production, with seasonal hatchling grounds installed annually; a fisher community awareness-raising programme aimed at bycatch reduction; a community-based sea turtle restoration project; nest monitoring and conservation; offshore fisher training on bycatch reduction; school education on sea turtles and marine megafauna; and community training on sea turtle monitoring.

More details are available in the presentation linked to above.

Country Update: India

The Vice-Chair presented a country update for India, explaining the primary focus had been on Olive Ridley Turtles due to the large mass of nesting sites in Orissa and the Andaman Islands, which had between 200,000 and 300,000 nesting turtles. There were circa 180 nesting beaches and plans to expand the PA network.

New research and conservation projects included: the tracking of Olive Ridley Turtle movements in Maharashtra (Wildlife Institute of India (WII), Dehradun); a comprehensive sea turtle population monitoring assessment, to be initiated shortly (WII, Dehradrun); the tracking of Leatherback Turtles in the Andaman and Nicobar Islands, which had >1,000 Leatherback nests annually (Indian Institute of Science (IISc) and Dakshin Foundation, Bangalore); flipper tagging of Leatherback Turtles in the Nicobar Islands (Zoological Survey India (ZSI)); a photo-mark-recapture study of foraging Green and Hawksbill Turtles in Lakshadweep (Dakshin Foundation, Bangalore) – although there were challenges with communication; and a monitoring and data collection programme in Andhra Pradesh, Goa, Kerala and Gujarat (WWF-India) following the identification of ghost gear and marine debris as a threat across the region.

More details are available in the presentation linked to above.

The Chair remarked that the Maldives could learn from India's development of the National Marine Turtle Action Plan.

Ms Ali Rasheed asked about studies of India's sea turtle populations. The Vice-Chair explained that, due to the size of India's coastline, the focus had been on index sites. Flipper tagging had allowed rough estimates, but mass nesting enumeration followed a very specific transect protocol recommended by the IUCN-SSC Marine Turtle Specialist Group. Annual nesting numbers had been monitored since the 1970s by state agencies and others. Dakshin Foundation also investigated offshore aggregations of turtles.

Mr Ekanayake noted that Sri Lanka had recorded a tagged turtle from India and the Vice-Chair said there was a long record of Sri Lanka and India sharing information. Mr Ekanayake highlighted that an increase in Green Turtles had been recorded and the Vice-Chair expressed interest in this, noting increased conservation measures in India and Sri Lanka as well as a decline of large sharks in the IO region, which helped to increase sea turtle populations. In Lakshadweep, there was conflict between fishers and Green Turtles, which had over-foraged seagrass beds, affecting reef fish diversity in the region. He stressed the need to address this as a region.

5. Sub-Regional Situation and Priorities

The Vice-Chair led this session, reminding members of the discussion at NIO-MTTF-2 where a list of priority tasks for each country had been compiled. These had been reproduced for this meeting in CMS/IOSEA/NIO-MTTF-4/Doc.5 Priorities Identified by NIO-MTTF-2 to aid discussions on the sub-regional situation and priorities. He encouraged participants to update the tables as appropriate. As the tasks were reviewed item by item, changes were made on-screen and the meeting agreed to the revised list.

The updated tables can be found in Annex 3 and 4 to this report.

6. Pilot Research Projects for Collaboration

Jack Frazier (Advisory Committee Chair) had prepared a presentation on Marine Turtles and Human Dimensions. The Vice-Chair gave the presentation on Mr Frazier's behalf as his remote connection was not stable enough. In the presentation, Mr Frazier stressed the need to understand both turtles and people to solve the turtle conservation problem, widen the scope of the work beyond the science and read a variety of literature. Archaeological evidence showed that humans had been preying on sea turtles for at least 60,000 years.

More details are available in the presentation linked to above.

Ms Frisch-Nwakanma read out an email from Mr Frazier, in which he explained that topics such as citizen science, engaging local communities and alternative livelihoods should play an important role in the NIO-MTTF's discussions. He urged participants to consider whether the motivation behind these initiatives was to have local communities conform to the needs of conservationists, or whether these were attempts to engage with them as partners and develop plans for the future in full collaboration. Mr Frazier was encouraging Task Force Members to adopt the latter mindset.

The Vice-Chair said that in India there was now a greater understanding that communities (particularly fishing communities) were also knowledge providers.

