EDITORIAL

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This special issue of IOTN on sea turtle-fisher interactions encompasses studies and reports from Bangladesh, India, Malaysia, Maldives, Pakistan, Sri Lanka and Tanzania. Showcasing the variety of work addressing this issue in the Indian Ocean and Southeast Asian region, articles present the outcomes of interviews, awareness campaigns and TED trials with fishers, a study of turtle entanglements in ghost gear, and the rescue and rehabilitation of turtles caught in fishing gear. We are reminded that while stranding information is most often used as indication of mortality due to interactions with fishers, it may also also provide information on species distribution, as the discovery of a stranded green turtle in Karwar (on page 29 of this issue) suggests a previously unknown feeding area or migratory corridor for the species.

Reports from the recent Symposium on Sea Turtle Conservation in Asia in Pakistan, and the 35th Annual International Symposium on Sea Turtle Biology and Conservation in Turkey, are complemented by the announcement for the 36th Annual International Symposium on Sea Turtle Biology and Conservation to be held in Peru. We hope to see you at the meeting for the Indian Ocean and Southeast Asia region and ghost gear workshop, both of which will precede the symposium itself.

IOTN readers are also encouraged to suggest study sites to investigate artisanal bycatch in the Indian Ocean (see the request from Kimberley Riskas, at James Cook University in Australia, on page 47 of this issue). None of us can improve the outcome of turtle-fisher interactions on our own, and we hope Issue 22 of IOTN demonstrates the potential for collaboration among countries and organisations in our region. Further reports and studies on turtle-fisher interactions and bycatch reduction methods are welcome for future submission to IOTN.

CALL FOR SUBMISSIONS

The Indian Ocean Turtle Newsletter was initiated to provide a forum for the exchange of information on sea turtle biology and conservation, management and education and awareness activities in the Indian subcontinent, Indian Ocean region, and south/southeast Asia. If you would like to submit a research article, project profile, note or announcement for Issue 23 of IOTN, please email material to iotn.editors@gmail.com before 1st November 2015. Guidelines for submission can be found on the last page of this newsletter or at http://www.iotn.org/submission.php.

ARTICLES

A PILOT STUDY OF THE INTERACTIONS BETWEEN MARINE TURTLES AND THE ARTISANAL GILL NET FISHERY IN TEMEKE DISTRICT, TANZANIA

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INTRODUCTION

Strategies to mitigate marine turtle bycatch are impeded by many factors, including a lack of reliable information on the spatial-temporal distribution of fishing effort affecting marine turtles at different life history stages, and the numbers of turtles at risk of bycatch in different fisheries (Muir & Ngatunga, 2007). Availability of reliable data is particularly problematic for artisanal fisheries in developing countries where basic data for the number of fishers, types of gear used and species of marine turtles captured are often unreliable, unavailable, or not collected. With artisanal fisheries comprising >95% of the world's fishers, this knowledge gap presents a major challenge to threatened species conservation and sustainable fisheries initiatives (Moore *et al*., 2010).

In Tanzania, marine fisheries are dominated by open access artisanal fisheries in near shore waters, using simple gear types to target multiple species, and the distinction between target and bycatch species is vague (Groenveld et al., 2014). As a result, there is very little documentation on the levels and types of bycatch in these fisheries, especially those that use passive gear such as gill nets (Davies, 2009).

It is generally accepted that the most accurate method to quantify bycatch rates involves using independent observers on board fishing vessels to record information on per-vessel fishing effort, target catch and bycatch (Moore et al., 2010). However, in developing countries this methodology is often cost prohibitive. More inexpensive survey techniques such as interviews with fishers, which can be implemented rapidly and at low cost, are considered ideal in areas where there is little or no information (Aragones et al., 1997).

In 2007, Tanzania participated in a large pilot study of a rapid bycatch assessment protocol to gather basic information about fisheries and affected non-target taxa (Moore et al., 2010). The study used interview surveys with fishermen to collect comparable information on artisanal fisheries effort, gear use, and bycatch of vulnerable taxa. In Tanzania, it was estimated that the annual incidental catch of marine turtles in the artisanal gill net fishery was between 617 and 6,170 individuals (Muir & Ngatunga, 2007).

The rapid bycatch assessment protocol has been used several times in Tanzania since 2007 (West & Matiku, 2010; Alavaisha, 2012). However, there are inherent limitations in the accuracy of human response data and independent validation is required to determine the reliability of responses and describe the link between true and reported bycatch information (Moore et al., 2010).

To investigate the relationship between true and reported bycatch data, a small pilot study of marine turtle bycatch was undertaken at a popular fishing ground in Temeke District in central Tanzania (Figure 1) using on board observers. Temeke District is subject to high fishing pressure due to its close proximity to markets in Dar es Salaam, the commercial capital of Tanzania with a population of more than 4.3 million people (2012 Population and Housing Census). Therefore, fisheries interactions are likely to be a major source of marine turtle mortality. During the 2007 bycatch survey, fishers interviewed in Temeke District reported that incidental capture of marine turtles was common. Stranding data also indicates that turtle-fisheries interactions are a frequent occurrence in Temeke District. Community turtle monitors recorded 1,015 strandings over a ten year period between 2004 and 2014 in Temeke District, with many carcasses showing evidence of net entanglement (Sea Sense, unpublished data).

METHODOLOGY

Observers were placed on two gill net boats, both departing from a fish landing site close to Minondo village (-6.9228, 39.4997) in Temeke District, Dar es Salaam. Nets were set at a reef known locally as

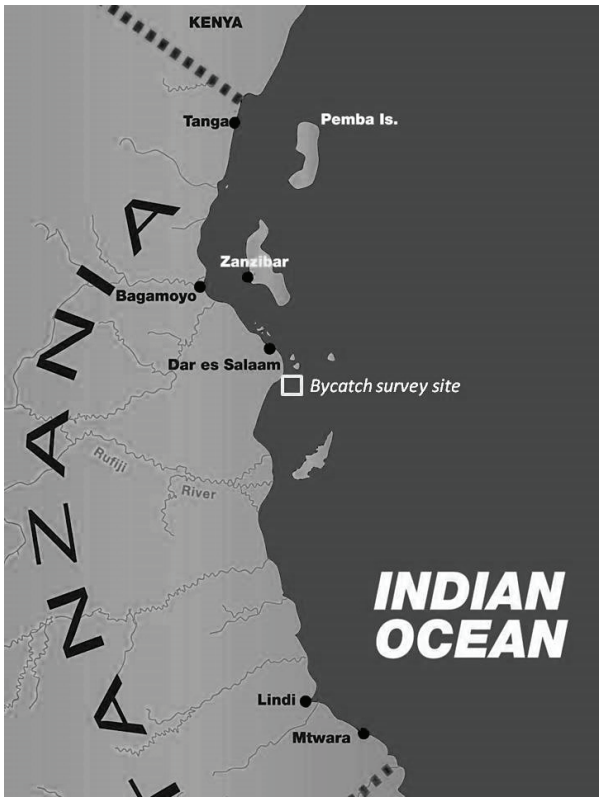

Figure 1. Bycatch survey site adjacent to Minondo Village, Temeke District, Tanzania

Mindadi reef which is approximately 2.5km^2 and situated 1.5km from the point of departure. Observers were on board for setting and hauling of every net over a period of six months between September 2014 and March 2015 (22 - 24 days per month in accordance with the Arabic calendar). Observers collected data on gear characteristics (net length, mesh size, setting position and soak time) and turtle bycatch (species, sex, carapace length and width and presence/absence of flipper-tags). Data were collected from a total of 152 gill net sets.

RESULTS

All gill nets were top set and had `mesh sizes ranging from 5 - 9 inches. The mean soak time was 23.6 hours (SD ± 1.4). Turtles were captured in 43 of the gill net sets (28%). In total, 57 individual turtles were captured (green n=48; hawksbills n=9). Ten sets captured multiple turtles, including one set which captured five individuals. All of the captured turtles were juveniles except for one adult green turtle (female).

A third of the turtles (n=20) were dead when the nets were hauled. All individuals found alive were released by the observers.

DISCUSSION AND CONCLUSION

Although the sample size was very small (only two boats), the bycatch study using on board observers has confirmed the presence of foraging populations of green and hawksbill turtles in near shore waters of Temeke District. Temeke District also supports one of the largest green turtle rookeries in Tanzania with an average of 102 nests (SD ± 28) laid there each year (Sea Sense, unpublished data). The bycatch study was conducted outside of the peak nesting season, so the frequency of interactions between gill net fishers and breeding adults remains unknown.

With a mean soak time of just under 24 hours, 152 gill net sets represents approximately 152 days of fishing. Therefore the level of marine turtle bycatch observed in this study is equivalent to a catch rate of 11 turtles per month. As a comparison, Young (2001) reported a bycatch rate of 50 turtles per year in the coastal gill net fishery in South Africa. The higher rate of bycatch observed in this study together with evidence from juvenile turtle strandings in Temeke District indicates that gill net bycatch poses a considerable threat to turtles within this segment of the population. Bycatch data derived from the observers were not used to estimate the annual take in the whole area because the vessels with on board observers covered only one fishing ground, and the rate of bycatch is likely to vary between areas depending on the level of fishing pressure.

Data generated by this study provided a useful comparison with estimated rates of bycatch obtained from interviews with fishers. The study using on board observers suggests that data produced by interview surveys underestimates the rate of marine turtle bycatch. Interview surveys conducted in Tanzania in 2007, 2010 and 2012 indicated that gill net fishers caught an average of 1-10 turtles per year. In contrast, 10 of the gill net sets in this study captured multiple turtles over a period of just six months, including one set which captured five individuals. The inconsistency in bycatch rates may be caused by fishers either having a poor memory for bycatch rates or untruthful answers may have been provided. During the bycatch survey in Pangani District in 2010, outside of the formal interview setting, fishers admitted to catching 1-4 turtles per month (West & Matiku, 2010).

The true impact of bycatch on the population can only be assessed effectively if post-release mortality

is known (Álvarez de Quevedo et al., 2010). All of the turtles captured during this study were released in the presence of the observers. The probability of survival of the captured turtles is unknown and may depend on the length of time the turtles were captured in the net and the fitness of each individual. In Tanzania, live turtles are rarely released from fishing nets and are instead slaughtered for consumption (West, 2010). In this context, data generated by bycatch studies can be used to identify communities that interact frequently with marine turtles to ensure they are targeted for bycatch education and awareness activities including sensitization on national laws and regulations prohibiting the trade and consumption of turtle meat.

Although none of the captured turtles were tagged, international flipper tags recovered in Tanzania between 2004 and 2014 show that the central Tanzanian coast is a migratory corridor and foraging ground for green turtles originating from regionally important nesting sites in Seychelles, Comoros and Mayotte (West et al., 2014). Therefore, the impact of bycatch in the artisanal gill net fishery in central Tanzania is likely to extend beyond juvenile populations and may constitute a considerable threat to marine turtles in the Western Indian Ocean (WIO) region.

Although there is a paucity of published data on the true extent of marine turtle bycatch across the WIO region, coastal fisheries (mainly gill nets) have been identified as the single biggest threat to marine turtles, dugongs and cetaceans in the region (Bourjea et al., 2008). Wallace et al.(2010) state that large data gaps on marine turtle bycatch in gill net fisheries across the WIO region represent urgent research priorities. Marine turtle research and conservation efforts in Temeke District and indeed within Tanzania focus almost exclusively on the protection of nesting females but little is known about the extent of in-water threats to marine turtles at other life history stages.

In view of these observations and the unexpected high level of bycatch observed in this pilot study, it is recommended that the study be expanded to increase the sample size of boats and to include comprehensive observer coverage at other locations and at varying times of the year in order to build a true picture of the extent of marine turtle bycatch in Tanzania. Access to data on bycatch rates across fisheries is essential for highlighting conservation priorities (Wallace et al. 2010).

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ESTIMATES OF TURTLE BYCATCH IN FISHERIES OF CHITTAGONG DISTRICT, BANGLADESH

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INTRODUCTION

Despite the coastal and offshore waters of Bangladesh being utilised by both industrial and artisanal fisheries (described in Hussain and Hoq, 2010), and fisheries bycatch identified as a major threat to sea turtles worldwide (Hamann *et al*., 2010), the rate and fate of turtle bycatch in Bangladesh waters is still relatively unknown. Observations of sea turtle mortality presumed due to fisheries bycatch have been published for coastal areas in the Chittagong Division (southwestern coast) of Bangladesh, including St. Martin's Island, Cox's Bazar-Teknaf Peninsula, and Sonadia Island (Islam 2002, 2011). A three week survey of three boats fishing west of Cox's Bazar, setting 22 marine set bag nets in that time, found 95 trapped sea turtles, of which 48 drowned (Islam 2007). Alam (1996, in Rashid & Islam 2005) regard rates of turtle bycatch in fishing gear to be relatively low; however, Rashid & Alam (2005) suggest previously reported numbers may be conservative due to the US requirements for imported shrimp to be caught by fishing vessels employing TEDs. Therefore, the frequency and outcome of turtle-fisher interactions in Bangladesh waters requires more information to assess the potential threat of fisheries to nesting and feeding sea turtles.

METHODS

We used the Standardised Dugong Bycatch Questionnaire (UNEP/CMS, 2010) to collect data about fishing practices and turtle bycatch. Participants for the study were recruited between January and March 2012 in Chittagong Division of Bangladesh by convenience sampling at the representative fishing sites of St. Martin's Island (Cox's Bazaar District), Sonadia Island (Cox's Bazaar District), and Bhatiary/North Bhatiary (Chittagong District) and interviewed by authors SSA, STS, TA and ZIK. Informed consent was obtained from all potential participants before interviews were conducted. The data presented are a sub-set of their responses to the survey, relevant to turtle-fisher interactions.

RESULTS AND DISCUSSION

Interviewee Background

We recruited 47 fishers (St Martin's Island n= 26, Sonadia Island n= 8 and Bhatiary/North Bhatiary n= 13), all of whom were male and the majority of whom were aged 26-50 (Table 1), to be interviewed. Interviewees acted as captain (57.5%), crew (38.3%) or in a variety of roles (4.3%) on their vessel. Fishing was the sole occupation of 44.7% of interviewees and the main occupation for 74.5%, and had been so for most of their life (Table 2).

Table 1. Age distribution of fishers (n=47) in Chittagong Division, Bangladesh.

Age Group (years)	Respondents (%)
15-25	23.1
26-50	65.4
51-75	7.7
>75	3.8

Table 2. Number of years fishing experience among fishers(n=47) in Chittagong Division, Bangladesh.

Number of Years	Respondents (%)
<=10	42.0
11-20	36.0
21-30	16.0
31-40	6.0

The survey participants fit within the recent demographic information known for fishers in Bangladesh (see FAO 2010), though are slightly younger than those interviewed by Hossain *et al*. (2014) as representative of South Kattoli in the Chittagong Division.

Fishery Information

Using predominantly medium sized vessels (5-10m in length), with approximately equal numbers motorised and non-motorised (Figure 1), the majority of fishing in this region occurred after the early Summer monsoon and/or in the Winter months (Figure 2). The mean number of crew per boat was 7.5±4.4 st.dev. (range 3-20). Most fishers reported using longlines, traps and cast nets (the latter two gear included in 'Other') (Table 3) in unknown habitats (Table 4) to target mixed species (including fish and shrimp; Table 5). However, the reliability of this information is suspect as one participant was repairing a gill net during the interview, but identified it as a longline even after the interviewer verbally described the differences between the two and showed diagrams of each (see also Interviewer Perceptions of Interviewee Responses). Despite this anomaly, and paucity of information on fishing habitats, reported information about fishing gear, vessel length and motorisation fits within that known for Bangladesh coastal and marine fisheries. The FAO (2012) previously described the Bangladesh marine fisheries sector as dominated by an artisanal fleet fishing with set bag nets, gillnets and longlines utilizing motorised and non-motorised boats from 6-12m in length, operating in waters up to 10m deep (Table 4). The semi-industrial gill net fishing fleet uses motorised vessels up to 20m in length in water >10m deep (FAO, 2012). Hussain and Hoq (2010) report only 42 shrimp trawlers and >80 finfish trawlers that are supposed to operate in waters of 40m depth but

Table 3. Fishing gear used by fishers (n=47) in the Chittagong Division, Bangladesh.

		Frequency of Use		
Type of Fishing Gear	#Fishermen Using Gear	Only	Mostly	Sometimes
Gill or Trammell Net	12	16.7%	41.7%	41.7%
Purse Seine	0	0.0%	0.0%	0.0%
Beach Seine	5	0.0%	0.0%	100.0%
Trawl Net	9	0.0%	44.4%	55.6%
Longline	29	31.0%	37.9%	31.0%
Bottom Longline	1	0.0%	0.0%	100.0%
Hook and Line	4	25.0%	0.0%	75.0%
Other (trap, cast net)	21	14.3%	47.6%	38.1%

Table 4. Fishing habitat used fishermen (n=47) in the Chittagong Division, Bangladesh.

		Fishing Habitat							
Type of Fishing Gear	# Fishermen	Deepwater	Coral	Seagrass	Mangrove	Rock	Estuaries	Fine Sediments	Unknown
Gill/Trammell Net	12	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%	77.8%
Purse Seine	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Beach Seine	5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Trawl Net	9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Longline	29	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Bottom Longline	1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Hook and Line	4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Other (trap, cast net)	21	4.5%	0.0%	0.0%	9.1%	0.0%	9.1%	0.0%	77.3%

Table 5. Target species of fishermen (n=47) in the Chittagong Division, Bangladesh.