Mr Whiting agreed it was important to involve social scientists and diverse partners, from communities to government, already in the project planning stage, building capacity from local to government level. He referenced the UN Decade of Ocean Science for sustainable development, which foresaw two-way knowledge transfer. In Australia, for example, indigenous peoples were permitted to harvest turtles as a part of their traditional practice.

Mr Zahirul said that in Bangladesh, collaboration between biologists and local communities was essential and that communities had a lot of knowledge to share. He wondered whether it would be good to publish information on this.

The Vice-Chair then requested each country to identify one priority of national importance and one of regional importance. These were collated, with the members prioritizing the pilot projects for collaboration. These were then reviewed and included in the Table of Priority Actions (see Annex 4 to this report).

7. Foraging Turtles in the Eastern Indian Ocean and Links to Other Regions

Scott Whiting presented on Foraging Turtles in the Eastern Indian Ocean and Links to Other Regions.

The Cocos Keeling Islands were situated halfway between Perth, Australia, and Indonesia, and comprised a southern atoll with 25 islands and a northern atoll with one island. Settlers had established settlements for coconut plantations in 1826. It was a primarily Muslim culture; most inhabitants were descendants of workers from South-East Asia, and called themselves Cocos Malays. In 1984, the residents voted to come under the authority of the Australian Government.

Little was known about sea turtles on the islands until 1999. From 1900 to 1950 turtles were in short supply and were brought from Java. In the 1970s, turtle hunting was stopped by a re-interpretation of religious law. Turtle studies began in 1999; between 1999 and 2016 there was an abundance of resident Green and Hawksbill Turtles. There was a moderate level of Green Turtle nesting on the islands, which were a separate genetic stock. There were very large seagrass beds and turtles occupied many of these habitats.

Mr Whiting then focused on the loss of seagrass in the Cocos Keeling Islands, which was essential for the Green and Hawksbill Turtle diet. Earlier data indicated very high growth rates for juvenile Green Turtles. A 2016 study (Buckee et al., 2016) found an 80 per cent loss of seagrass, attributed to coastal development and climate change stressors. Factors inhibiting seagrass recovery could include sea turtles continue to graze on recovery shoots of seagrass and also remaining poor water quality (high turbidity). As the islands were extremely isolated, the seagrass loss could extend for many decades. Seagrass remained vital for ecosystem health and fish and invertebrate biodiversity and well as cultural food security. Turtles had started dying and the population and growth rates were expected to decline. A two-year study was starting to investigate turtles again using historical data.

Mr Whiting then described other links between turtle populations in the Indian Ocean. Leatherbacks in Australia, for example, had links to the Northern Indian Ocean (Tracking Leatherback Turtles from Little Andaman Island. Adith Swaminathan, Naveen Namboothri, Kartik Shanker, Dakshin Foundation, IO Turtle Newsletter No 29).

Loggerhead Turtles were also found to have long-distance migratory routes. There were large Loggerhead rookeries in Australia and during winter storms with onshore winds post-hatchlings

were blown ashore, taken into care, and released six months later. Transmitters had been put on some of the turtles, tracking them for up to 260 days before they lost transmission. One famous Loggerhead Turtle, Yoshi, had been picked up by a Japanese fisher, housed in an aquarium in South Africa for 25 years, then released with a transmitter. Tracking data indicated she travelled to from South Africa to Western Australia. One theory was that Yoshi was a Western Australian turtle and 25 years later returned to her native waters. Mr Whiting also shared two different techniques for capture and tagging, netting or jumping, which worked for Flatback Turtles as they tended to stay near the surface. They had caught 160 turtles this way.

He concluded by emphasizing the benefits of longer-term foraging studies that connect rookeries to foraging areas and provide population parameters that cannot be obtained at the nesting beach.

More details are available in the presentation linked to above.

The Vice-Chair stressed the need for research on seagrass loss. Mr Whiting referred to funding available for work on seagrass through the MOU on the Conservation and Management of Dugongs and their Habitats throughout their Range (CMS Dugong MOU) and other groups working on the restoration of seagrass.

Regarding the seagrass loss around the Cocos Keeling Islands, Andrea Phillott (Invited Expert, FLAME University) referenced Rohan Arthur's work on turtles relocating and adapting. Mr Whiting agreed but pointed out that because the Cocos Islands were so remote, turtles did not seem to relocate, remained at Cocos and became malnourished (see Buckee, J., Hetzel, Y., Nyegaard, M., Evans, S., Whiting, S., Scott, S., Ayvazian, S., van Keulen, M. and Verduin, J., 2021. Catastrophic loss of tropical seagrass habitats at the Cocos (Keeling) Islands due to multiple stressors. Marine Pollution Bulletin, 170, p.112602. https://www.sciencedirect.com/science/article/abs/pii/S0025326X21006366).