		Target Species				
Type of Fishing Gear	#Fishermen Using Gear	Fish	Squid	Crab	Shrimp	Mix
Gill/Trammell Net	12	11.1%	01.0%	0.0%	0.0%	88.9%
Purse Seine	0	0.0%	0.0%	0.0%	0.0%	0.0%
Beach Seine	5	0.0%	0.0%	0.0%	0.0%	100.0%
Trawl Net	9	0.0%	0.0%	0.0%	0.0%	100.0%
Longline	29	18.5%	0.0%	0.0%	0.0%	81.5%
Bottom Longline	1	0.0%	0.0%	0.0%	0.0%	100.0%
Hook and Line	4	0.0%	0.0%	0.0%	0.0%	100.0%
Other (trap, cast net)	21	28.6%	0.0%	0.0%	9.1%	71.4%

may be found trawling at 10m. These fishing practices, and seine nets set in arrays parallel to the shore, entangling nesting females (Islam *et al*., 2011), may contribute to turtle mortality.

Sea Turtle Observations and Bycatch

Turtles had been seen by 95.6% of respondents (n=45). Of those, approximately 63.2% identified the turtles they regularly see as green, hawksbill, olive ridley, loggerhead, leatherback or flatback (Figure 3) when asked about their encounters with each species. However the most abundant turtle in Bangladesh waters are most likely to be nesting olive and green turtles, and foraging green turtles (Rashid & Islam, 2005) with leatherback and loggerhead turtles rarely reported. In addition, flatback sea turtles are endemic to Australia. These discrepancies, combined with only 45.9% of respondents indicating they really know the difference among sea turtles, suggests the likelihood of correct species identification by this cohort is low. Responses also suggest participants may be responding affirmatively because they believe a response is expected or desired by the interviewer; such responses would confound results of the study.

Most of the interviewees observed turtles while travelling to, or at, their fishing areas (Figure 4), with reported overall frequent observations (Figure 5) including several times in the last year (Figure 6). Despite seeing turtles while fishing, the majority of fishermen (~80%) reported catching no turtles in the last year, last 5 years, or in their lifetime, while the remaining ~20% indicated they had caught up

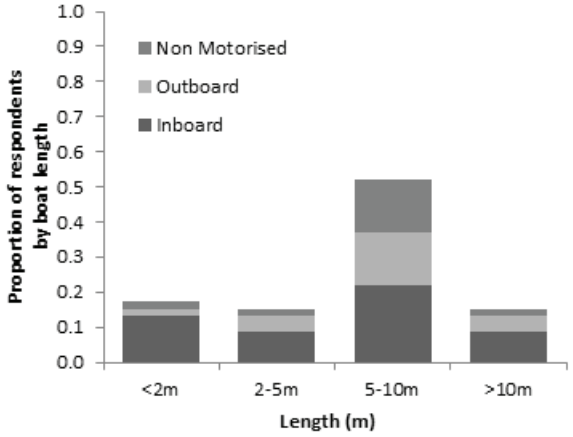

Figure 1. Length (n=47 respondents) and motorisation(n=34 respondents) of boats used by fishers in Chittagong Division, Bangladesh.

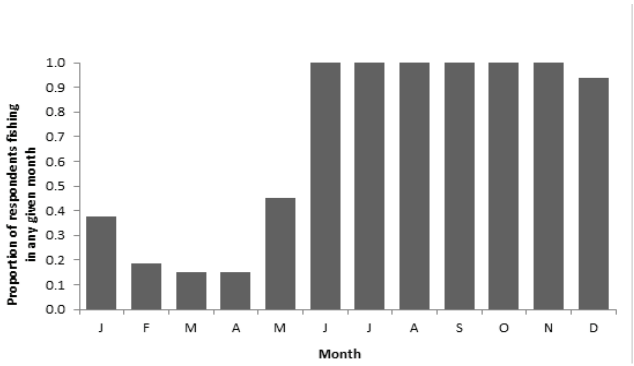

Figure 2. Seasonality of fishing in Chittagong Division, Bangladesh (n= 47 respondents).

to 10 turtles in the same time periods (Table 6). However, 44 of the 47 interviewees responded to a question asking what they did with turtles that were captured; 45.5% of the responses indicated that dead turtles were discarded and 81.8% of responses indicated that live turtles are released. There were no reports of bycatch turtles, live or dead, being eaten, sold, or used as bait, despite previous reports of superstition within the fishing community resulting in entangled turtles being viewed as a poor omen and often killed (Islam 2002). Sea turtles were only added to the protected list of the Bangladesh Wildlife (Preservation and Protection) Act in 2012 and should not be hunted or deliberately killed, but it is unknown if the participant responses are reflection of their real actions or xavoidance of potential prosecution as interviewers were often asked several times if they were 'from the government'.

When asked to indicate trends in the overall number of turtles and number of turtles they caught, most fishermen (~65%) thought both numbers had declined, with approximately equal proportions (~10%) indicating turtle numbers had increased or remained the same, or did not know the trend (Table 7). There are currently not enough data on nesting or feeding populations of sea turtles in Bangladesh to determine if fishers perspectives of population trends are accurate. Approximately equal numbers of respondents (n=37) to a question about the importance of turtles believed they were important (45.9%; reasons including they are a natural part of the environment, and eat jellyfish) as not important (54.1%; reasons including they were of no use, and ate target fish species). Awareness programs at St Martin's and Sonadia Islands may have contributed to the knowledge among some fishers about the ecological role and importance of

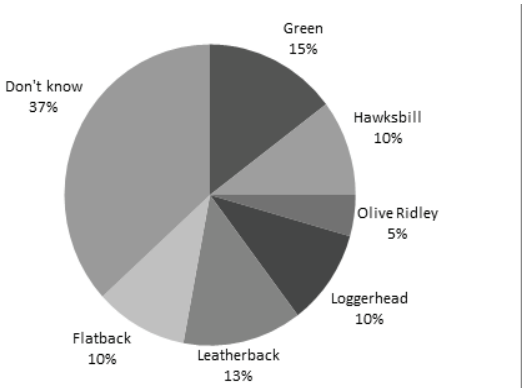

Figure 3. Sea turtles species observed by fishermen (n=45) in Chittagong Division, Bangladesh. 66.7% of respondents said they had observed one species of sea turtle, 17.8% had encountered two species, 13.3% reported three species, and 2.2% identified four species.

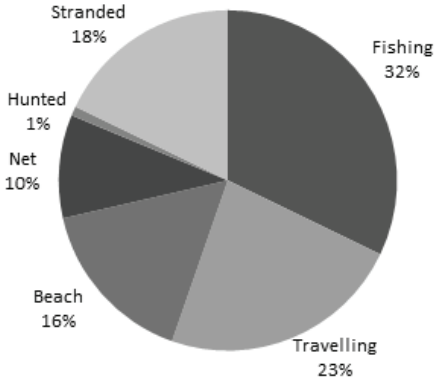

Figure 4.Activities during which turtles are observed by fishermen (n=45) in Chittagong Division, Bangladesh

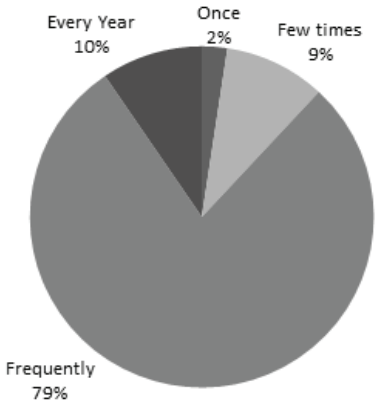

Figure 5. Overall frequency of turtle observations by fishermen (n=42) in Chittagong Division, Bangladesh.

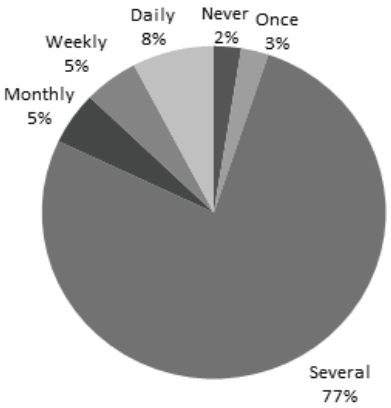

Figure 6. Observations of turtles in the last year by fishermen (n=42) in Chittagong Division, Bangladesh.

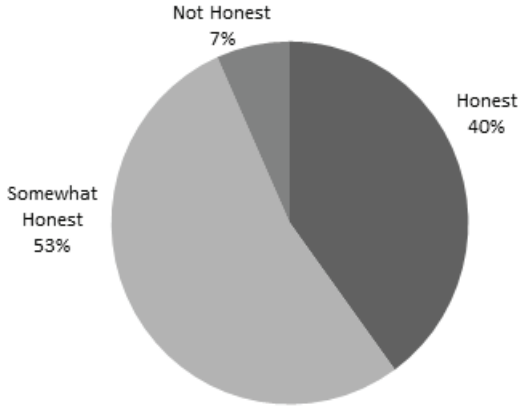

Figure 7. Interviewers perceptions of fishers openness and honesty when responding to questions about bycatch.

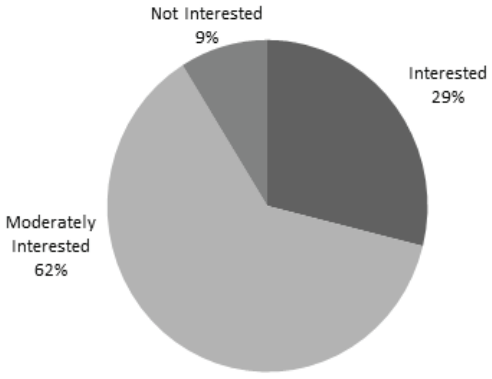

Figure 8. Interviewers perceptions of fishers interest and engagement during the interview.

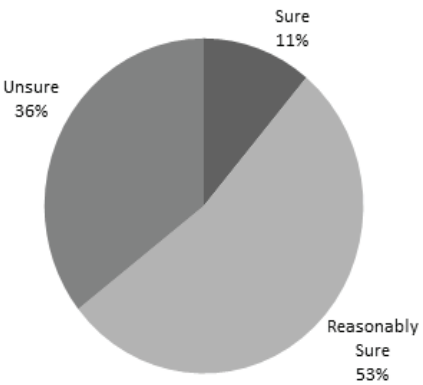

Figure 9. Interviewers perceptions of fishers certainty about answers to numerical questions.

sea turtles (Islam 2002).

Table 6. Temporal variation in frequency of turtle captured by fishermen (n=42) in Chittagong Division, Bangladesh.

	Number of Turtles			
Time Period	0	3-10	1-2	>10
Last year	83.3%	2.4%	4.9%	7.3%
Last 5 years	78.0%	2.4%	2.4%	17.1%
Lifetime	78.0%	0.0%	0.0%	22.0%

Table 7. Perceived trends in number of turtles and number of turtles caught by fishermen (n=42) in Chittagong Division, Bangladesh.

	Perceived Number of Turtles			
	More	Less	Same	Don't Know
# Turtles Caught	11.9%	66.7%	11.9%	9.5%
# Turtles Overall	12.2%	63.4%	14.6%	9.8%

Interviewer Perceptions of Interviewee Responses

The four interviewers answered a series of confidential questions at the end of each individual interview, indicating their self-perception of participant's openness and honesty (Figure 7), interest and engagement (Figure 8), and certainty in answering numerical questions (Figure 9).The results indicate only moderate to low confidence among interviewers about most responses.

CONCLUSION AND RECOMMENDATIONS

The current study suggests a low rate of sea turtle capture by fishers in the Chittagong Division of Bangladesh, but inconsistent responses among participants- for example, only ~20% of all respondents reported they had caught turtles while fishing during their lifetime, while ~93% responded to a question about disposal of turtles caught while fishing- and only low to moderate confidence among interviewers about the engagement of fishers during the interviews raise questions about the reliability of responses to the questions. Further research is required to better understand the practices of fishers in Bangladesh, including gear type and characteristics, fishing habitat, soak times, and capture rates. We suggest an onboard observer program is more likely to capture accurate information about turtle bycatch in coastal fisheries than interviews. However, if interviews are the only means by which information can be gathered, using the randomized response technique (RRT; see Keane *et al.*, 2015) may help reduce problems due to non-response bias (e.g. unknown fishing habitat) and socially-desirable responses (e.g. naming a sea turtle species without confidence).

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A SURVEY OF MARINE TURTLE BYCATCH AND FISHERFOLK ATTITUDE AT KALPITIYA, SRI LANKA

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Bycatch is a major threat to all five species of marine turtles that nest and/or forage in Sri Lankan territories (Ekanayake *et al*., 2015). Fishing communities on the north-west coast of Sri Lanka depend on seasonal, artisanal gill net fisheries targeting pelagic shoaling fish. Previous studies have revealed that these fisheries experience unwanted and expensive interactions with olive ridley turtles (Kapurusinghe & Cooray, 2002; Rajakaruna *et al*., 2009. The turtles actively seek and feed from gill nets containing captured fish, but in the process often become entangled, causing additional damage with each entanglement. Once turtles are entangled they may drown, but are more often hauled aboard fishing vessels alive and extremely aggressive. In response, fishers either beat the turtles' heads until they are rendered unconscious, or hack off the turtles' flippers to make disentanglement easier. The turtles are then either discarded at sea, or brought back to shore for illegal processing for their meat for local consumption. Harming and killing the turtles, or possessing their body parts, is prohibited under the 1972 Fauna and Flora Protection Ordinance of Sri Lanka (FFPO, 1972; amendment 1993 and 2009). Through these unwanted turtle interactions, fishing families are therefore compromised through the significant costs incurred in repairing damaged gear, as well as at risk of illegal activity under national legislation. Marine turtles are also endangered animals and play a key role as coastal biodiversity. Therefore, it is necessary to reduce unwanted interaction between fisher folk and marine turtles.

The overall objective of the study summarized in this report was to reduce turtle bycatch and mortality due to interactions with fishers and fishing gear, and promote marine turtle conservation among fishing communities in the Gulf of Mannar, off the Northwestern Province (NWP) of Sri Lanka. The activities described below took place between August 2014 and July 2015.

1. A beach survey was conducted along the coast from Chilaw to Kalpitya, to count both the number of dead turtles washed ashore and any remains of turtles killed for consumption, in order to assess the geographic range and frequency of turtle bycatch. Based on initial results, the

survey was then extended further south from Kalpitiya to Palakudawa, along the lagoon and some small islands in the lagoon, to search for any remains of turtles killed for consumption. During the beach survey, 21 entire turtle carcasses and 26 carapaces were counted. Separation of the 26 carapaces from the plastron indicated that the turtle meat was taken for consumption.

2. An attitudinal survey was conducted among 509 fishers from Chilaw to Kalpitiya and also along the lagoon to assess the attitudes of the fishing community towards bycatch reduction and conservation of marine turtles. The survey data confirmed that marine turtle bycatch occurs at a considerable level. More than 50% of participants reported encountering turtles during their fishing activities, ranging from 1-2 turtles per day up to 20 per day. Furthermore, it was confirmed that people still consume the meat of turtle bycatch. However, the attitudinal survey indicated that fishermen have a fair understanding about marine turtles and coastal biodiversity conservation.

3. Awareness programmes for school children and fisher folk were held in the Kalpitiya area. The 36 programmes involved ~3,500 students and 1,200 adults from the coastal fishing communities. In addition to improving particiipants knowledge about the importance of coastal biodiversity and its conservation, the programme also aimed to increase their capability for environmental conservation and sustainable fisheries. For example, we explained how to release turtle bycatch safely back to the sea.

We expect to see immediate positive outcomes from the project. Two months after conducting a programme, a chairman of a local fisheries society reported that no members of his society had killed turtles along the Puttlam lagoon this year, despite it being a common practice each June- August when olive ridley turtles move into the lagoon area. I have also recently visited the site and small island in the lagoon, where turtle carapaces are normally found, and did not find any new turtle shells.

Conservation materials such as posters were distributed among fishers in these societies, and are often displayed in their homes. This helps people remember the awareness programme and our message about sea turtle and coastal biodiversity conservation. Furthermore, school children from the fishing villages will potentially change their attitude towards conservation of sea turtles and coastal biodiversity when they become fishermen. Children in this area often begin fishing at the age of 16 years or younger. So the effect will should become more apparent in the near future.

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A SUMMARY OF SEA TURTLE MORTALITY ALONG THE TAMIL NADU COAST OF INDIA AND THE NEED FOR TURTLE-FRIENDLY FISHERIES

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There are five species of sea turtles reported from Indian waters, the olive ridley, green, leatherback, loggerhead, and hawksbill (Kar and Bhaskar, 1982; Bhupathy & Saravanan, 2002). In the past two decades, reports from within both the Indian and international media have indicated an increase in sea turtle mortality along several coastal stretches of the east coast of India due to anthropogenic activities, including fishing, movement of shipping vessels, disposal of municipal waste and coastal armouring structures (Sachithanandam *et al*., 2015). India's Coastal Regulation Zone (CRZ) Notification, 2011, under the Environment (Protection) Act, 1986, declared all turtle nesting areas of the Indian coastline as Ecologically Sensitive Areas (ESAs) and regulated human activities within them. In Odisha, olive ridley turtles exhibit synchronous mass nesting, known as arribadas. This species is listed as Endangered under in Schedule 1 of the Indian Wildlife (Protection) Act, 1972. Further, the Hon'ble Supreme Court of India (2003) recommended banning of trawlers within 20 km of the three mass nesting beaches during the November to May nesting period in Odisha. To quantify turtle mortality along the Tamil Nadu coast, which is both nesting habitat for olive ridley turtles and part of the migratory corridor for olive ridleys that nest in Odisha, field work was conducted from December 2013 to July 2014. Using a hand held Trimble GPS, we recorded 96 and 134 carcasses of olive ridley turtles along the Chennai coast (between Foreshore Estate and Napier Bridge) and Nagapattinam coast (between Nagapattinam Port and Nagore) respectively. A questionnaire was also used to survey local fishing communities for their perspective on the capture rate of sea turtles. From the responses, we inferred that the primary cause (80%) of turtle mortality during the period were fishing activities including trawling, setting of gill nets, and offshore long line fishing, and factors such as pollution and predators resulted in 20% of turtle mortalities. Nearly 85% of turtle mortality occurred between December and March, and most during the November to May breeding period. Close to 60% of fishers reported that turtles became entangled in their nets during fishing activities, 45% indicated that they were not aware of the importance of sea turtles, and 30% stated that they were unaware of the 2011 CRZ notification.

Fishing is the main livelihood for coastal people in this region, and gill nets, trawlers, nylon dip net, cotton drag nets, cotton shore seines, and long lines are all in operation. Kasimedu Harbour and Chennai Port are located on the northern side of the Chennai study site, and the sea is always busy with passage of cargo vessels, fishing boats, and passenger ships. The Tamil Nadu Marine Fisheries Census of 2010 indicated there are 2,800 trawl boats and 3,000 non-mechanised boats operated at Kasimedu, and 1,465 mechanised and 4,129 non-mechanised crafts in Nagapattinam district, with 32,652 units of fishing gear (Sachithanandam *et al*., 2015).

To further protect the sea turtles in Tamil Nadu, the following are recommended:

(i) Regulation of fishing activities, taking into consideration guidelines issued by the Food and Agriculture Organization of the United Nations (FAO) in 2005 to reduce sea turtle mortality in fishing operations. Operation of trawl and gill nets, bycatch reduction, promotion of Turtle Excluder Devices (TEDs), and development and implementation of appropriate combinations of hook design, type of bait,

depth, gear specification and fishing practices, should be orchestrated in association with the state government and relevant conservation societies.

(i) No-fishing zones be determined by monitoring reproductive groups of turtles.

(ii) All mechanized fishing boats be prohibited within 5-20 km of nesting beaches during the breeding season (December-March).

(iii) Human activities like night driving, artificial lighting, recreational equipments, coastal armouring structures, disposal of municipal waste on beaches be regulated during the breeding season (December-March).

(iv) Extensive patrolling near turtle nesting grounds be conducted by state government, NGO/research institutions/volunteers during nesting periods.

(v) Awareness is created among the local fishing communities and general public on the need for, and processes behind, sea turtle conservation.

(vi) Nesting sites be monitored and mapped using geospatial techniques, and the relevant beaches be identified as sensitive zones using signs in appropriate locations.

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A TWO YEAR SUMMARY OF TURTLE ENTANGLEMENTS IN GHOST GEAR IN THE MALDIVES

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INTRODUCTION

The Maldives comprise 1,192 islands that form two narrow chains of atolls 820km in length and 130km wide. The atoll chains run North-South across the East–West currents of the Indian Ocean and act as a trap for flotsam. Lost, abandoned, or discarded fishing nets (otherwise known as ghost nets) are often part of this floating debris. According to the UN, around 640,000tons of ghost gear is discarded into the world's oceans every year. Ghost gear can be found in all of the planet's oceans, lakes, rivers, and seas, and has a devastating effect on marine animals and their environment. Millions of marine mammals, turtles, seabirds, and other species have been injured or killed by entanglement in, or ingestion of, ghost gear. Hundreds of ghost nets are found in the Maldives alone every year. Fishing nets made of polypropylene or polyethylene are less dense than water and can float in currents for years (or even decades), catching vulnerable marine animals and mixing with other marine debris in oceanic gyres (Macfayden *et al.*,2009).

The Maldives' dominant fishing techniques are pole-and-line and hand-line, neither of which use nets; therefore, it is unlikely that ghost nets are generated in the Maldives (unless they come from illegal fishing

operations), and most likely originate in neighbouring countries or in international waters. Currently there is a lack of information on the amount and types of ghost gear generated annually in the Indian Ocean, from what countries and fisheries it originates, and the interactions between sea turtles and ghost nets. Despite global efforts to remove and research ghost nets, the issue remains largely unresolved (e.g. Butler *et al*., 2013; Timmers *et al*., 2005; Wilcox *et al*., 2012). Here, we present the results of a two year study on sea turtle entanglements in ghost gear in the Maldives and give recommendations for further studies into ghost net-sea turtle interactions in the Indian Ocean.

METHODS

Study site

The Maldives, situated in the middle of the Indian Ocean, is dominated by two major monsoons (or seasons). The South West monsoon (SW or Summer Monsoon) lasts from May to October, and the North East monsoon (NE or Winter Monsoon) occurs between December and March. April and November are normally transitional periods of unsettled weather between monsoons. During these periods the winds and oceanic currents reverse directions. Currents flow mainly eastward during the summer monsoon (SW) and westward during the winter monsoon (NE) (Molinari *et al*., 1990; Shankar *et al*., 2002).

Data collection

Ghost nets were collected from beaches, reefs, and open water throughout the Maldives. Some nets were recorded by citizen scientists (including recreational divers, snorkelers, local community members, and tourists) but trained marine biologists permanently stationed in the Maldives collected most of the nets. With over 100 volunteers dispersed throughout the Maldives, nets were discovered and removed in an ad hoc fashion as opposed to by systematic surveys. However, utilising a team of trained volunteers allowed us to extensively increase the amount of geographical area that could be covered in a country where it is otherwise logistically difficult to collect data. Volunteers followed a standardized protocol for removing and collecting data on ghost nets that was designed by the Olive Ridley Project (ORP) and the International Union for Conservation of Nature (IUCN). The protocol was based on the WWF Net Kit first published in 2002 at http://awsassets.wwf.org.au/downloads/mo001_the_net_kit_1dec02.pdf.

When sea turtles were found entangled in the recovered ghost nets, their curved carapace length (CCL) was either estimated to the nearest 5cm (when removal from the water was not possible) or accurately recorded when removal of the turtle from the water was feasible. Miller (1997) estimated the CCL at maturity of a female olive ridley sea

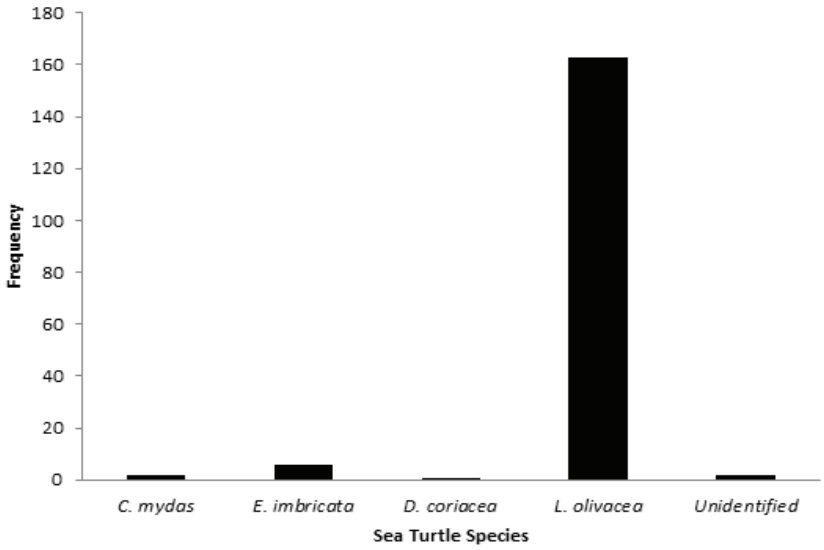

Figure 1. Number and species of sea turtles found entangled in ghost nets in the Maldives between 01 June 2013 and 30 June 2015.

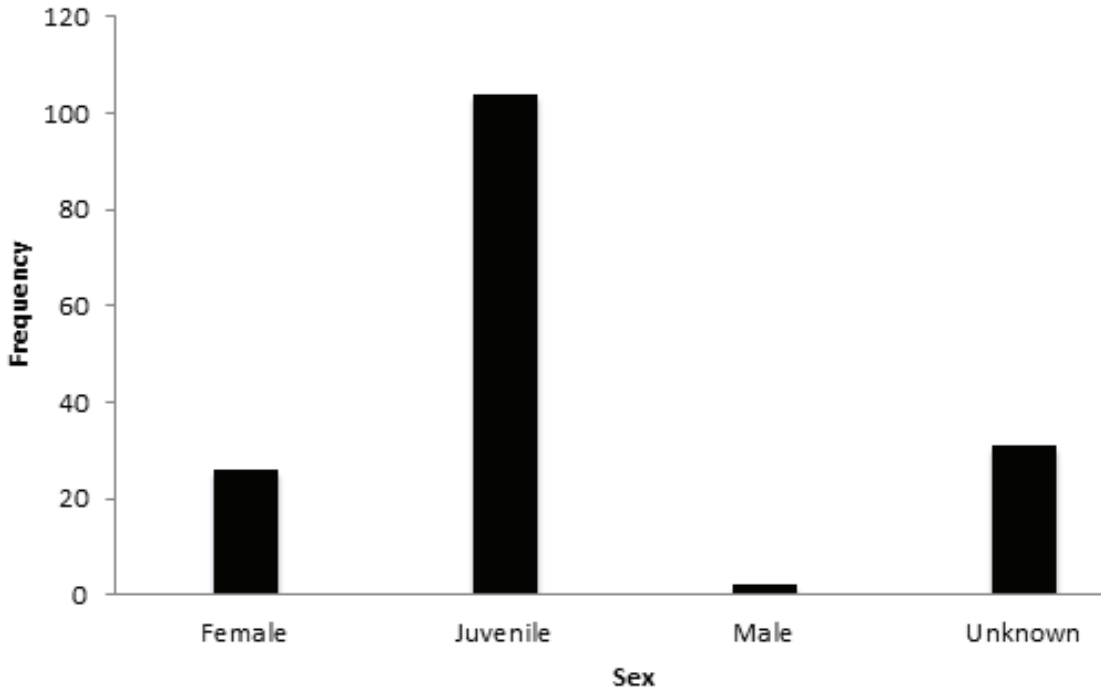

Figure 2. Age and sex class of olive ridley turtles found entangled in ghost nets in the Maldives between 01 June 2013 and 30 June 2015.

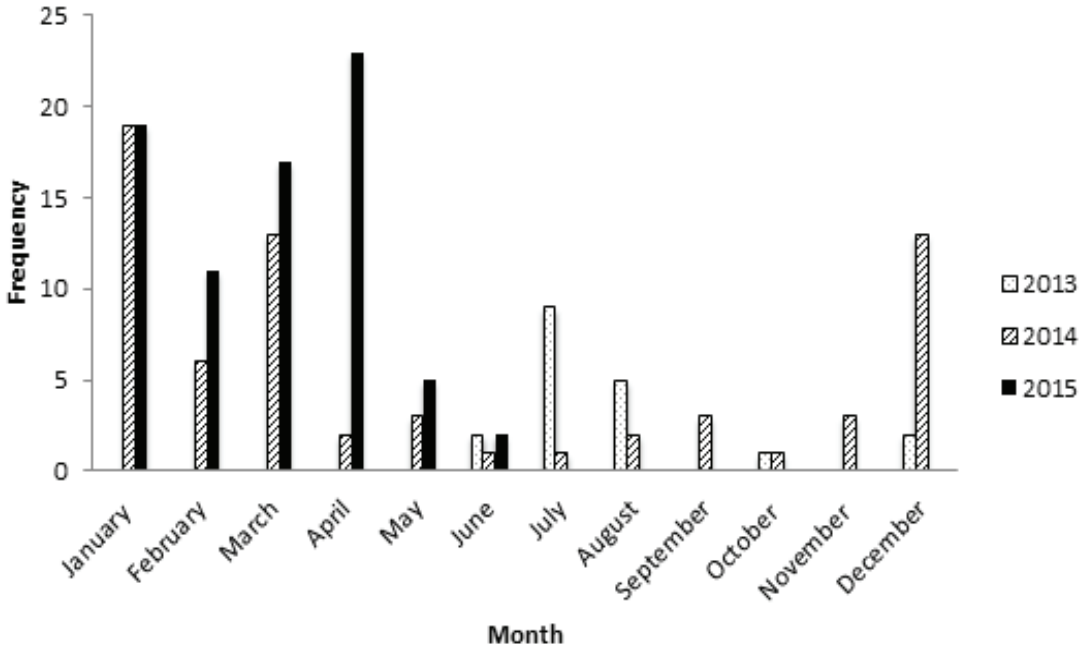

Figure 3. Number of olive ridley turtles per month found entangled in ghost nets in the Maldives between 01 June 2013 and 30 June 2015.

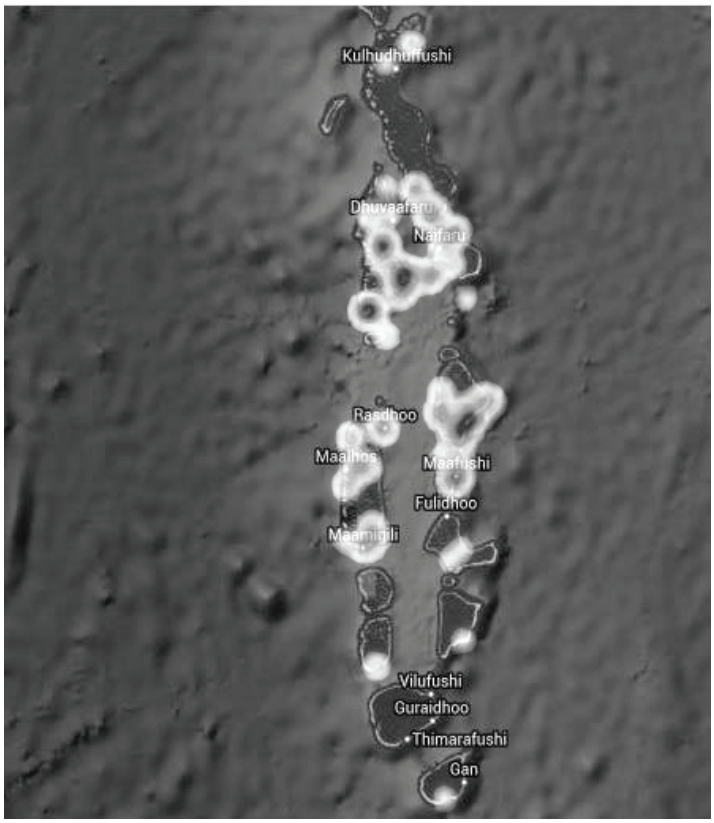

Figure 4. A density map of all of the turtles found entangled in the Maldives between 01 June 2013 and 30 June 2015. The darker shade represents high concentrations while the lighter shades represents low concentrations. Higher densities of trained volunteers in certain areas may skew the data.

turtle in the Indian Ocean to be 66cm, while Pandav *et al.* (1997) noted that most turtles nesting on the east coast of India had CCLs larger than 66cm, with only a few nesting females measuring less than 60cm. For the purposes of this study, we have assumed that individuals of 60cm CCL or larger are mature adults. The species of turtle was either confirmed by the person that disentangled the turtle (if the source was deemed by the authors to be reliable) or it was confirmed by the authors from photographs. The authors recognize that gaps in their data exist, as all ghost net recoveries occurred within a few hundred meters of shore. Discussions with Maldivian fishermen revealed that they regularly see ghost nets (up to 15 per day were reported) floating offshore and many of these nets have turtles trapped inside them. However, logistical difficulties exist in accessing remote or offshore areas of the country. The authors realize that many ghost nets and entangled turtles likely float by unnoticed and unrecorded and that the results presented here represent only the minimum number of turtle entanglements that have occurred in the Maldives over the last two years.

RESULTS

A total of 174 sea turtles were found entangled in ghost nets in Maldivian waters between 01 June 2013 and 30 June 2015. Species specific capture rates were: *Chelonia mydas* (n=2), *Eretmochelys imbricata* (n=6), *Dermochelys coriacea* (n=1), and *Lepidochelys olivacea* (n=163) (Figure 1). A further two individuals were found entangled in ghost nets, but the species could not be confirmed as no photos were taken. Olive ridley turtles accounted for 94% of all entanglements during this time period. An additional eight olive ridley turtles were found with injuries indicative of previous entanglement, such as amputations of flippers or strangulation marks around the neck, but not actually entangled in a ghost net.

Olive ridley entanglements

Juvenile turtles appear to be at the highest risk of entanglement, with 104 found entangled (64% of all olive ridleys recovered) compared to 26 (16%) females and only two (1%) males (Figure 2).

Numbers of recorded entanglements were plotted against time in an attempt to identify peak periods and recognize seasonal variations (Figure 3). During the NE monsoon, 100 olive ridley turtles were recorded (61% of total) with peak incidences in January (Nt=38)* and March (Nt=30). Comparatively, during the SW Monsoon, 35 turtles were recorded entangled (21% of total). The inter-monsoon months of April and November collectively accounted for 28 (17%) entanglements.*Nt= total number during a particular month based on data from 2013-2015. Records of entanglements appeared to be concentrated in three atolls (Baa, North Male, and Ari) (Figure 4), but the authors believe that this is because of the higher density of trained volunteers in these atolls. Of the entangled olive ridley turtles, 20 were either found dead or died shortly afterwards at a rehabilitation centre. The authors recognize that the remains of dead turtles may have been removed from ghost nets by predators and, therefore, may be under-represented in the dataset. As of July 2015, eight olive ridleys that were found entangled during the study period were currently undergoing rehabilitation or suffered injuries too debilitating to be released back into the wild. The remaining 83% of ORTs were either released immediately after disentanglement or were released back into the wild after a period of rehabilitation.