8. Conservation of Leatherback Turtles in the Andaman and Nicobar Islands and the Northern IO

Adhith Swaminathan (Invited Expert, Dakshin Foundation) presented on Conservation of Leatherback Turtles in the Andaman and Nicobar Islands and the NIO, highlighting the Dakshin Foundation's three projects in the Lakshadweep, Andaman and Nicobar Islands, and in Odisha on Olive Ridley, Leatherback and Green Turtles. The Foundation had also initiated (in 2009) the Turtle Action Group (TAG) network with 20 NGO members and a Sea Turtles of India portal where people could upload data.

In regard to Leatherback Turtles in the Andaman and Nicobar Islands, Satish Bhasker, a pioneer in sea turtle biology and conservation in India, had visited most of the islands in the archipelago between 1978 and 1995. Many of the nesting beaches he surveyed were now recognized as important sites for protection.

Between 2010 and 2014, the Foundation had a small grant to track Leatherback Turtles nesting on Little Andaman Island and they were tracked all the way to Western Australia and East Africa. A recent set of transmitters gave them more data, with one turtle transmitting up to 395 days and covering up to 12,000 kms. The data showed that Leatherback Turtles travelled to both ends of the Indian Ocean. They had not managed to establish a long-term monitoring programme on the Nicobar Islands but had been conducting surveys, which showed that the population was stable. Forty years of research revealed that Leatherback Turtles nesting in the Andaman and Nicobar Islands made up the most significant nesting population in the NIO.

Future plans included the continuation of the monitoring programme in Little Andaman Island, with the hope of sourcing funding to conduct satellite tracking. The Foundation had been trying to conduct periodic rapid surveys in Great and Little Nicobar Islands, with island-wide surveys in the Andaman Islands of other species of turtles, to standardize the mass nesting census, and expand education, capacity-building, outreach and community engagement.

Andrea Phillott (Invited Expert, FLAME University) asked if the Olive Ridley population in the Andaman Islands was being monitored and wondered how the proposed development in the Andaman and Nicobar Islands would affect Olive Ridley and Leatherback Turtles. Mr Swaminathan said there were mitigation plans in place and the turtles were nesting in multiple sites so seemed quite resilient.

The Vice-Chair asked whether they had found tagged Leatherback Turtles from before the tsunami; Mr Swaminathan explained that their recapture rate was quite low given the limited resources, and they had not found any yet. In response to a question from Mr Whiting about Leatherback Turtle trends, he said the population appeared to be quite stable, with annual fluctuations.

9. Monitoring and Mitigating the Impact of climate change on sea turtle eggs and hatchlings

Andrea Phillott (Invited Expert, FLAME University) presented on Monitoring and Mitigating the Impact of Climate Change on Sea Turtle Eggs and Hatchlings, with a focus on the impact of climate change on sex ratios (as turtles sex is temperature-dependent) and the factors affecting hatchling survival.

She first explained the temperature tolerance range of sea turtle embryos, with the upper tolerance being circa 33-35°C and lower tolerance 25-27°C. Hatchling production decreased with extreme incubation temperatures. At high temperatures, more females would be produced, but there was also a risk of embryo mortality.

Accordingly, mitigation measures have been developed and utilized. However, she stressed the need to monitor before mitigating to assess whether and, if so, what measures are needed.

She concluded by stressing that sea turtle populations were expected to have some resilience to climate change. It was only necessary to mitigate high nest temperatures when ongoing monitoring indicated it was needed, not as a precautionary measure.

More details are available in the presentation linked to above.

Mr Ekanayake asked about Olive Ridley Turtles as they nested on open beaches. Ms Phillott said measures depended on the temperature and location; the approach for one species might not apply to all. The Vice-Chair noted that sex ratios of Olive Ridley Turtles on the east coast of India varied: some years they were almost 100 per cent female and other years around 40 per cent. It also depended on rainfall. He stressed the need for monitoring and a long-term data set. He also noted that regulating temperature in hatcheries was a challenge as they often maintained a constant temperature and could be like an oven rather than cooling overnight.