DISCUSSION

Olive ridley turtles

There have been no confirmed reports of nesting olive ridley turtles in the Maldives, although one live hatchling was found on Baa Atoll in 2007 (G. Stevens, pers. comm.) and there have been two reports of false crawls in Baa Atoll by one author (JAH, pers. obs.). Olive ridleys are very rarely observed on near-shore Maldivian reefs. Despite this, they are the most common species found entangled in ghost nets in the Maldives. Often, recovered individuals are severely emaciated, dehydrated, and suffering from injuries such as complete or partial flipper amputations and strangulation. Individuals have also been found in nets with flipper amputations that had begun to heal. These injuries suggest that the turtles spend days, if not weeks, entangled and floating in ocean currents before drifting near shore. The true number of entanglement incidences throughout the Indian Ocean is unknown, but likely to be much greater than what is reported here. These data only represent a small proportion of the true number of entanglements, as most go unnoticed or unreported. Our study suggests that if olive ridley turtles are recovered within weeks of entanglement, most can be released either immediately or after a short period of rehabilitation. However, the fate of turtles released from ghost net entanglements remains unstudied.

We can confirm that juvenile olive ridleys are at the highest risk for entanglement in ghost nets. Unfortunately, still little is known about this life stage of olive ridley turtles. It is believed that their early nomadic years are spent drifting with ocean currents (Shenoy *et al*., 2011). Adults are also highly migratory and spend much of their life in the open ocean. Pitman (1990) noted that the species are often seen investigating, or associated with, flotsam in the eastern tropical Pacific. Olive ridley turtles also have a habit of basking at the sea surface (Pitman, 1993), which may make them susceptible to boat strikes and entanglements.

The main breeding period for olive ridleys in India and Sri Lanka is December through April, with a nesting peaking in February and March (Frazier, 1987; Pandav & Choudhury, 1998). This coincides with the NE Monsoon and the time of year when the most entanglements were recorded. Males are rarely encountered entangled in ghost nets, but the authors hesitate to speculate why this is.

Hawksbill, green and leatherback turtles

The only report of a leatherback turtle entangled in a ghost net was reported in video format with a leatherback of unconfirmed size swimming towards the cameraman while towing a large ghost net behind it. A tiger shark was shadowing the turtle, and the divers were unable to follow to disentangle the animal. The fate of the turtle remains unknown.

Hawksbill and green turtles are commonly sighted on reefs in the Maldives and nesting of both species occurs

frequently (Frazier *et al*., 1984). Hawksbill and green turtles spend much of their time in shallow reef or sea-grass environments, so are generally only at risk of entanglement when ghost nets drift close to shore. The threat of entanglement to turtles in near-shore environments is usually short-lived as nets are either washed on to the beach, removed by humans, or snag on a shallow reef. This could explain why fewer hawksbills and greens are found entangled in ghost nets compared to olive ridley turtles, which likely encounter more ghost nets in their pelagic habitats. The threat of entanglement for an adult green or hawksbill turtle would increase during their breeding migration, when they travel hundreds to thousands of kilometers across open ocean.

Recommendations

The problem of ghost nets and their interactions with sea turtles remains undefined. A critical lack of evidence further complicates this issue. We recommend improved and increased efforts in data collection and improved collaboration between organisations and individuals focused on ghost net and turtle entanglements. Adult male turtles are rarely found entangled and their migratory routes or behavioral choices could give clues as to why they manage to avoid entanglements. Satellite telemetry comparing the migratory routes of adult males, adult females, and juvenile turtles could identify hotspots for ghost net encounters. Understanding where juvenile olive ridley turtles travel after being released from entanglement may identify areas in the region where juvenile turtles may be congregating. Most of the turtles were disentangled from what the authors defined to be gill nets and we would, therefore, recommend an immediate reduction in gill net fishing in the region.

That 83% of the entangled olive ridleys were released back into the wild either immediately after disentanglement or after a short rehabilitation period demands more response to the growing problem of ghost gear in the Indian Ocean. The lives of many turtles could be saved if the turtles are found within weeks of initial entanglement. The problem of ghost gear needs to be brought to the attention of the global public and residents of the Indian Ocean need to be aware of how their actions contribute to the problem.

CONCLUSION

Between 01 June 2013 and 30 June 2015, 182 sea turtles were recorded entangled in ghost nets or suffering from injuries consistent with being previously entangled in a net in the Maldives. A team of trained volunteers following a protocol designed by ORP and IUCN recorded sea turtle entanglements in ghost nets in an ad hoc fashion. Olive ridley turtles made up 94% of the turtles entangled and juvenile turtles were the most common life-stage recorded (64% of captures for the species). Entanglements peaked during the NE Monsoon, which coincides with the olive ridley breeding season in India and Sri Lanka.

Ghost nets are a threat to all species of turtles in the Indian Ocean and encroach on a number of marine habitats. However, they appear to be the most dangerous to turtles in the open ocean where they may be seen as a source of shelter or food by passing animals.

The authors highlight that the number of entanglements reported here represent only a fraction of the true number, as most entanglements likely go unnoticed or unreported. We recommend that the problem of ghost gear and its impact on marine turtle populations be brought to the attention of the general global public and that there be improved efforts in data collection in order to properly quantify the problem and eventually define mitigation measures.

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TURTLE EXCLUDER DEVICES IN MALAYSIA- PROGRESS, STEADILY BUT SURELY

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Sea turtles across the planet face a range of pressures. Hunting, egg collection, loss of nesting beaches, along with habitat alteration (Lutcavage *et al*., 1997), and possibly most pervasively, bycatch in commercial and artisanal fisheries (NRC, 1990; Epperly, 2003). The US National Research Council listed shrimp fishing as the most serious threat to turtles back in 1990, as turtles that overlap with fishing grounds become entrained in fishing nets and drown (NRC, 1990). In the US alone, estimates of thousands upon thousands of sea turtles being killed in shrimp fisheries (Finkbeiner *et al*., 2011) drove the National Marine Fisheries Service to adopt Turtle Excluder Devices (TEDs) as the primary mitigation measure back in the 1980s. A TED is usually an oval frame with vertical bars set at precise spacing that allows shrimp and fish to pass through to the cod end, at the back of the net, while turtles and other large

objects are forced out through an opening covered by a net flap. Seen from a practical standpoint, TEDs can improve the quality of the catch, as large objects such as logs and large animals do not crush it, and the reduction of debris in the back of the net saves fuel, which is a benefit to fishers.

But, TEDs have met with opposition from day one. In particular, fishers are concerned over catch loss and a decrease in revenue. Shrimp loss rates in the US were earlier estimated in the region of 1% to 13% (Renaud *et al*., 1993) although subsequent, more robust assessments of those same data pointed to loss rates in the region of 6% (Gallaway *et al*., 2008). More recently, economic analysis and empirical testing of models suggests this figure is likely closer to 2% (Mukherjee & Segerson, 2011). Fishers also find TEDs bulky or otherwise unsuitable- whether this is real or just perceived – and the controversy reigns to this very day. A good account of this long-standing controversy, at least for the US, is provided by Durrenberger (1990). And yet, TEDs have been adopted by a number of countries across the planet with varying (usually positive) degrees of success. And until something better comes along, and so long as shrimp fisheries persist, TEDs are here to stay.

In Malaysia the TED adoption story is an interesting one, as it entwines turtles, politics, international diplomacy and, of course, fishers and turtles. It started in the late 1990s, when the US adopted legislation that required countries that exported shrimp to the US to use bycatch-reduction devices such as TEDs (Mitchell, 1991). Malaysia and several other countries took the case to the World Trade Organization, arguing (at its most basic) that this imposed the laws of one country upon another. The WTO agreed and the US had to re-open the trade (WTO, 1998). For several years this went back and forth, until the WTO finally recognised the US's position and what it was trying to do – save turtles (e.g. WTO 2001). In Malaysia though, TEDs were by then apparata non grata and turtles continued to suffer.

As the dust settled on TEDs politically, in 2007 and with seed funding from Malaysia's GEF Small Grants Programme (SGP), the Marine Research Foundation (MRF), a small two-person NGO based in Sabah, set about contacting fishermen. At first MRF tried selling the idea of trialing TEDs for a short period, 'just to see how they would work on Malaysian boats'. Through that project TEDs slowly gained acceptance among a small group of fishers, and the programme was 'officially' underway. To better explain TED performance, MRF raised funds from Conservation International (CI) in the Philippines to create a short documentary video using local boats and crews. Another grant enabled MRF to take six fishermen on a study tour in the US, hosted by the National Marine Fisheries Service (NMFS). The fishers came back as ambassadors to the programme. A year later, a second round of GEF/SGP funding allowed MRF to expand the project to a second port, where the programme slowly grew. During that phase MRF also used GoPro cameras to prove to fishermen that the flaps were indeed closed and that turtles were being saved nearly every day, with minimal loss to catches. The camera footage was a real eye-opener and more fishing crews bought into the idea. Several grants from the Save Our Seas Foundation (SOSF) allowed MRF to continue to trial TEDs at an experimental level. A key lesson herein was that it took a number of years and several grants to get things going. MRF leveraged SGP funds to get the CI funding. Later, MRF leveraged the CI and NMFS funding into the second SGP round, and finally MRF used this to leverage the SOSF funding. The process lasted several years, and required the creative marketing and financing skills to keep the project running.

But the truth was that the voluntary adoption process was not working as well as one would have hoped. It was time-consuming and MRF could reach only a handful of fishers willing to try TEDs, which they quickly removed when the trials were over. What was needed was for the Malaysian government to come on board and drive the programme, because without legal backing, TEDs were not going to be mainstreamed into Malaysian policy.

And so another year later and with a second grant from the US NOAA Pacific Islands Regional Office, MRF managed to take four government officials to visit the NMFS while TEDs were being tested with live turtles off the coast of Florida. The officials returned and made a strong case for TEDs, and shortly thereafter MRF and the Malaysian Department of Fisheries (DOF) discussed ways to improve TED uptake at a national level. Finally, a grant from the SOSF provided an opportunity to take the Director General of Malaysia's DOF on a fact-finding mission to the US. This was a major, if not the most significant, turning point in the

Malaysian TED story.

While in Florida, a Malaysia-designed TED was submitted to the NMFS for rigorous testing and it worked like magic- every turtle escaped in less than one minute. This was a crucial turning point: witnessing the performance of the Malaysia TED encouraged the Malaysian DOF to take things further: The Director General instructed his staff to establish a national steering committee and tasked it with developing a long-term implementation strategy. The committee has (since) met several times and a long-term implementation plan is underway. As the government embarks on the nationwide programme, MRF has been asked to provide technical advice to the committee and to the Department of Fisheries.

Jointly, and with an SGP Strategic Grant matched by NOAA funds, MRF and the Malaysian DOF now run workshops across the country; training fishers, net makers and DOF officials in the proper construction, installation and use of TEDs. The DOF has set 2017 as the date for legal requirements for TEDs in shrimp fisheries. This is an amazing achievement- from NGO initiative to fully-fledged Government programme. It is a wonderful case study of leveraging the power of a small SGP grant into something larger, growing it and nurturing it until it blossoms into a government programme.

Not all Malaysia's fleets are equipped with TEDs yet, but this is just a matter of time. State by state and port by port, TEDs are being introduced one boat at a time- and as this happens, the future of Malaysia's turtle populations is being safeguarded. It is an exemplary story of how a small NGO can leverage funding and known technology- controversial or not- into a National program and help create the environment in which sea turtles continue to flourish.

But a word of caution: It is important to note that just as any fishing gear's applicability and effectiveness varies from location to location, so do the effectiveness and applicability of TEDs. Not all fishing grounds compare. Not all nets are the same. Not all vessels are the same, or even closely similar. Not all gear designs are compatible. Some vessels tow one net; others two, or even four. Some trawl nets have long 'legs' from the otter boards to the net proper. Others barely have legs at all. Some use 'tickler chains', others use T-shaped spreader bars. Some are retrieved manually and others are retrieved with mechanical winches. All of these and a suite of other factors impact how effective a net, and thus a TED, can be in any given situation. Thus, as a fisher learns- evolves even – to adapt to fishery and gear and weather and debris and oceanographic and seabed characteristics, so the need to adapt and evolve the use of TEDs concurrently so that they become as efficient and effective as possible- often likely resulting in benefits to the fisher, and almost certainly resulting in benefits to sea turtles.

A TED is merely a metal grid. It is how it is used, not only its design, that saves turtles. In Malaysia, the varied fisheries are, encouragingly, slowly coming to understand this very concept.

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DEMONSTRATION AND TRIALS OF CIFT- TURTLE EXCLUDER DEVICES (TEDS) IN TAMIL NADU

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INTRODUCTION

The south Indian coast is the migratory route for olive ridley turtles en route to their mass nesting habitats along the beaches of Odisha in north-east India. The breeding season for the olive ridley is between the months of December to April. Turtles migrate from their various feeding grounds, which may be spread across ocean boundaries, and congregate a few kilometers off-shore from their natal beaches for mating. The nesting females use the same off-shore habitat during the 11-15 day inter-nesting intervals between their 2-3 nesting events per season.

It is during this time that breeding turtles may be threatened by accidental interactions with commercial and artisanal fishers and their gear. A high number of dead and live stranded adult olive ridleys are recorded along the east coast between January and March each year. The number of strandings has increased during the past 5 years, which the cause of death believed to

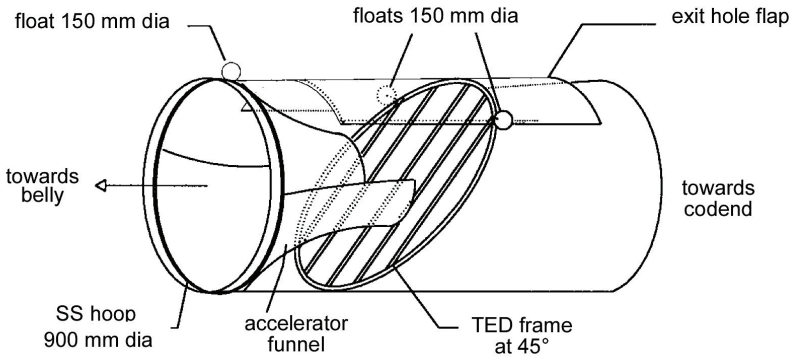

Figure 1. Design of a CIFT-TED.

be drowning in fishing gear. On 22nd February 2014 and 7th March 2014, there were two widely recorded mass strandings, one in Nellore, Andhra Pradesh, and the second close to the Vellar estuary, Tamil Nadu by TREE Foundation. The combined mortality of those two events was estimated at over 2,000 olive ridley turtles.

Under current regulations, mechanised trawl boats are not allowed to operate within 8km of the shore in Andhra Pradesh, 5.5km in Tamil Nadu, and 5km in Odisha. Trawlers that target shrimp fisheries are required to be fitted with turtle excluder devices (TEDs), yet none of the boats currently use them due to concerns about reduction in catch.

DEMONSTRATION OF TEDs TO FISHERS

A three day event (20-22 January 2015) was held to introduce trawl boat owners and workers operating from Kasimedu Chennai fishing harbour to the benefits of using TEDs. The demonstration and trials were organized by TREE Foundation in conjunction with the Fisheries and Forest Departments. The members of the trail team comprised of Dr. R Raghu Prakash (principal scientist), V.Kamaraju (TED net-maker) and S. Policeu (technician) from Central Institute of Fisheries Technology (CIFT); Dr. Supraja Dharini, P. Sundeep, V. Hari, and A. Yesudoss from TREE Foundation; N.S.Prem Raj (Fisheries Foreman) and S. Bakthavatsalam from the Coastal Security Group Commandos, Tamil Nadu; Vinod and Nishant (volunteers from Student Sea Turtle Conservation Network (SSTCN)); N. Devarajan (camera-person) and Sekar (assistant cameraman). The Trawl Boat Owners Association was represented by members Arasu, C. Desingu, and 12 trawl fishermen.

After a brief welcome address from G. Ezhulumalai (TREE Foundation senior Sea Turtle Protection Force member), Dr. R Raghu Prakash introduced and explained the use of CIFT-TEDs (Figure 1).

The CIFT-TED has a circular stainless steel (316 marine grade) hoop with a diameter of 900 mm at the front end of the device. The accelerator funnel attached to the front hoop propels fish and shrimp catch faster towards the cod end. There is an elliptical 1000 x 800mm stainless steel ring (10mm thick) fitted with vertical 8mm deflector bars 150mm apart a further 19m back in the accelerator funnel, at an angle of between 30° and 55°, to assist trapped turtles to the escape flap fixed at the top of the grill. The rings are connected with webbing to a single piece of polythene netting of 40mm stretched mesh size. The single piece of netting that forms the outside of the TED measures 150 x 60 mesh.

Designed by Dr. R Raghu Prakash and a team of CIFT scientists and produced at the Central Institute of Fisheries Technology, Visakapatnam, Andhra Pradesh, the advantages of this indigenously designed TED is that it is interchangeable within 20 minutes among the various net types used by local trawlers. When used, there is a significant reduction in unwanted by-catch so operators do not have to free trapped turtles and sort through by-catch, activities which reduce their fishing effort. The quality of catch is also improves as there are no trapped turtles to crush the fish, and fishers can command a better market price for their catch.

Dr. Prakash's presentation was followed by a question and answer session. A member of the Trawl Boat Owners Association was apprehensive about the use of the TEDs, not convinced that there would only be a loss of 5% of captured fish. Dr. Prakash explained that he had derived the results from ~500 trawl samples with the TED over 15 years of research (Prakash, pers.comm.).
Other workshop participants, including Mr. M. Mohamed Nainar (Assistant Director, Fisheries Department, Tamil Nadu); Mr. G. Balasubramaniyam (Deputy Superintendent, Coastal Security Police, Tamil Nadu), Dr. S David Raj (Forest Range Officer, Chennai), Commandant S.E.D Anand Kumar (Indian Coast Guard, Region East), encouraged the trawl fishers to have an open mind and trial the TED. They explained that the number of stranded sea turtles have increased dramatically over the last few years, and that the TED would only require seasonal operation between November and March. A short video from 'Scubazoo' of a TED in operation and pictures of the two mass strandings of sea turtles that occurred in Andhra Pradesh and Tamil Nadu in 2014 were used as illustrations. The Chennai Chengai Singaravelar Trawl Boat Owners Association, Kasimedu Fishing Harbour, volunteered to provide boats for a trial so fishers could observe the deployment of TEDs at sea.

A CIFT-TED was fitted to the standard trawl net in a trawl boat and two hauls with a 1hr drag period, and a gap of two hours and 5km between hauls, were conducted. No turtles

were captured in either deployment, however, a trawl boat operating ~60m from the trial boat caught a live olive ridley turtle (subsequently released unharmed and observed by the author) in the same time period. The sea trial illustrated that minimal loss of fish occurred when using the TED, a concern of many fishers. The scientist present for the trial estimated the likely fish loss during the TED deployment, engaging the fishermen on board for the valuation of weight of each catch. It was estimated that only between 2-3% of the catch escaped from the net fitted with a TED, which surprised the fishers.

After another one hour trawl time, an adult male olive ridley (70cm curved carapace length, 66cm curved carapace width) was observed trapped in the bag attached to the escape flap. This capture provided the observers with an opportunity to understand a TED in operation. The turtle was allowed to recuperate for a few minutes before being gently lowered from the boat and released back into the ocean, much to the delight of those present who observed the turtle to swim off uninjured. Another individual turtle and a pair of mating turtles were also sighted (N:13-11-330, E:080-21-230), demonstrating that the trawler operation area is both an important mating and foraging area and the need to implement TEDs in the fleet.

Outcome of the TED sea trials

Having observed both the simplicity and effectiveness of the device, trawl operators are now considering implementing TEDs on their boats. The trials clearly demonstrated that the benefits of using a TED outweighed the initial installation cost of Rs.1,000 that would have to be borne by the operators. The loss of catch for the demonstration was <5%. To date, all TED trials have had a 0% turtle capture rate.

The demonstration and sea trials have been hailed as a positive step towards success by all parties involved, and could mark a turning point in sea turtle conservation in Tamil Nadu. TREE Foundation proposes to conduct surveys measuring the success of the sea trials before the next season. There is a superstition among fishers that catching a turtle brings bad luck, and boats will usually return to the fishing harbour, cutting short their fishing activities for the day, in a turtle is caught then conduct a costly religious ceremony to cleanse their nets and boat. Subsequent awareness and interactive programs with fishing communities have been held since the initial TED demonstration and sea trials (see Table 2).

Further actions to reduce sea turtle bycatch and mortality

TREE Foundation urgently recommends the Fisheries Department and Forest Department to :

- All trawl nets be inspected by enforcement agencies when boats are landing their catch. Boats that are not fitted with TEDs should be impounded until such a time as they are installed.
- A closed trawl season be declared between November and March during the olive ridley breeding season.
- The Tamil Nadu Fisheries Department issue notices to all registered fishermen and trawl boats, with the penalties listed for the accidental or intentional capture or sale of sea turtles and their eggs.
- Nets set for Ray and Guitar fish are banned by the fishing welfare association however their use by some fishermen in a number of villages is widespread. This ban needs to be incorporated into the Marine Fisheries Regulations Act and enforced at all levels of fishing and any such nets confiscated on sight. Such enforcement should be conducted by the Fisheries, Forest Department and the Coast Guard. All areas where fish are landed need to be monitored as monitoring only the larger landing sites will lead to fishermen landing their catch in more remote areas.
- Fisheries personnel prepare the fishing communities for a complete and enforced ban on the illegal use of gill nets, ray fish nets and tuna fishing lines.
- Fishing limits in their current form be enforced with support from the Coastal Security Police and the Indian Coast Guard.

Table 2. Awareness programs to complement the TED sea trials in Tamil Nadu.

Date	Venue	Organized jointly with TREE Foundation
20-01-15	Jeevarathan Maligai, Kasimedu	Fisheries Dept., Forest Dept, Coast Guard, Coastal Security Group
23-01-15	Mahabalipuram, Kanchipuram	Fisheries Dept.
24-01-15	Pazhaverkadu, Thiruvallur	Fisheries Dept.
28-01-15	Vengambakkam, Kanchipuram	Coastal Security Group, Fisheries Dept.

SUMMARY FINDINGS FROM TED TRIALS OFF PAKISTAN COAST IN 2014

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INTRODUCTION

Five species of sea turtle, green turtles (*Chelonia mydas*), olive ridley turtles (*Lepidochelys olivacea*), hawksbill turtles (*Eretmochelys imbricata*), loggerhead turtles (*Caretta caretta*), and leatherback turtles (*Dermochelys coriacea*), have been reported from coastal areas of Pakistan (see Zaheer *et al*., 2010). Given the overlap between turtle habitats and those of fishing operations, a large number of turtles are caught in trawl nets used for shrimp fishing in the coastal waters of Pakistan. IUCN Pakistan, under the USAID Ambassador Fund Small Grant Project 'Saving the Endangered Sea Turtles on the Coast of Pakistan' and in collaboration with Marine Fisheries Department, Government of Pakistan, has encouraged the use of turtle excluder devices (TEDs) in trawl nets through awareness raising and capacity building of fishers, and distribution of TEDs for installation in their trawl nets during fishing operations. As a part of this initiative, sea trials were conducted under the project to monitor performance of installed TEDs.

METHODS

The sea trial TED monitoring programme was designed and conducted from 01-17 November 2014. A comprehensive TED Observer Data Sheet was designed by Dr. Nicolas Pilcher for monitoring of catch of target and non-target species in each trawl fishery. The data sheet included questions about duration of trawl, trawl pattern, GPS location, types of target and bycatch species, and condition of bycatch species at the time of release. An Urdu translation of the data sheet was then prepared to facilitate better understanding by the local implementation team. A colored pictorial turtle species identification guide was given to the each observer to enable identification of the turtle species encountered during the trial.

Two observers were engaged and trained for TED monitoring and completing the Observer Data Sheets. The observers were two educated youths from a local fisher community at Rehri village near Karachi, who volunteered to participate in the TED sea trial monitoring programme. Two boats were used for the trials to determine TED effectiveness, B13682 in offshore areas of Sindh province and B14170 in offshore areas of Balochistan, and 100% observer coverage was maintained on each boat. During the trials, TEDs were used during 43% of tows, while no TED was in place in the remaining 57%.

Based on the GPS location recorded during the sea trials, GIS based maps were created to mark the location of trawling. GPS locations of trawl interactions with marine animals were superimposed on the GIS map. This was possible as a result of a separate baseline study (Pilcher *et al*., 2015) on sea turtle mortality in fishing operations based on interviews with trawl fishermen. It was thus possible to correlate the findings of both the TED trial monitoring and baseline study. A GIS expert at IUCN provided technical support in transcribing field data on to GIS based maps.

Data analysis followed standard protocols for assessing differences in catches, including a determination of any significant differences in tow characteristics (to eliminate tow-related bias) such as time of deployment, water depth during deployment, and duration of tows. Analyses also included a description of total tow times both with and without TEDs, proportion and representativeness of tows with TEDs, values of catches, and numbers of turtles caught in trawl activities.

RESULTS AND DISCUSSION

No sea turtles were caught by boats using TEDs. However, eight green turtles were caught when the boats were not using TEDs. Four turtles were caught in the offshore waters in front of Gaddani on the Balochistan coast, and the other four were caught in the offshore waters of the Indus Delta in front of Khahi Creek. The eight turtles were captured over a fifteen day period. On one of these days, two turtles were caught by the same boat in off-shore waters of Sindh province. There are likely to be hotspot areas where more turtles may be caught, and days when bycatch rates vary, but these trials demonstrate that turtles may be incidentally caught by the shrimp trawl fleet off the coast of Pakistan. One observer witnessed three floating carcasses of mature turtles in offshore areas of the Sindh province.

The eight captures equated to 0.05 sea turtle captures per hour, which translates to one sea turtle caught every 23hours of fishing per boat. To determine overall fishery mortality, bycatch rates could be multiplied by the total amount of fishing effort with shrimp trawls.

The bycatch frequency was calculated to be 0.13 turtles per trawl deployment, with fishing boats deploying their nets multiple times in one day.

The total tow time while using TEDs was 129.05 hours (40.9% of trial time). In contrast, the total tow time while not using TEDs was slightly higher at 186.47 hours (59.1% of trial time).

The average duration of trawl tows while using a TED was 2.43 hours, while the average tow time when not using a TED was 2.63 hours. There was no significant difference between tow times amongst vessels and whether using TEDs or not ($ANOVA^{1,86}F=5.619$, $p=0.966$).The average depth at which fishing boats operated did not vary substantially; boats equipped with TEDs fished in waters that averaged 14.7m while boats without TEDs fished in waters averaging 14.5m ($ANOVA^{1,86}F=5.558$, $p=0.544$).

However, there were significant problems with revenue and losses when fishers use TEDs. There was a significant difference ($ANOVA^{1,122}F=5.698$, $p=0.019$) in fish-related income, with TED-equipped boats landing an average of approximately half of what non-TED-quipped boats did, at only 3,246 PKR per TED haul compared to 8,080PKR from non-TED tows. Similarly, there was a significant ($ANOVA^{1,122}F=31.508$, $p=0.0001$) reduction in revenue from shrimp catches, with TED boats landing an average of only 9489 PKR per haul compared to 20508 PKR per haul from non-TED boats. It is likely that the difference results from the way in which the TEDs are used rather than the TED designs themselves, but further trials and refinements will be needed before these can be marketed

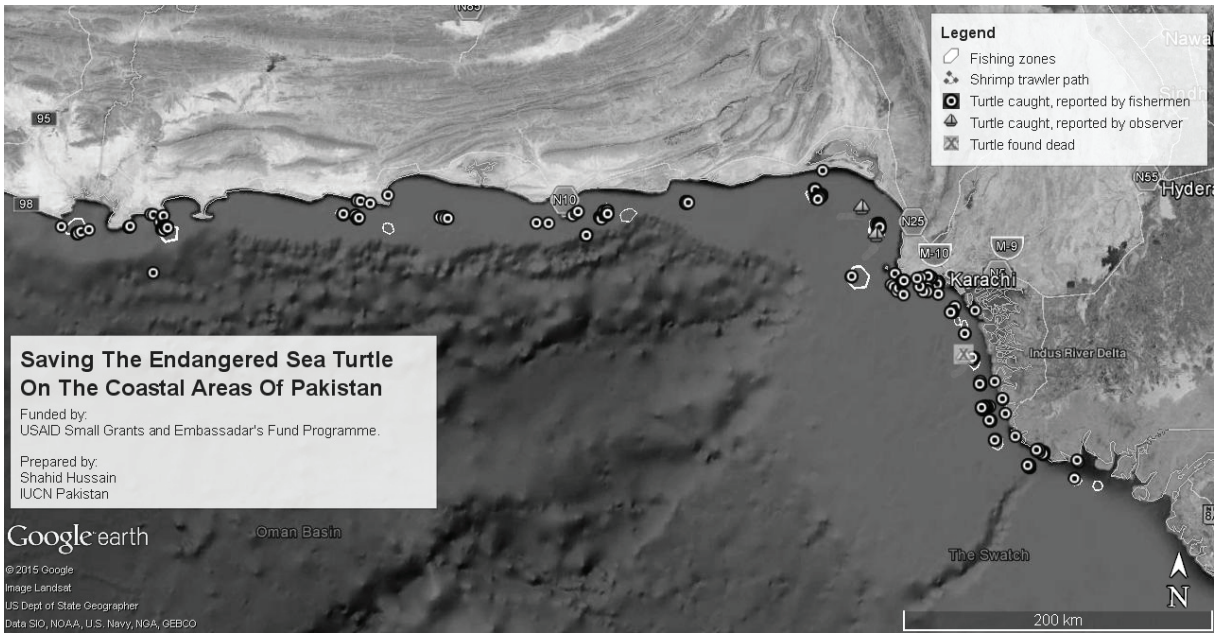

Figure 1: Distribution of Pakistan fishing areas. Circles represent fishing hotspots.

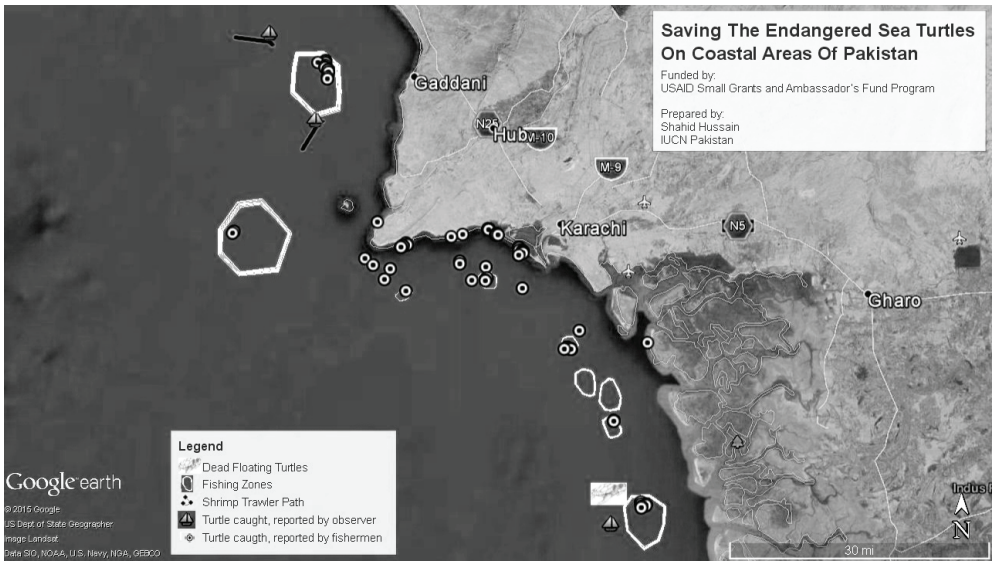

Figure 2: Locations of sea turtles caught in trawls during sea trials in Pakistan.

widely across fishing communities.

There is insufficient data from the spatial analysis component of the trawling survey (Figure 1) to be able to determine if there are any fishery hotspots, and at present it appears that fishing is spread relatively evenly across the coast with a concentration in Sindh Province. However, superimposition of GIS locations of sea trial monitoring on the baseline study map (Figure 2) shows the overlap of sea turtle concentrations and some coinciding with fishing areas.

CONCLUSION AND RECOMMENDATIONS

The findings of our TED sea trial monitoring reveal that there is an overlap of shrimp fishery areas and sea turtle occurrence. The TED Observer Programme confirmed that sea turtles were being taken in the trawl fishery in offshore waters of Pakistan, as eight turtles were caught in trawl nets when the boats were not using TEDs. This equates to 0.05 sea turtle captures per hour, which translates to one sea turtle caught every 23 hours of fishing per boat. The findings of this sea trial monitoring is in concurrence with the findings of a separately conducted baseline study on mortality of sea turtles in fishing operations (Pilcher *et al*., 2015), which also indicates that there is a significant bycatch problem with the shrimp fishery in Pakistan that need to be addressed.

The baseline study revealed that a large proportion (87%) of fishers reporting catching turtles accidentally in their nets in the past year. Based on collected responses from fishermen, and extrapolation of the data to the entire operational fishing fleet of 551 vessels operating out of Karachi Harbour, the extent of the fishery-wide potential bycatch of sea turtles ranges from 1817 to 2381 turtles in just the last year. These figures indicate high rates of mortality of sea turtles due to interactions with trawlers in Pakistan.

The findings of the TED sea trial monitoring and the baseline study suggest the need for a diverse programme of trials and demonstrations, along with the development of a technical TED team in the Marine Fisheries Department, to reintroduce TED use among fishers. This should lead to a significant reduction in sea turtle mortalities in Pakistan.

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STRANDING OF A GREEN TURTLE, *CHELONIA MYDAS*, ON THE COAST OF KARWAR, INDIA

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An adult, female green turtle was found dead at Karwar beach (14°48'42.29"N, 74°07'33.00"E), Karnataka, west coast of India on 20th December 2012. There was no external injury on its body. It is likely the turtle was incidental catch in one of the gill or trawl nets operated in and around Karwar region, district Uttara Kannada, Karnataka State on the west coast of India. Intensive near-shore fishing takes place between Mangalore and Karwar in near shore water up to depth of 50m. Fisherfolk report the operation of trawlers in this area results in the accidental catch and mortality of sea turtles (Naik, unpubl. data), most of which is unreported or unnoticed.

The olive ridley is the only species of sea turtle known to nest along the coast of Karnataka. Large turtles, possibly green or leatherback turtles, nest in the small islands off the Honnavar coast (Sharath, 2006). In the Indian territorial waters there is little information on the green turtle, except for a few nesting records (Bhaskar, 1984; Sunderraj *et al*., 2002; Tripathy and Choudhury, 2002; Venkatesan *et al*., 2004) and no recorded stranding of this species from Karnataka coast in recent years.

The stranding of a green turtle in this area might indicate the Karnataka coastal areas as feeding grounds, or possibly migratory pathways, for the species. Juveniles and adult turtle green turtles are found foraging near the coast or around the islands in the Karwar region mainly. Mortality of sea turtles in trawling gear could be due to the lack of trawler efficiency devices in the fishing nets, as TEDs are not mandatory on the west coast of India as they are on the east coast.