Suresh Kumar (India) asked how to address situations where there was high mortality but not sufficient expertise to make a sound decision. Ms Phillott advised looking for warning signs such as eggs not hatching or hatchlings not making it out of the nest. Nest structure was a challenge when relocating nests as broad open holes did not reflect the natural structure of the nest. She again stressed the need for monitoring before and while measures were taken. Mr

Razzaque highlighted concerns about the impact of carrying out mitigation measures and suggested hatchlings emerged in cooler temperatures and with tidal movement that cooled beaches.

The Secretariat proposed developing guidelines on this for the MOU. Ms Phillott stressed that collection of baseline data was important.

The Vice-Chair agreed that monitoring was important, and that it would be useful to recommend basic requirements for hatcheries such as a format/process for recording temperature and the equipment required. There was currently no monitoring of moisture in India for example. This could be included in recommendations from the MTTF.

Ms Mohamed noted that in the Maldives there was currently no sex determination being carried out on hatchlings and asked for advice on best practices for examining sex ratios. Ms Phillott noted that there were different approaches, including keeping a sample of hatchlings until they grew bigger and then doing a surgical laparoscopy (although she did not advocate this); conducting a blood test (but this was not currently available at scale); and examining the dead embryos in the nest (but this was only an indicator and could be skewed). Ms Mohamed also asked if there could be a shift in sex ratio after the monsoon and Ms Phillott confirmed research indicating that rainfall affected sex determination. The temperature during the middle third of incubation (the thermosensitive period) determined the sex of the hatchling.

The Vice-Chair said that another method sometimes used was to sacrifice a few live hatchlings for testing as there was a bias in using dead hatchlings unless there was historical data.

10. Photo-ID and Citizen Science

Katarina Himpson (Invited Expert, Reefscapers) presented on Citizen Science and Turtle ID. The Maldives were important foraging and nesting grounds for Green and Hawksbill Turtles, with no apparent set nesting season. Green Turtle nests were recorded more commonly. There was inter-atoll variation in species composition and evidence of a mid-century population decline.

Conservation challenges included the remoteness of the islands, competing development priorities, and the lack of community engagement – currently most conservation was carried out by foreigners working in resorts so there was a level of disconnect between people, the environment and cultural heritage. The solution was citizen science.

The intention of this project under the Maldives Sea Turtle Conservation Programme (MSTCP) was to produce an observational study on distributions, site carrying capacity and population stability. There were limitations to the data, with a geographical/temporal bias, coarse scale, limited reliability (as most submissions were from visitors with little or no training) and a decrease in reporting over time. They were trying, through the outreach programme, to encourage locals to submit photos (underwater cameras were now more accessible than in the past).

More details are available in the presentation linked to above.

Mr Razzaque asked about the challenges of the Photo-ID project – for example, how to obtain quality photos around nests in the dark when using flashlights was discouraged. Ms Himpson explained that most submissions were from in-water sightings and the photo quality was a challenge, but they had the technology to address this.

Mr Whiting asked if they took field trips themselves. Ms Himpson said they ran trips with resort guests, so guides could visit sites regularly and record sightings, depth and behaviour patterns.

The Vice-Chair asked if they were collating the Photo IDs and what the training protocol was to avoid double-counting. Ms Himpson explained that they had only recently started to process the data but hoped to write it up in due course. The Vice-Chair also asked if they planned to survey for population density or abundance and Ms Himpson said this would depend on resources (currently, they were awaiting the delivery of a drone).

Martin Stelfox (observer, online) referenced a recent paper: "A brighter future? Stable and growing sea turtle populations in the Republic of the Maldives".[1] The data suggested that the populations of both Green and Hawksbill Turtles were stable and/or increasing and that the country appeared to provide excellent habitat for recruiting juveniles of all species.

11. Prioritising Research and Conservation Efforts

Mr Whiting presented on Prioritizing Research and Conservation Efforts, first outlining a number of non-static factors that impacted turtle conservation project management, including global economics, education, communication and partnership politics at all different levels.

Prioritization was necessary because of the scarcity of time and money, the need for accountability, and to reassure and provide transparency for stakeholders, managers or funders.

There were many ways to prioritize, both complex and simple. He presented one example as outlined in Simpson et al. 2015 "Prioritisation of conservation research and monitoring for Western Australian protected areas and threatened species" (Conservation Science W Austr. 9 (3) 227-237 (2015)).