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TREE FOUNDATION'S RESCUE AND REHABILITATION CENTRE FOR SEA TURTLES IN CHENNAI, TAMIL NADU, AND NELLORE, ANDHRA PRADESH, INDIA

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Sea turtles that nest along the Indian coast face many threats during their breeding, nesting and foraging due to lack of awareness and enforcement of regulations designed to protect the species. A considerable number of turtles entangled in fishing gear have their flippers intentionally or accidentally amputated by fishermen and are unable to swim, feed or fend for themselves. They are at the mercy of ocean currents which carry them to various locations along the coastline where they then strand.

The TREE Foundation Rescue and Rehabilitation Centre was established in 2010 and runs in association with the Wildlife Wing of the Forest Department (Chennai, Tamil Nadu). The centre receives many calls about injured and stranded turtles. After noting down basic details, such as a brief description of the turtle, obvious external injuries, general condition of the turtle, and approximate location, the Foundation's stranding team attends the scene as soon as is possible, usually within one hour. Sometimes it is possible to treat the injury on site and release the turtle at the location, however the turtles often have to be brought to the Centre for rehabilitation due to the nature and seriousness of its injuries, such as a recently amputated flipper or a carapace or skull injury. Rehabilitation takes place with the help of 15 part time and five full time trained Sea Turtle Protection Force members and volunteers under the direct supervision of Dr. Supraja Dharini and veterinarians as per requirements. Since 2010, TREE Foundation has rehabilitated 35 turtles and nursed back to health and successfully released 11 olive ridley sea turtles, two green sea turtles, and two hawksbill sea turtles (Table 1). A few critically injured turtles succumb to their injuries soon after being brought to the centre. As of March 2015, there were 11 turtles undergoing rehabilitation at the Centre.

December 2014 to April 2015 saw a small reduction in sea turtle strandings, with 975 dead turtles washing ashore and 20 injured stranded turtles reported to the Foundation. This is still a very large number of strandings compared to the average number per year. In 2013, there were 235 strandings from January to April. The beginning of 2014 was a tragic time for sea turtles and by March 2014 there were 1906 turtles stranded along TREE Foundations project areas in Nellore and Kanchipuram on the south east coast of India. Most of the strandings were believed to be of turtles that had drowned in fishing gear. TREE Foundation protects between 340-380 nests each year along the Kanchipuram coast, but buries more than 400 turtles that have died due to interactions with fisheries gear. On February 22nd 2014, more than 820 dead turtles were found on the coast of Nellore due to trawl fishers operating in violation of the 8km from shore fishing regulation as set out in the Marine Fisheries Regulations Act. Yet another mass stranding event was observed in March 2014 at the Vellar Estuary, Tamil Nadu. Through interactive discussions with artisanal and trawl fishermen we are encouraging the fishermen to check their nets at least every 30 minutes to ensure no turtle has become entangled. If they do find a turtle they are requested to release it, without causing it any injury, as soon as possible to avoid its drowning. TREE Foundation has applied 'How to Safely Release a Sea Turtle' stickers to over 3000 boats, however, many fishermen do not follow the guidelines despite having agreed to do so previously. If Turtle Excluder Devices are implemented in this region then future sea turtle deaths could be reduced. TREE Foundation conducted a TED workshop for trawl fishers in January 2015, followed by sea trials of TEDs on 12 boats. The trawl fishers were happy with the outcome of the trials and there is a very real chance that they will voluntarily implement TEDs in the future.The introduction of TEDs is

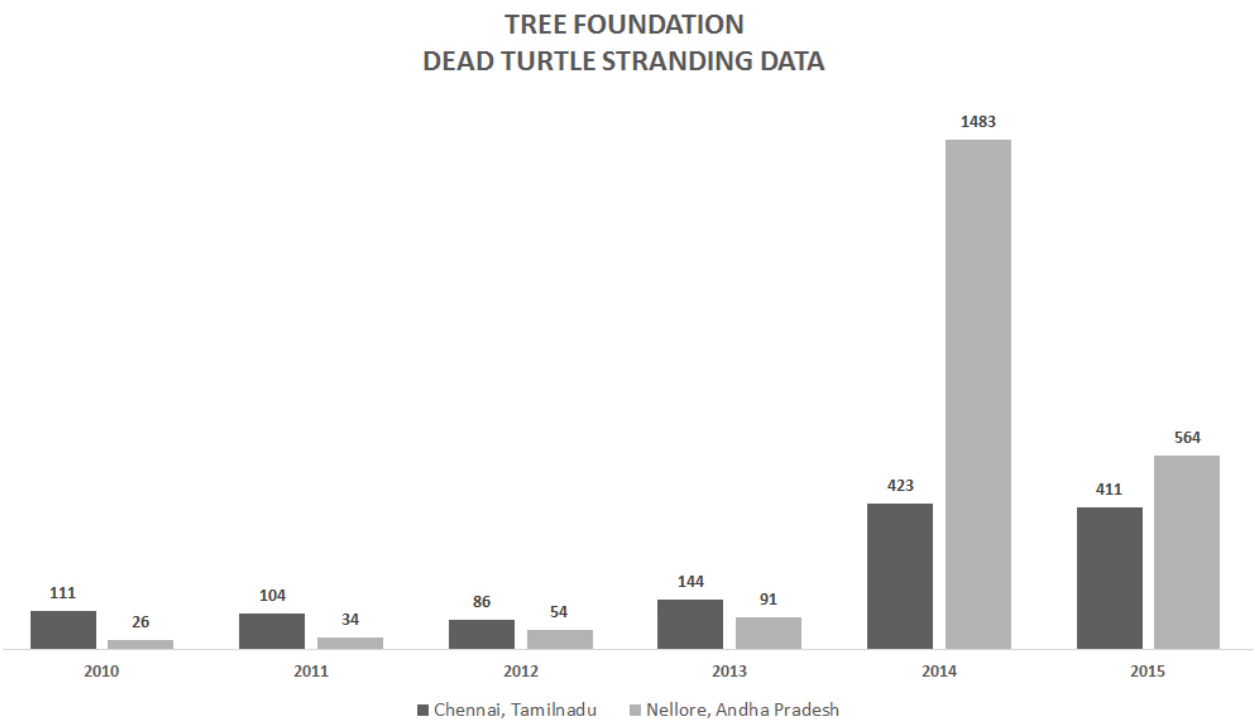

Figure 1. Number of dead turtles recorded by TREE Foundation 2005-2010.

important as TREE Foundation data for the states of Tamil Nadu, Andhra Pradesh and Odisha over the past 13 years indicates the number of dead adult turtles washing ashore is increasing (Figure 1). Fishermen have reported that in Chennai fishing harbour alone there are 200 gill net boats, and between 40 and 100 turtles of all size class and species are caught every day during the months of August through to May of the following year. The by-catch also includes other marine species, such as manta rays and sharks. The state Fisheries Departments have not yet taken steps to regulate fishing during the sea turtle breeding season, nor check new types of fishing gear for its by-catch rate before widespread introduction. We propose that there is an urgent need for on-board independent observers on at least 30 gill net fishing trips during the coming season, between September 2015 and March 2016, to confirm this anecdotal information in order to effect policy. TREE Foundation is working in close collaboration with the Fisheries Department, Forest Department, Coastal Security Group, and the Indian Coast Guard in order to find viable solutions to mitigate sea turtle mortality. The relevant enforcement agencies are equally concerned with the increasing mortality rate we have observed, and are increasing their efforts in the hope of reversing this trend through increased awareness, stricter enforcement of existing legislation and working in closer inter-agency partnerships.

ACKNOWLEDGEMENTS

TREE Foundation acknowledges the permission and support from: The Chief Wildlife Wardens of Tamil Nadu and Andhra Pradesh, The Wildlife Warden Chennai, Divisional Forest Officer , Nellore. Ms. Jean Beasley, The Topsail Turtle Hospital, Disney Worldwide Conservation Fund and US Fish & Wildlife Services.

Table 1. TREE Foundation's Rescue and Rehabilitation Centre Patient List 2010-2015 (Chennai, Tamil Nadu and Nellore, Andhra Pradesh, India). AP = Andhra Pradesh state; all other turtles were recovered from the Kancheepuram coast, Tamil Nadu.

S.No.	Species	Location	Date Found	Release Date	Date of Death	Name- Injury/Condition
1	Olive Ridley	Panayur Kuppam	10.02.2010	Pending		Karuna- Three flippers amputated
2	Olive Ridley	Kovalam	10.02.2010	23.04.2010		Hope- One flipper amputated
3	Olive Ridley	Perunduravu	13.04.2010	19.05.2012		Sagari- One flipper amputated
4	Green Turtle	Vasavan Kuppam	20.04.2010	21.08.2010		Greenie- Entangled in net
5	Hawksbill	Uyiyali Kuppam	24.02.2011	23.07.2011		Sukruti- One flipper amputated
6	Olive Ridley	Periya Neelankarai	28.02.2011	23.07.2011		Olivia- One flipper amputated
7	Olive Ridley	Sadras Kuppam	01.03.2011		05.04.2012	Abdhi- Only left fore-flipper remaining
8	Olive Ridley	Uyiyali Kuppam	18.03.2011	19.05.2011		Sagarika- One flipper amputated
9	Olive Ridley	Paramankeni	16.12.2011		26.12.2011	Adhira- One flipper amputated
10	Olive Ridley	Pazhaya Nadu Kuppam	15.04.2012	Pending		Chinni- Both right flippers amputated
11	Olive Ridley	Sadras Kuppam	23.11.2012		29.12.2012	Sady- One flipper amputated
12	Olive Ridley	Kanathur	22.12.2012		10.04.2013	Kannu- Multiple skull fractures
13	Olive Ridley	Besant Nagar	24.01.2013	14.04.2013		Yuvathi- One flipper amputated
14	Olive Ridley	Cuddalore Chinna Kuppam	02.02.2013	02.10.2013		Nayani- One flipper partially amputated; partial blindness right eye
15	Olive Ridley	Kovalam	24.07.2013		23.09.2013	Dhuki- Plastron injury (split of 8 inches)
16	Olive Ridley	Valmiki Nagar Beach	22.01.2014		06.03.2014	Valmiki- Multiple skull fractures
17	Olive Ridley	Periya Neelankarai	04.02.2014		04.02.2014	Juvee- Plastron injury (2x 1 inch cuts); skull fracture; carapace fracture
18	Olive Ridley	Mahabalipuram	20.02.2014	24.05.2014		Pallavi- One flipper amputated
19	Olive Ridley	Marina Beach	21.02.2014	09.08.2014		Nisha- Entangled in net; injury to flippers and neck
20	Olive Ridley	Marina Beach	26.02.2014		27.02.2014	Marina- Deep dog bite on front flippers
21	Hawksbill	Nellore	26.02.2014	17.06.2014		Rasul- Entangled in net, front flipper amputated
22	Olive Ridley	Mypadu, Nellore, AP	22.01.2013	24.04.2013		Samudra- Entangled in net, front flipper amputated
23	Olive Ridley	Chinnaramadupalam, Nellore, AP	17.03.2013	19.03.2013		Samudhri- Entangled in net, dehydrated
24	Green Turtle	Ramachandrapuram, Nellore, AP	19.02.2014	20.02.2014		Hanu- Entangled in net, minor injuries
25	Olive Ridley	Erranidibba, Nellore, AP	11.03.2014	26.04.2014		Rakshathi- Entangled in net, front flipper amputated
26	Green Turtle	Perundhuravu	17.01.2015	In treatment		Kelona- Extreme dehydration and weakness
27	Olive Ridley	Injambakkam	20.01.2015	In treatment		Oliver- One flipper amputated
28	Olive Ridley	Nainar Kuppam	29.01.2015	Pending		Jojo- Both right flippers amputated
29	Hawksbill	Bogulu Mandalam, Nellore, AP	10.02.2015	In treatment		Rasi- Dehydrated; sunken plastron
30	Olive Ridley	Kasimedu	12.02.2015	In treatment		Jagruthi- Right front flipper injured, partial eye injury caused by net entanglement
31	Hawksbill	Lakshmipuram, Nellore, AP	12.02.2015	In treatment		Navya- Dehydration and impaction
32	Green Turtle	Marina Beach	20.02.2015	In treatment		Alisha- Dehydration and impaction
33	Olive Ridley	Marina Beach	25.02.2015	In treatment		Dhanya- Left front flipper injured by net entanglement
34	Olive Ridley	Perunduravu	26.02.2015	In treatment		Punarvi- Left front flipper injured; fractured carapace, fractured snout due to propeller

REPORT ON REGIONAL SYMPOSIUM ON SEA TURTLE CONSERVATION IN ASIA, KARACHI, PAKISTAN, 24-25TH MARCH 2015

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INTRODUCTION

The International Union for Conservation of Nature (IUCN) organized a two day Regional Symposium on Sea Turtle Conservation in Asia on 24-25March, 2015, at PC Hotel, Karachi. The symposium was held under the USAID Small Grants and Ambassador Funds Program (SGAFP) project 'Saving the Endangered Sea Turtles on coastal areas of Pakistan' being implemented by IUCN Pakistan.

The two day symposium was attended by marine turtle conservation experts from regional countries, including Abu Dhabi, Bangladesh, Germany, Malaysia, Sri Lanka, Thailand, Vietnam and Pakistan. Representatives from US Consulate Karachi, Pakistan Ministry of Climate Change, Pakistan Marine Fisheries Department, Pakistan Maritime Security Agency, Sindh Wildlife Department (SWD), Sindh Fisheries Department, Balochistan Forest & Wildlife Department, Sindh Coastal Development Authority, World Wide Fund For Nature Pakistan, private sector organisations, academia, and IUCN Pakistan, including the IUCN Global Vice President and Regional Councilor West Asia, Regional Director IUCN Asia, and several other government and civil society organizations from the Balochistan and Sindh provinces, were in attendance.

INAUGURAL SESSION

The inaugural session of the symposium was held on 24th March 2015 under the Chairmanship of Mr. Arif Ahmed Khan, Secretary, Ministry of Climate Change, Islamabad. Welcoming the delegates, Mr. Mahmood Akhtar Cheema, Country Representative IUCN Pakistan, provided an overview of the IUCN's partnership with USAID under SGAFP as the pioneering engagement. He mentioned that turtle conservation was one of the first initiatives of IUCN Pakistan in the mid-eighties. Mr. Khan acknowledged SGAFP and its project partners' support during project implementation.

Syed Ghulam Qadir Shah, National Coordinator MFF Program IUCN Pakistan, gave a presentation on USAID Sea Turtle Project and briefed the participants about the project objectives and achievements. Mr. Shah explained how the project has contributed to the overall sea turtle conservation plan by creating awareness, building capacity of local communities, and contributing to implementation of national and international policies related to sea turtle conservation. His presentation was followed by the screening of a documentary on sea turtles produced under the project.

Mr. Shaukat Hussain, Director General Marine Fisheries Department, appreciated the IUCN efforts in improving the knowledge and skills of fishermen with regard to implementation of TEDs in shrimp trawling nets through demonstrations and training. He specifically mentioned the visit of the US State Department inspection team, on 18-20 November, 2014, to assess the turtle conservation program being implemented in Pakistan. The inspection team recommended certifying Pakistan to continue its export of shrimp to the U.S.A. Mr. Hussain said that the seafood needs to be harvested in a manner not harmful to sea turtles.

Ms. Aban Marker Kabraji, Regional Director, IUCN Asia, described turtles as an integral component of coastal ecosystems and livelihoods and explained that sea turtles

are an indicator species of the health of an ocean because of their functional importance in marine ecosystems. She described the Pakistan sea turtle conservation programme as one of the longest run initiatives of the Sindh government, continuous since the 1970s. IUCN and its members have supported the provincial government's efforts through strategic planning, capacity building and creating awareness about the importance of conserving sea turtles.

Mr. Arif Ahmed Khan, the Federal Secretary of Ministry of Climate Change, highlighted the importance of "respecting other species on earth" and described why the survival of threatened and seemingly insignificant species was essential for the overall health of the planet. He emphasized the role of the Ministry of Climate Change, which, under its mandate, should bring together experts to discuss and deliberate on environmental issues. Mr. Khan said the private sector, being a potential partner and also a beneficiary, needed to come forward and take steps to ensure that international obligations were met so that the export of seafood remained uninterrupted and marine life was not threatened.

TECHNICAL SESSIONS

The inaugural session was followed by four technical sessions on sea turtle conservation related themes during which eleven technical papers were presented. Each paper was followed by a Question and Answer session.

Technical Session 1: Population Dynamics and Monitoring
Chair: Syed Mahmood Nasir, Inspector General of Forest, Ministry of Climate Change
Co-Chair: Aban Marker Kabraji, Regional Director, IUCN Asia

Paper 1: IOTC-IOSEA: Turtle-fisheries interactions in the Indian Ocean South East Asia (IOSEA) region

Ms. Clara Nobbe, Coordinator of the IOSEA Marine Turtle Memorandum of Understanding Secretariat, highlighted the objectives of the IOSEA that is mandated to manage marine species, including sea turtles, in the Indian Ocean and adjacent seas. She said that the primary objective of the organization is to ensure the conservation and optimum utilization of fish stocks and has paid increasing attention in recent years to the impacts of its fisheries on other marine species, including seabirds and sharks.

Paper 2: The innovation on the design of a turtle excluder device (TED) for implementation on the monsoon shrimp trawl in Kemaman, Terengganu, Malaysia

The paper was presented by **Dr. Nicolas Pilcher** on behalf of **Mr. Syed Abdullah bin Syed Abdul Kadir and Nazuki bin Sulong,** Malaysian Department of Fisheries, comparing two TED (Turtle Excluder Device) models used in Malaysia: the super-shooter TED designed by NOAA, and an innovate model designed in Malaysia following the fundamental principles of the NOAA model which was tested and accepted by the local monsoon shrimp trawl fishermen. The trial study demonstrated to the fishermen that the use of TEDs led to better catch quality, reduced the cost of fuel, and increased overall efficiency in the fishing activity.