He outlined the framework used in Western Australian Marine Parks, which included a process for identifying the value of assets, pressures and knowledge gaps (see https://flatbacks.dbca.wa.gov.au/sites/default/files/NWSFTCP%20Strategic%20Conservation%20Plan.pdf and https://library.dbca.wa.gov.au/static/Journals/080559/080559-09.007.pdf). The framework used a series of questions to score each of these. The results were used to compile a table showing what should be worked on and why:

- High Value x High Pressure = Conservation and Monitoring Priority
- High Pressure x High Value without Knowledge = Applied Research Priority
- High Value x Low Knowledge = Fundamental or Foundation Research Priorities

Western Australian Marine Parks carried out this exercise for Flatback Turtles, listed all pressures and obtained a score prioritizing: artificial light, introduced pest/feral animals, global temperature increases, modification of beaches, and marine debris. He outlined the categories of conservation actions under each element as well as the overarching/overlapping actions. All these formed the basis for the action plan. Under each action there would be a management objective and target, with deadlines and outputs/milestones.

[1] Hudgins JA, Hudgins EJ, Köhnk S, Mohamed Riyad E, Stelfox MR (2023) A brighter future? Stable and growing sea turtle populations in the Republic of Maldives. PLoS ONE 18(4): e0283973. https://doi.org/10.1371/journal.pone.0283973

Mr Whiting then focused on monitoring as a management strategy. He shared a 'levels of knowledge' pathway, which could be used for monitoring activities, starting with assessing baseline information and moving on to the ability to define monitoring parameters and, finally, the ability to set targets and limits of acceptable change. He explained that it was useful to move along that continuum but starting by obtaining basic, standardized and annual data..

Monitoring needed to be consistent, repeatable, done over a long-enough time series, representative (e.g. for a rookery or management unit), effective and efficient. He shared some graphs that showed the effectiveness/ineffectiveness of different management programmes and the importance of monitoring.

He then turned to environmental offsets – i.e. requirements for companies to compensate for residual impact from a proposal or activity so that there would be no net loss but hopefully a net gain for the environment. Direct offsets included protection or restoration, such as 'like-for-like' habitat protection or rehabilitation. Indirect offsets included research or education to benefit the asset (e.g. turtles, seagrass, birds). In countries where no offset legislation existed, proponents sometimes proposed voluntary offsets. Environmental offsets could be controversial, and Mr Whiting posed the question: was it really possible to offset biodiversity loss?

Arguments against offsetting included: most assets cannot be replaced or offset (there is no 'like-for-like'); the benefits are unmeasurable (there are no universal metrics for biodiversity); and the high level of uncertainty (particularly in terms of time lags and the lack of knowledge of many systems). Moreover, failure could have severe consequences.

Arguments for offsetting included: linking the proponent with likely damage, following the 'polluter pays' principle; and providing a market value for the land or asset. There was almost always a residual impact, so this could provide significant additional long-term funding and promote a social conscience among industry. In Australia, for example, marine turtle-related offsets since 2009 totalled AU$75 million.

He referenced the North West Shelf Flatback Turtle Conservation Programme (NWSFTCP) which he manages. The programme was funded by Chevron at AU$1 million per year for 60 years. The objectives were to increase the conservation and protection of the stock through monitoring and research, mitigation of threats, and information and education programmes. The benefits of such a long-term initiative included that it allowed planning to be done over a long period and provided time for building systems. It created trust and consistency among partnerships and stakeholders, leveraging collaborative projects, knowledge benefits, long-term monitoring and the transfer of knowledge to decision makers. It also created funds for mitigation and allowed time to change policy and legislation, while buying in political support.

The Vice-Chair acknowledged the importance of using these frameworks to communicate with managers and felt it was a useful resource for countries.

12. Sea turtle health and rehabilitation

Max Polyak (Invited Expert, Olive Ridley Project) presented on Sea Turtle Health and Rehabilitation. He was the lead veterinary surgeon for the Olive Ridley Project (ORP), which was involved in rehabilitation, research, and communication and outreach. Over the past ten years, ORP has established the Marine Turtle Rescue Centre (MTRC); treated 200 sea turtles and released 107 of them, besides a photo-ID project, ghost gear recovery, and education programmes.

ORP had treated numerous Hawksbill, Green and predominantly Olive Ridley Turtles presenting clinical conditions such as injuries from entanglement and buoyancy disorder. Their vision was to become a 'Sea Turtle University': an advanced clinical teaching hospital, multidisciplinary research programme and professional training centre. Turtle health was a key part of their clinical research. MTRC had a lead veterinary surgeon, resident veterinary surgeon, qualified veterinary nurse, and veterinary programme officer as well as a clinical chemistry/blood laboratory and facilities for digital radiography, endoscopy, ultrasound, photobiomodulation (Class 4 laser) and surgery.