Paper 3: TED Trial monitoring and estimation of sea turtles mortality along the coast of Pakistan

Dr Nicolas Pilcher, Co-chair of the IUCN Marine Turtle Specialist Group, presented findings of the studies conducted with SGAFP funding using interviews with 300 fishermen targeting shrimp and fish and monitoring through sea trials. The study assessed the current state of the fishery, the rate of turtle bycatch, and TED uptake. According to the study findings, 87% of fishers reported catching turtles accidentally in their nets last year. Most of them reported to have caught one turtle, but their number could exceed 10 turtles per boat per year. Green and olive ridley turtles made up the bulk of the bycatch, but loggerheads and occasional leatherback were also reported. "When these values are extrapolated fishery-wide, they could account for 1,817 to 2,381 turtle deaths in the last year alone". Although fishers reported that the bycatch trend was on the decline, this was likely linked to the overall number of turtles rather than any change in practices, he added. During the survey, most fishers acknowledged they knew about the TEDs and that they had seen them, and a substantial proportion of them had used a TED at some point in the past but only 7%indicated they used them now. A number of fishers indicated having trouble using TEDs (losing catch), and this created resentment that

resulted in TED removal. Dr Pilcher added that Pakistan was a registered TED user nation with the US Department of State, but the implementation of TED regulations had been scarce for many years. He highlighted the need for a diverse program of trials and demonstrations, along with the development of a technical TED team, to reintroduce TEDs amongst fishers and save sea turtles in Pakistan.

Technical Session 2: Population Dynamics and Monitoring
Chair: Ghulam Mohammad Mahar, D.G Sindh Fisheries Department
Co-Chair: Ms. Clara Nobbe, Coordinator, IOSEA Marine Turtle MoU Secretariat, Germany.

Paper 4: Turtles mortality in fishing operations in Pakistan

Mr. Mohammad Moazzam Khan, Technical Adviser on Marine Resources to the World Wide Fund for Nature-Pakistan, highlighted the findings of a study initiated in October 2012 on monitoring of fishing operations in coastal and offshore areas of Pakistan. The study revealed that, in the pelagic gillnet operations in the offshore water, get enmeshed resulting in observed mortality in 3% cases. The maximum number of turtles killed in one such operation was 5. He reported that an estimated 25,000 to 30,000 turtles caught in the pelagic gillnets were released annually. Turtles were rarely caught in trawl nets, and he regarded fishing gears used in creeks as not harmful for turtles due to their absence from creek systems. He added that a large number of turtles were enmeshed in monofilament nets along the Sindh and Balochistan coast, however, in almost all cases the turtle was observed to be alive because of the shorter duration of the operation and light weight of the gear. He reported that only one species, the green turtle, currently nested along the coast of Pakistan. Olive ridley turtles used to nest along the coast, but no records of its nesting had been authenticated for the past 12 years. Mr. Khan also confirmed the occurrence of loggerhead, hawksbill, and leatherback turtles in the coastal waters of Pakistan.

Paper 5: Sea turtle monitoring and conservation status in Bangladesh

Mr. M. Zahirul Islam, Executive Director, Marine Life Alliance, Bangladesh gave a presentation on sea turtle monitoring and conservation status in Bangladesh. He highlighted the status of the five species of sea turtles and their nesting and nesting grounds in the Bay of Bengal and adjacent coasts. Mr. Islam presented an account of conservation measures implemented by MarineLife Alliance since 2000 at St. Martins Island, Teknaf-Cox's Bazar Peninsular beach, and at Sonadia Island, including the release of 40-50 thousand hatchlings into the sea each year, and satellite tracking of sea turtles to gather critical information on their marine foraging habitat.

Describing the threats to sea turtles in Bangladesh, he mentioned that bycatch; egg poaching, predation, beach alteration and tourism expansion as being the main threats along the south eastern coast at Cox's Bazar and St. Martins Is. He emphasized the need to initiate community based conservation and monitoring.

Technical Session 3: Management, Policy and Legislation
Chair: Javed Ahmed Mahar, Conservator of Wildlife Sindh, Karachi
Co-Chair: Dr. Donna Kwan

Paper 6: Management of sea turtle hatcheries in Sri Lanka

Mr. Thushan Kapurusinghe, Project Leader, TCP, described the management of sea turtle hatcheries in Sri Lanka. Based on findings of an investigative study conducted in 2011, he mentioned that all existing marine turtle hatcheries management in the in the southern coastal belt of Sri Lanka were deficient and operating illegally. The study revealed scientific weakness in hatcheries management in terms of keeping too many hatchlings in tanks together, mixing different species of hatchlings in tanks, delayed reburying of eggs, keeping critically endangered hawksbills, releasing hatchlings during the day time, taking turtles out of the tanks for photos, and releasing hatchlings from the same place each day.

Based on study findings, hatchery managers were trained according to management guidelines provided by the National Action Plan for Sea Turtles in Sri Lanka, and to keep records about the species and number of eggs they purchase, hatching success, and incidence of disease. Hatchery owners requested the Wildlife Department to issue an identity card for their turtle egg suppliers, but both wildlife officials and lawyers maintained that the existing

environmental laws prohibited issuing such licenses to individuals to collect sea turtle eggs.

Paper 7: Beyond baseline: Rethinking priorities for turtle conservation in Sindh

Mr. Syed Najam Khurshid, Pakistan, presented findings from a baseline study conducted in 2010-11 to record the nesting, distribution and current status of marine turtles along the Sindh coast from Cape Monze to Keti Bunder. The study assessed various environmental and social factors, focusing on nesting sites and interaction of local people with marine turtles, including potential nesting sites, migration pattern, beach encroachment, and environmental pollution. The study emphasized that community-based sea turtle conservation initiatives have not yet been made a priority. He urged the need to develop turtle conservation strategies based on an integrated approach towards conservation.

Technical Session 4: Community-Based Sea Turtle Conservation

Chair: Dr. Nick Pilcher, Co-Chair IUCN Turtle Specialist Group

Co-chair: Mr. Shamsul Haq Memon, Ex-Secretary, Forests & Wildlife and Environment Dept. Karachi

Paper 8: Marine turtle conservation in Pakistan with special reference to measures taken by the Sindh Wildlife Department

Dr. Fahmida Firdous, Ex-Conservator of Wildlife Department, Sindh, Pakistan, presented an account of various conservation efforts carried out since 1972 by Sindh Wildlife Department at Sandspit and Hawkes Bay beaches along the Karachi Coast. These conservation measures included protection of nesting turtles, eggs and hatchlings from poachers and predators, tagging, and tag recoveries. She claimed that up to December 2013, 28,339 nests, comprising 2,383,981 eggs, have been transferred to protected enclosures, and 717,588 hatchlings were released safely to the sea. In addition, more than 7,940 turtle were tagged, and 650 tag recoveries have been recorded.

Paper 9: Community based marine turtle conservation in VietNam– need for a long-term effort

Ms. Bui Thi Thu Hien, Marine and Coastal Resources Programme Coordinator, VietNam, described community based sea turtle conservation efforts in VietNam. She suggested that laws alone do not work unless communities were involved in conservation and the decision-making process. Despite taking several conservation measures in VietNam, such as monitoring nesting females and clutches, community involvement, as well as awareness campaigns, the number of nesting and foraging marine turtles in VietNam has decreased in comparison to the populations in 2003. At present, only three species (green, hawksbill and leatherbacks) still nest in VietNam as a consequence of several decades of over-exploitation, coastal development for sandy aquaculture and hotel construction, by-catch issues, habitat degradation, and climate change. She emphasized the need for long-term research to fill the knowledge gaps. She claimed that the conservation efforts initiated by IUCN VietNam during the last decade have helped in capacity building of local communities and other stakeholders, which has resulted in a shift in attitudes, changes in fishing practices and bycatch reporting, and an increase in volunteerism.

Paper 10: Twenty years of community based sea turtle conservation in Rekawa Sanctuary, Sri Lanka

Mr. Thushan Kapurusinghe, Project Leader of TCP Sri Lanka, presented a case study of community based sea turtle conservation in Rekawa Sanctuary where local community members of Rekawa exploited marine and coastal resources, including collection of sea turtle eggs, due to poverty and lack of awareness. The Turtle Conservation Project (TCP) initiated community based conservation work in 1996, which integrated community livelihood development and conservation. TCP has formed different Community Based Organisations (CBO), such as the community batik group, fish breeding group, sewing group, coir mat making group, and bee keeping group, and has provided alternative livelihood development skills training and equipment to the CBO members. The initial capital needs were met through the revolving fund scheme.

Paper 11: Opportunities for regional cooperation to address the impact of marine debris and bycatch of marine megafauna in the North-West Indian Ocean Region

Dr Donna Kwan, Program Management Officer, CMS Dugong MoU Secretariat, UAE, in her paper highlighted knowledge gaps related to nature and extent of marine

debris as a threat to the long-lived marine vertebrates (marine megafauna) such as marine turtles, cetaceans and dugongs in the North-West Indian Ocean (NWIO) region. Marine megafauna are known to ingest or become entangled in anthropogenic debris that has either been deliberately discarded or lost in the oceans, including interactions with 'ghost' gear–nets, lines and traps that are abandoned, lost or discarded in our ocean- and active fishing gear. She described a Regional bycatch Initiative aimed at addressing the lack of baseline data that has been prepared for Bahrain, Iran, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, and United Arab Emirates. The proposal presents an important opportunity to work with all relevant government authorities and interested stakeholders to (1) assess the status of knowledge of the bycatch of marine megafauna, (2) understand the policy and regulatory frameworks, if any, in place, and (3) inform management and decision-making in the NWIO region of the impact of fishing gear on marine megafauna.

CLOSING OF REGIONAL SYMPOSIUM

The closing was organized for the 25 March 2015 and was chaired by Dr.Sikandar Mandhro, Provincial Minster of Law, Parliamentary Affairs, Environment and Sindh Coastal Development Authority, and attended by Mr. Alexander Orr, Economic Officer, US Consulate Karachi, Syed Mahmood Nasir, Inspector General of Forests, Ministry of Climate Change, Mr. Malik Amin Aslam, IUCN Global Vice President and Regional Councillor West Asia, Ms. Aban Marker Kabraji, Regional Director IUCN Asia, Bangkok and representatives of various government and civil society organisations belonging to Balochistan and Sindh provinces and media.

The closing ceremony started with a welcome address by Mr. Mahmood Akhtar Cheema, Country Representative, IUCN Pakistan. This was followed by a symposium summary and regional perspective of threats facing sea turtles by Dr Nicolas Pilcher, Co-Chair, IUCN Turtle Specialist Group. He emphasized regional collaboration and learning by quoting examples of successful implementation of TED program in Malaysia and community based sea turtle conservation in Sri Lanka. He said problems were not the same everywhere; therefore, there is not one solution that is applicable to all countries. The solutions need to be custom-tailored for issues at hand in each country. He stressed the importance of sharing conservation ideas through communication, maintaining links, and contacts, knowledge sharing and case studies.

Speaking on the occasion, Mr. Alexander Orr appreciated and congratulated IUCN Pakistan on the successful implementation of the USAID-SGFAP funded sea turtle conservation project. He stated that sea turtle conservation was a regulatory requirement under US law. It is essential that any export of shrimp to US from TED registered nation complies with US regulations. He stated that a two member inspection delegation from US consisting of Mr. Jack Forester and Mr. Stephen Wilger visited Pakistan during November 2014 to monitor compliance of these regulations, and trained officials of Marine Fisheries Department and fisherfolk in installation of TED. As per recommendations of the inspection team, Pakistan has been certified to export shrimp to U.S. Mr. Alexander also briefly mentioned about USAID grant priorities to support economic development in Pakistan.

During the closing session, Ms. Aban Marker Kabraji described the symposium as a good way of sharing regional experience and networking for nature conservation. She mentioned that IUCN was working on several regional initiatives related to mangrove conservation, trans-boundary collaboration in water management and aspired for a regional partnership on species conservation. Sea turtles are an apt representation of the trans-boundary and geographically contiguous work of the Asia region through their migratory nature. She appreciated USAID-SGAFP support to IUCN for wildlife conservation in Pakistan and hoped that this partnership would flourish in future.

In his remarks, Mr. Malik Amin Aslam, IUCN Global Vice President shared that Pakistan's sea territory has expanded by an additional 50,000 square kilometers, allowing more area for our conservation work.

Dr. Sikandar Mandhro, the Chief Guest at the closing session, appreciated the role of IUCN in organization of the regional symposium and inviting experts from different regional countries to discuss and debate environmental issues. He viewed such events as important to bridge gaps in knowledge and conservation practices, and helpful in

guiding conservation policies and priorities.

The closing session ended with vote of thanks offered by Mr. Mahmood Akhtar Cheema, Country Representative, IUCN Pakistan to the chief guest, representative of US Consulate Karachi international and national delegates, representatives of various government and non-government organizations, private sector, media and IUCN.

REPORT ON THE 'SAVING THE ENDANGERED SEA TURTLES IN COASTAL AREAS OF PAKISTAN' PROJECT

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INTRODUCTION

In Pakistan, sea turtles nest at Hawkesbay and Sandspit beaches in Sindh province, and on a few beaches, including Ormara, Tak, and Daran, in Balochistan. The project 'Saving the Endangered Sea Turtles in Coastal Areas of Pakistan' was sponsored by USAID Small Grants and Ambassador's Fund Program. The project was implemented for the period of one year, between April 2014 to April 2015 and its partners included: Climate Change Division, Government of Pakistan; National Coordinating Body of Mangroves for the Future Programme, Marine Fisheries Department (MFD), Government of Pakistan; Wildlife & Forest Department, Government of Sindh; Wildlife & Forest Department, Government of Balochistan; and, Worldwide Fund for Nature Pakistan.

The proposed project focused on implementing some of the actions suggested in the Strategic Plan for Conservation of Marine Turtles in Pakistan (2010), a plan prepared through a consultative process with technical support provided by Dr. Nicolas J. Pilcher of the Marine Research Foundation, Malaysia. The capacity of the Master Trainers and other fishers was further strengthened through a training conducted by Mr. Jack Forester, Fisheries Gear Specialist, Officer of Marine Conservation US Department of State, Washington, D.C. in the office of Marine Fisheries Department, Karachi.

Significant threats to sea turtles in coastal areas of Pakistan include fishing nets, degradation and encroachment of nesting beaches, and coastal pollution. Because of the highly migratory nature of sea turtles, and the challenges to conducting robust demographic studies, it is difficult to estimate the overall population size of marine turtles in Pakistan. There is, however, evidence that some sea turtle populations have declined dramatically in recent decades. From 1981 to 1983, nearly 6,000 green turtles and 200 olive ridley turtles nested on the beaches of Hawksbay and Sandspit (Kabraji and Firdous,1984). In 1987, 113 olive ridley turtle nests were recorded (Wildlife of Pakistan, 2009), but no olive ridley turtle nesting has been reported in Pakistan since 2003 (Zaheer et.al. 2010). In 2007, 2372 green turtles nested at the Hawksbay and Sandspit but there have been no records for this species since. Considering the apparent declines in sea turtle abundance in Pakistan, there is an urgent need to mitigate the ongoing threats to local populations and increase local awareness about the importance of conservation efforts aimed at recovering the local populations.

The continental shelf of Pakistan is heavily used for commercial and artisanal fishing. The use of turtle excluder devices (TEDs) in fishing nets is mandatory under Pakistan's marine fisheries regulations, and Section 609 of US public law 101-162 prohibits the import of shrimp into the United States of America unless a country's shrimping programme requires shrimp fishing trawlers to use TED's comparable in effectiveness to those used in the USA, and the country has a credible enforcement system

in place. The Provincial Government of Sindh and Federal Government of Pakistan have already notified fisheries about the legislative requirements concerning installation and monitoring of TEDs in shrimp trawl nets employed in territorial waters, as well as in the waters beyond 12 nautical miles in the exclusive economic zone (EEZ) of Pakistan, to ensure safe escapement of sea turtles from the shrimp trawl nets.

Pakistan is also a signatory to a number of global conventions and treaties related to marine resources conservation, including the Memorandum of Understanding (MoU) on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA). The IOSEA MoU is an intergovernmental agreement under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals. In addition, Pakistan is signatory to the Convention on Migratory Species (CMS) and Convention on Biological Diversity (CBD). Therefore, this project contributes to the Government of Pakistan's compliance to these international obligations.

PROJECT GOALS AND OBJECTIVES

The project goal was to promote the conservation of sea turtles in Pakistan. Its' main objective was to reduce the mortality of sea turtles during fishing operations along Sindh and Balochistan coasts. The project focused on promoting awareness and capacity building of communities and coastal resources managers in the use of turtle excluder devices (TEDs) in order to reduce mortality of sea turtles in fishing operations, prevent damage to the fishers nets, and create opportunities for nature based ecotourism, education, and livelihood support for the local communities.

ACTIVITIES AND ACHIEVEMENTS

The project was implemented successfully in coastal areas of Sindh and Balochistan. The project, although small in size and duration, contributed greatly to the conservation of sea turtles in Pakistan and on-going efforts of the Pakistan Government to ensure compliance with TED regulations.

The overall impact of the project can be measured by the policy level achievement of the Government of Pakistan in having Pakistan positively certified for shrimp export by the inspection team of US Department of State, which visited Pakistan in November 2014. Although the use of TEDs had previously been a regulatory requirement both under US and Pakistani regulations, there was little effort to encourage its application.