Mr Polyak then focused on treatment. For entanglements, the current standard of care was conventional wound management with selected amputations. To improve this, they had developed a limb salvaging protocol that involved cellular-molecular-integrative medicine, including laser therapy, stem cell therapy, platelet-rich plasma therapy and acupuncture. For buoyancy disorder, they employed a comprehensive approach involving targeted external weight therapy, training new muscle memory, nebulization, centesis, blood patches from a donor to repair tears in the lungs, sea cage training, and surgical implants.

A key component of the project was the integrative research programme, which aimed to increase knowledge of sea turtle health in the region. The recent awarding of a multi-year grant would enable the development of a sea turtle health reference database of hospitalized and wild animals through clinical bloodwork and gut microbiome analysis.

Finally, the MTRC had a well-established professional training centre with a visiting veterinary programme. ORP was the founding member of the Sea Turtle Rescue Alliance, designed to expand access to expertise on sea turtle medicine (with 16 current members). The Alliance would soon host a regional veterinary training course in Thailand and Mr Polyak invited all NIO-MTTF members to encourage interested veterinarians to participate in the training. Mr Ekanayake was keen to send some Sri Lankan surgeons to the training.

Ms Himpson asked for good sources on the effectiveness of laser therapy in treating sea turtles. Dr Polyak said unfortunately most information was anecdotal as not enough had been published on this topic – the work he had just presented was his evidence. Furthermore, in the bloodwork, they had found indicators linked to high levels of stress in injured patients. Interestingly, the results from animals that underwent laser treatment were normal. This was not a full study, but enough to make them want to investigate it further.

Mr Whiting asked what sort of model he envisaged for the 'university'. Dr Polyak said it was currently just a concept, but they were developing relationships with the Maldives National University and some other universities. Mr Whiting noted that crocodiles and sea turtles had an enhanced ability to heal compared to humans. There was a group working on crocodiles that were researching this and he wondered if Dr Polyak knew anyone working on something similar for sea turtles. Dr Polyak said immunologists were studying the incredible ability of sea turtles to heal and deal with pathogens: sea turtles were in a constant state of tolerance; if a pathogen entered their body, the immune system recognized it as a foreign body but did not attack it.

13. Recommendations and Actions

The Vice-Chair drew attention to Table 2, 'Detailed issues/tasks identified by NIO-MTTF according to priority, status of completion and identified volunteer to oversee the completion' in CMS/IOSEA/NIO-MTTF-4/Doc.5 Priorities Identified by NIO-MTTF-2. Members reviewed the table item by item and made additions and revisions on-screen. They also reviewed and updated the IOSEA flipper tagging database. The priorities agreed under Agenda Item 6 were

also reviewed and included in the Table. The overall deadline for actions was agreed as prior to NIO-MTTF-5. The revised Table 2 can be found in Annex 3 to this report.

The discussion then focused on funding concerns. Ms Frisch-Nwakanma (Secretariat) referred to guidance developed by the Advisory Committee on Funding Opportunities and Fundraising Resources for Marine Turtle Conservation, which was designed to help with funding applications. The Secretariat was offering to write a letter of support for funding applications for research or conservation projects that the Advisory Committee had prioritized (see List of IOSEA AC-endorsed research and other priorities to help to leverage funding for scientific research) or that the NIO-MTTF had identified as a priority. The Vice-Chair suggested putting together collaborative proposals, with support from the Advisory Committee, based on the approach outlined in Mr Whiting's presentation under Agenda Item 11.

14. Next Meeting

Ms Frisch-Nwakanma (Secretariat) reminded members of the revised Terms of Reference for NIO-MTTF meetings agreed by NIO-MTTF-3, which foresaw annual meetings, with an in-person meeting at least every two years and others held online. NIO-MTTF-5 should therefore be held online in 2024, unless a country volunteered to host it. She also noted that the 9th Meeting of the Signatory States to the MOU (MOS9) would likely be held in the first half of 2024 and that there would therefore not be time until later that year, except perhaps for a preparatory meeting prior to MOS9.

The Vice-Chair invited offers to host. Following the discussion on funding (see Agenda Item 13) it was agreed to plan for an online meeting in late 2024, with a two-month window for countries to consult domestically on the possibility of hosting in 2024 or 2025 and then feed back to the Secretariat and the Chair.

Mr Ekanayake raised the challenges of securing additional funds to host meetings. The Vice-Chair proposed that funding could be provided collaboratively by all Signatories. The Chair asked whether this would entail an increase in contributions to the MOU; the Secretariat instead recommended MTTF members self-organize to fundraise collaboratively. The Vice-Chair reminded members that funding towards hosting NIO-MTTF-2 in Sri Lanka had been provided by WWF-Pakistan and the Dakshin Foundation. It was agreed that members would consult with their countries and consider options.

15. Any other business

Mr Whiting encouraged participants to consider what they were taking home from the meeting and note any connected outcomes or stories that they could bring to the next meeting, noting that it would be important to share these with funders and governments that were considering hosting the Task Force.

16. Closing of the meeting

Warm expressions of appreciation for the generous hosting in a beautiful location were extended to the Government of the Maldives. Following the customary acknowledgements of the Chairs and all participants, the Chair encouraged members to collaborate through the WhatsApp group, and reminded them about the field trip the next morning, before closing the meeting.

Annex 1

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Annex 2

Agenda

1. Opening of the Meeting
2. Adoption of the Agenda and Schedule
3. Outcomes of NIO-MTTF-3 (2021)
4. Presentations from each Country
5. Sub-Regional Situation and Priorities
6. Pilot Research Projects for Collaboration
7. Foraging Turtles in the Eastern Indian Ocean and Links to Other Regions
8. Conservation of Leatherback Turtles in the Andaman and Nicobar Islands and the Northern Indian Ocean
9. Monitoring and Mitigating the Impact of Climate Change on Sea Turtle Eggs and Hatchlings
10. Photo-ID and Citizen Science
11. Prioritizing Research and Conservation Efforts
12. Sea Turtle Health and Rehabilitation
13. Recommendations and Actions
14. Next Meeting
15. Any Other Business
16. Closing of the Meeting

Annex 3

Priority Tasks & Sub-regional Projects for Collaboration

Table: Detailed issues/tasks identified by the Task Force according to priority, status of completion and identified volunteer to oversee the completion (I - Initiated, NI - Not Initiated, RT - Requires training, RF - Require funding, TT - Transfer of technology, NA – Not Applicable)

Current High Priority Tasks

Issues/ Tasks	**BGD**	**IND**	**MDV**	**PAK**	**LKA**	**Overseen by**	**Comments**
(Large scale, mechanised) Fisheries/bycatch							
Training of observers (separate for trawlers/ gill nets, smaller outboard fisheries in large quantities)	I	NI	I	I	I	National volunteers	BGD + LKA: Small scale fisheries not large fisheries
Soak time (needs preliminary data collection)	NI	NI	NA	I	NI	National volunteers	
Training for safe releases	I	I	I	I	I	National volunteers	Collate regional practices
Reduction technologies (TEDs)	I	I	NA	I	NI	National volunteers	Check compliance levels
Reduction technologies (LED lights)	NI, RT, TT	NI, RT, TT	NA	I	I	National volunteers	
Delimiting mesh sizes (needs preliminary data collection)	NI	NI	NA	I	NI	National volunteers	Distinguish between mono- and multifilament
Enforcing compliance with fishing regulations						National volunteers	Workshops to be conducted with fisheries/environment ministry to clarify details on regulations (outside of capacity of MTTF, refer to MOS/WP)
Standardized monitoring protocol							
Hatchery and head-starting practices	I	I	NA	I	I		Published

Issues/ Tasks	BGD	IND	MDV	PAK	LKA	Overseen by	Comments
In-water studies (photo identification, etc.)	NI	I	I	I	NI	Martin Stelfox	Central repository to be identified
Strandings and mortality (data collection, database)	I	I	I	I	I	Murali	Repository needs to be set up (e.g. expand data portal in India)
Tissue sampling	I	I	I	I	I	Andrea	Published, Phillott, A. D., & Gamage, R. N. (2014). A summary of sea turtle genetic studies in the Indian Ocean and Southeast. *Indian Ocean Turtle Newsletter*, *20*, 19-35. FitzSimmons, N. N., & Limpus, C. J. (2014). Marine turtle genetic stocks of the Indo-Pacific: identifying boundaries and knowledge gaps. *Indian Ocean Turtle Newsletter*, *20*, 2-18.
Determining sex ratios	NI, TT	I	NI, TT, RF	NI	I, TT	Andrea	In Process
Ghost nets							
Direct dialogue/surveys with fishermen	I	I	I	I	NI	ORP / Martin Stelfox	In Process
Collaborative research							
Regional flipper tagging database/addressing gaps	I	I	I, TT	I	I		Advice from AC requested
Genetics	I	I	I	NI	I		
Identifying important foraging grounds	I	I	I	I	I		

Issues/ Tasks	BGD	IND	MDV	PAK	LKA	Overseen by	Comments
Sustainable eco-tourism							
Establishing guidelines						Lalith, Lisama, Andrea & Shoaib	Compile examples from sub-region
Citizen science							
Educate on data collection and species identification, etc.	I	I	I	I	I		
Sea turtle health							
Document sea turtle health (baseline data)						Max	
Conduct training for veterinarians						Max	
Sharing first aid best practices and guidance for rehabilitation facilities							

Lower priority/to be addressed in the future

Issues/ Tasks	BGD	IND	MDV	PAK	LKA	Overseen by	Comments
(Large scale, mechanised) Fisheries/bycatch							
Gear modification (hook/net modification)	I	NI	NA	I	NI		
Promotion of low impact fishing gear (needs preliminary data collection)							(outside of capacity of MTTF, refer to MOS/WP)
Recommend to national fisheries agencies to monitor sea turtle bycatch							
Identifying gear/nets being used; (need to collect secondary data from fisheries)							(outside of capacity of MTTF, refer to MOS/WP)
Collaborative research on and protection of all species							
Satellite telemetry	I	I	I	I	I		
Identifying important nesting habitats	I	I	I	I	I		
Identifying important developmental habitat	I	I	I	I	I		

Issues/ Tasks	BGD	IND	MDV	PAK	LKA	Overseen by	Comments
Identifying important migratory corridors	I	I	I	I	I		
Maintaining long-term index monitoring sites	I	I	I	I	I		
Taking a multi-species approach (Sea birds, marine mammals, sea snakes, protected elasmobranchs)	I	I	I	I	I	National volunteers	
Coastal development and artificial light							
Best practices to manage coastal development and artificial light to be made available to the NIO							E.g. ports (outside of capacity of MTTF, refer to MOS/WP)
Use local consultants/experts rather than international consultants/experts							(outside of capacity of MTTF, refer to MOS/WP)
Socio-economic issues							
Determine best practices (social sciences – literature review)	I	I	I	I	I		Covered in WP
Impact of climate change							
Monitor nest temperatures							
Determine pivotal temperatures							
Monitor habitat variables							
Marine pollution							
Monitoring nesting beach habitat for pollution							

Annex 4

Table of Priority Actions

Country	Priority Tasks
Bangladesh	Communication gaps between the regional partners (e.g. make use of informal opportunities like Newsletter)
	Common platform to update information (could be through IOSEA website: Information hub with links)
	Sharing satellite tracking information in the region (publish overview of data as regional overview)
Sri Lanka	Keep ground level staff engaged with the MOU
	Genetic information on loggerheads in the region initiated
	Provide regular updates of information on regional genetic stocks
	Foraging population of hawksbills in the region to be monitored
	Gap in information on nesting/habitat surveys in northern Sri Lanka
	Decision on leaving wild nests even under threat of natural predation/inundation (as opposed to artificial threats)
Pakistan	Improving communication between the national and regional partners
	Identifying non-nesting of Olive Ridleys (Genetics, satellite telemetry)
	Determining impact of climate change on the habitat and species population
	Enhancing engagement of local fisher communities (Govt and NGOs for safe release and tagging)
	Replicating crew-based observer schemes
	Implementing hatchery management objectives
	Tackling extent of poaching of eggs/hatchlings and other life stages
	Funding for research and on-ground activities to fil the scientific gaps for marine turtle populations
Maldives	Addressing larger regional threats for turtles (impacts due to fishing, ghost nets, poaching)
	Communication channels (Social media campaigns; WhatsApp group)
	Increase of resource mobilization for monitoring and enforcement
	Increase awareness and education, especially targeting police officers
	Increase local participation in conservation (guidance for region to track progress)
India	Hatchery management objectives, distinguish conservation role and awareness raising role
	Tagging information from the region to be updated
	Best practices for incentives for protection/alternative livelihoods for local communities