The project's main objective, to reduce the mortality of sea turtles during fishing operations along Sindh and Balochistan coasts, was achieved in several ways. Previously, there was little information available about the mortality of sea turtles in fishing operations in the coastal areas of Pakistan, nor was their data on the use of TEDs in trawl fisheries. Our survey revealed that a large proportion (87%) of fishers reported incidental bycatch of sea turtles in their nets in the past year, and extrapolated data suggested the fishery wide bycatch rate of sea turtles could range from 1817 to 2381 turtles in the last year alone. Most fisherfolk knew what TEDs were and had seen them; a substantial proportion (70%) had used a TED at some point in the past, but only 7% indicated they currently used them. Eight 'Master Trainers' were selected from local communities and trained in installation of TEDs in shrimp trawl nets. The Master Trainers, along with two representatives from MFD and the project staff, participated in at-sea trials to monitor the performance of installed TEDs to further strengthen the participants' understanding of TED implementation and use.

The Master Trainers were further utilized for providing hands on training to other fisherfolk in Sindh and Balochistan in installation of TEDs and in sea turtle conservation. In total, the project trained 126 community members in TED installation and distributed 100 aluminium TEDs for installation. The TEDs were designed with support from international sea turtle experts and modified as per recommendations of the US Inspection Team expert, Mr. Jack Forester, Fisheries Gear Specialist, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), Washington. The inspection team recommended increasing the TED size from 34" x 41" to 42" x 52" as the trawl nets used in Pakistan were bigger than in other countries. In order to facilitate capacity building in other fisherfolk, an illustrated TED Installation Manual and Rescue Guidelines was

prepared in the local languages; Urdu, Sindhi and Balochi, in collaboration with MFD.

The project also engaged with local communities in Sindh and Balochistan through regular monthly meetings. Under the project, 22 community meetings were held with the target communities at the project sites in Ormara Balochistan (villages: Ball, Taaq, Chandi, Hud/Soomar, Ormara, Takka, Seekone, and Kund Malir) and along the Karachi coast in Sindh province (villages: Kakapir, Baba Bhit, Rehri, Mubarak, Abdur Rehman, Salehabad, Bangla, Shamspir, and Manjhar). During these meetings, 358 community members learned about the importance of sea turtles in coastal ecosystem, and the potential for sea turtle mortality in fishing operations.

In addition to community meetings, the project celebrated World Turtle Day, International Biodiversity Day, and World Wetlands Day with the local communities on Sandspit beach. Approximately 360 children from local schools and community members, representatives of government departments and members of civil society participated, and learned about the ecological importance of sea turtles. A short documentary on sea turtles was also developed, and will continue to be used to raise awareness among local communities beyond the project life.

To promote regional knowledge and experience sharing, a Regional Symposium on Conservation of Sea Turtles in Asia was organized at Karachi on 24–25 March 2015. This was the first meeting of its kind in Pakistan, and is described on page 33-38 in this issue of IOTN.

LESSONS LEARNED AND RECOMMENDATIONS

i. No such project has been previously implemented in Pakistan, and many people, including fisherfolk, were not aware about TEDs. The project addressed many doubts, misconceptions, and conflicting opinions about the usefulness of the TED as a tool to save sea turtles, and the need for regulatory compliance to continue exporting shrimp to the USA. Follow up actions on raising awareness among fisherfolk are required, in addition to research that demonstrates the efficiency and effectiveness of TEDs in saving sea turtles without resulting in financial loss. Further collaboration and capacity building among fisherfolk and officials of Marine Fisheries Department and other monitoring agencies is required to ensure the implementation of TED regulations in Pakistan.

ii. There is a general belief that shrimp trawlers do not operate along the Balochistan coast, as all trawlers are registered with MFD and operate from harbours in Karachi. However, our studies revealed that shrimp trawling was evenly distributed in coastal waters along the Balochistan and Sindh provinces, and some shrimp trawlers operated as far as the border with Iran.

iii. During community meetings it was felt that women were interested in participation in sea turtle conservation initiatives. Future projects should incorporate a gendered perspective in their project design and implementation.

iv. Lengths of used nets were a great concern on nesting beaches and may be the potential cause of adult and post-hatchling sea turtle stranding. Regular beach cleanups are required to remove nets and maintain sea turtle nesting grounds.

v. Construction of beach huts in Sandspit area and encroachment on nesting areas needs to be regulated.

vi. The regional sea turtle conservation symposium promoted knowledge sharing at the national and regional level, and also highlighted the need for regional collaboration in addressing by-catch issues.

vii. The need for preparation of a National Turtle Conservation Strategy of Pakistan, a more comprehensive version of the Strategic Plan for Conservation of Marine Turtles in Pakistan (2010), emerged as one of the key recommendations at the regional symposium.

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REPORT ON 35TH ANNUAL SYMPOSIUM ON SEA TURTLE BIOLOGY AND CONSERVATION, 18-24 APRIL 2015, DALAMAN, MUGLA, TURKEY

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The 35th Annual Symposium on Sea Turtle Biology and Conservation was held in Dalaman, Mugla-Turkey on 18-24 of April, 2015. The theme of the symposium was "Hospitality". It was chosen as meeting participants attended from around the world and hospitality reflected Turkey's friendly and inviting culture. Furthermore, Turkey brought everyone together, "bridging the civilizations", bridging Europe, Asia and Africa. This was a great opportunity for the people from these continents to participate in the Symposium, as it was easier for them to travel from their home countries. Besides the regular sessions normally held at past symposia, specific to the meeting in Turkey, we celebrated "World Children Day" on April 23rd with special sessions for children's activities. Without a doubt, today's children are the future sea turtle researchers and conservationists, and so we wanted to ensure that we pass our mission on to the younger generation.

A total of 610 people from 80 countries registered for the Symposium. An additional 250 local students and educators attended particular sessions. The venue for the symposium was the Hilton Hotel-Dalaman, Turkey. The program included 4 regional meetings (Africa, IOSEA, Retomala and East Asia), 9 workshops, 2 special sessions (Mediterranean Turtle Conference and Freshwater Turtle Session), and a Video Night that showed 12 videos. In addition to the regular sessions, we hosted the 5th Mediterranean Conference on Marine Turtles. A total of 135 oral papers and 230 posters were presented.

Workshops: A total of 9 workshops were offered the weekend before the symposium started. These were the Fourth Workshop on Stabile Isotope Techniques in Sea Turtle Research: Lessons Learned and Future Steps, Temperature-dependent Sex Determination, Sea Turtle Rehabilitation and Health, GIS, Tourism and Turtles, Biologging For Sea Turtles, Fisheries Observer Programs: Key to Successful Fisheries Management, Children Activities and New Techniques. The first parts of two of the workshops were held on Thursday, 23rd April 2015. Unfortunately, the Novel Techniques for Environmental Campaigning Workshop was cancelled. The attachment of four satellite devices and releasing of sea turtles within the Biologging for Sea Turtles Workshops II and Children Workshop activities were carried out at DEKAMER Sea Turtle Rescue Center. This event attracted many local people and authorities as well as the children. A 3D printed Jaw was attached to an injured turtle on 23rd of April, attracting many local and international media. These activities overlapped with ISTS' mission that ISTS brings people together to promote the exchange of information that advances the global knowledge of sea turtle biology and conservation.

Pre-symposium Meetings: The 5th Mediterranean Conference on Marine Turtles and the Terrapin, Tortoise & Freshwater Meetings were two main pre-symposium meetings. The regional meetings for Africa, Latin America, East Asia, and Indian Ocean & South East Asia were also held. The Marine Turtle Specialist Group meeting was set

on Wednesday 22nd of April, 2015.

Key Note Speakers: Three keynote speakers delivered three 30 minutes addresses to symposium participants. Richard Reina's presentation gave the audience a comprehensive overview of the topic Climate Change and Sea Turtles: What It is, What it isn't and What we need to do about it, which nicely served after the opening ceremony to all of the symposium participants. Mohd Uzair Rusli gave his keynote speech on Synchronous Activity Lowers: The Energetic Cost of Nest Escape by Green Turtle Hatchlings in the Nesting Biology-I session on Tuesday 21st of April, 2015. On Wednesday, 22nd of April 2015, Kate Mansfield gave her speech at the In-Water Biology-II session on Out With the Old, In With the New Hypothesis: Swimming Behavior and Ontogenetic Habitat Shifts Among Wild-Caught Oceanic Stage Turtles. All three addresses were excellent and very well received by the audience.

Symposium Sessions: This symposium included traditional sessions held at previous symposia, such as Anatomy, Physiology and Health; In-Water Biology Session (Ecology, Telemetry, Foraging, Behavior); Nesting Biology (Ecology, Behavior, and Reproductive Success), Population Biology and Monitoring (Status, Modeling, Demography, Genetics, Nesting Trends, In-Water Trends), Fisheries and Threats Session; Conservation, Management and Policy; Education, Outreach and Advocacy; and Social, Economic and Cultural Studies. In addition to those sessions, we also scheduled poster discussion hours for each session and these were found very productive to meet with all presenters in one room, and facilitated by chairs.

Business Meeting: Very important issues were addressed during the plenary business meeting conducted the last day of the symposium. The travel committee report, the Treasurer's report and other issues related to our society were discussed.

ISTS Elections: The report of the ISTS Nominations Committee presented the following names of the winners of the 2015 Elections: President Elect- Frank Paladino, Board of Directors- Andrea Phillott and Laura Prosdocimi' and Nominations Committee- Michael Jensen, Thushan Kapurusinghe and Andy Estrades'.

Board meeting: The Board meeting was held on Tuesday 21stof April, 2015. The meeting was fruitful and lasted until midnight. The Board received and discussed reports from the Nominations Committee, Student Committee, Travel Committee, Students Awards Committee, Awards Committee, as well as reports from the Treasurer.

Student Committee: Since its inception at the 31st Symposium, the ISTS Student Committee has played an increasingly important role in the meeting. For the meeting in Turkey, the Committee was chaired by Itzel Sifuentes and Adriana Cortez. Student participation in the Symposia is critical to the future of our Society's mission, and we commend and encourage continued productive activity by the Student Committee. They organised around 50 volunteer evaluators to provide valuable presentation feedback for about100 students that requested it. They were actively involved in new techniques workshop and organized Student Committee Mixer on Tuesday afternoon.

Travel grants: A total of 162 registrants received a travel grant at ISTS35. This level of travel grant awards represents about 25% of the total registered participants. Travel grants took the form of room and board grants, which was highly advantageous for the awardees and for the Society. Only 16 people who received Travel Grant have to cover their food shares. The Travel Grant Committee was chaired by Alexander Gaos, with Angela Formia, Kelly Stewart, Karen Eckert, Alan Rees, Alejandro Fallabrino, Aliki Panagopolou, Maggie Muurmans, Andrea Phillott and Emma Harrison as members. Participant distribution for Travel Grant was 28 % from Europe, 18 % from America, 14 % from US/Canada and %14 CA/America, 11% from Africa, 7% from Asia-Pacific and 4% from South Asia and 4% from Middle East.

Social Events: Welcome Social, Live and Silent Auctions, Farewell party, Student Awards were some of the social events held during the symposium. A welcome cocktail and Turkish Folk Dance were performed on Sunday evening. Children performed folk dances on Sunday and Monday evenings. The popular "Speed Chatting with the Sea Turtle Experts" session made an appearance on Wednesday afternoon and was enjoyed by the experts as well as the participants that plied them with questions

on topics ranging from techniques to career advice. On Tuesday evening, Video Night provided informative entertainment to Symposium participants as they enjoyed 12 video presentations from around the world. On the final day of the Symposium, together with the Gala dinner, the Archie Carr Student Awards and the ISTS Awards were followed. The formal portion of the evening closed with words of appreciation from the President and the ceremonial passing of the ISTS Presidential Trowel to incoming President Joanna Alfaro Shigueto. On Friday, we organized three tours and participants visited Pamukkale, Ephesus and Dalyan lagoons.

Auctions: The proceeds from the annual Live and Silent auctions contribute to Travel Grant funding for students and international participants. We had the usual fantastic response from the sea turtle community in the way of unique donated items for both auctions. With ISTS promoting a more socially responsible outlook, the Auction Team found themselves pushed to the limits to find creative and fun ways to raise funds. The results of their efforts were brilliant and provided new paying and entertaining activities, including "Jail and Bail" and "A Sea Turtle Beauty Pageant". The live auctioneer Rod Mast did again an excellent job. The dedication of Auction Chairs, Jennifer Homcy and Marina Zucchini, for the success of these important events is appreciated by all.

Awards: During the gala dinner, a series of awards were made to prominent members of our society. Lily Venizelos and Henri Reichart were awarded the Lifetime Achievement Award for their extensive and significant contributions to the promotion of sea turtle biology and conservation. Awards were also given to Kutlay Keco for Ed Drane Award for Volunteerism, Flegra Bentivegna for Champions Award. President's Awards were given to Ibrahim Baran and June Haimoff. Congratulations to the all awardees.

Archie Carr Student Awards: There were 41 oral presentations and 67 poster presentations entered by students in the Archie Carr Student Awards. The Program Chairs worked with the Student Award Chairs to minimize conflicting student presentation times, thereby ensuring all student presentations were seen by the judges, but we encourage future Program Chairs to liaise with the Student Award Chairs early in the planning process to minimize the requirement for last minute work by all parties. Judges of the presentations in Turkey were: Ana Barragan, Cynthia Lagueux, Dave Owens, Emma Harrison, Kate Mansfield, Marc Girondot, Mariana Fuentes, Paolo Casale, Ray Carthy, RoldanValverde, Sara Maxwell, Zoe Meletis. The winner for Best Biology Poster was Abilene Colin Aguilar (CICESE, Mexico). Best Conservation Poster went to Mireia Aguilera Rodà (Univ. Las Palmas de Gran Canaria) and runner up was Aurora Oliver de la Esperanza (Univ. Zaragoza, Spain). The Best Biology Oral was won by Natalie Wildermann (James Cook University, Australia) and Joseph Pfaller (University of Florida, USA) was Runner Up. The Conservation Oral winner was Sarah Nelms (University of Exeter, England), and Aliki Panagopoulou (Drexel University, USA) was Runner-Up.

Grassroots Award: The Grassroots Conservation Award is given for the poster or oral presentation that best demonstrates a positive contribution towards the conservation of marine turtles and/or their habitats. This year the Award went to the Fundação Maio Biodiversidade for "Community-based conservation is a key to successful sea turtle protection in Maio Island, Cape Verde" with the authors of Adilson Passos, Amanda Dutra, Franziska Koenen, Alexandra Morais, and Mafalda Navas. The judges were Alejandro Fallabrino, Angela Formia, Jack Frazier, Manjula Tiwari and Ingrid Yanez.

Funding: Generous funding by many entities made it possible for the ISTS35 to be a success. The organizing committee deeply thanks the donors below for their generosity. At the Platinum level ($25,000 and above): Turkish Government (Ministries, Governors and Mayors), Pamukkale University, and Marine Turtle Conservation Fund. At the Gold level ($5,000 - $19,999): WWF-Turkey, International Seafood Sustainability Foundation, Regional Activity Center, UNEP-RAC/SPA, Istanbul Aquarium and The Ocean Foundation. At the Silver level ($1,000 - $4,999): Hilton-Dalaman, Wildlife Computers, Istanbul SeaLife Aquarium, Sirtrack, Mugla Trade and Commerce Union, BTC Pipeline Company, Disney's Animal Science and the Environment, Telonics, Mersin Municipality, Vaughan W. Brown Charitable Trust, Bern Convention of European Council. At the Bronze level ($500 - $999): Sea Turtle Conservancy, MEDASSET, Denizli Trade and

Commerce Union, The Leatherback Trust, DOKAY, Mac-ART Design Agency.

Vendors: This year's Vendor tables were Wildlife Computers Inc, Collecte localisation satellite, Wipsea, Kaptan June Sea Turtle Conservation Foundation, Qarapara Sea Turtles Chile NGO, Karumbé, Endangered Wildlife Trust, IUCN Marine Turtle Specialist Group, WWF International, MEDASSET, ARCHELON, Loggerhead Marinelife Center. Carbon Offsets: A meeting the size of the ISTS Symposium represents a considerable use of resources, primarily for travel, but also for onsite lodging and activities. This year, a coordination and follow-through by Erin Seney and Ray Carthy, the ISTS introduced an initiative to offset the carbon footprint of the meeting. The organization made a donation to Carbonfund.org to offset the full on-site footprint of the meeting. We also gave one flask as a gift for participants to use in the future as a way of reducing plastic usage.

Memorial Tribute: During the opening and closing ceremonies of the symposium we observed one minute of silence in tribute to the lives that were lost since the last symposium, especially the recent loss of Prof. Nicholas Mrosovsky.

Acknowledgments: Organizing the symposium took a significant number of hours and effort. The successful organization strongly benefit from the selfless work of a large number of volunteers. My personal thanks goes to all organizing committee members. My deepest thanks go out to every single one of them for their hard work, friendship, and their dedication to the International Sea Turtle Society. Without the vision and generosity of our Sponsors this Symposium would not have been possible, and I thank them all for embracing our interests and cause as their own. The ISTS Board of Directors and its Executive Committee for their guidance and support. Every single one of the various Committee chairs. My Program Officer Ingrid Yanez did a great job of fund raising under trying conditions.

Thanks to: The Program Staff- Oğuz Türkozan, Brian Shamblin and Wayne Fuller and program coordinator Eyüp Başkale and Event Coordinator Dogan Sözbilen and all of the outstanding Session Chairs.

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Workshop organizers Daniela Freggi, Andrew DiMatteo, Sandra Hochscheid, Kate L. Mansfield, Yonat Swimmer, Marc Girondot, Şükran Yalçın Özdilek, Simona Ceriani, Kim Reich, Jeffrey Seminoff, Emine Dinç, Jane Akalay, Fikri Türkeş, Ayşe Oruç and Konstantina Kostoula for helping to organize the workshops.

I also thank Luis Cardona Pascual and his organizing committee for organizing 5th Mediterranean Conference on Marine Turtles within the ISTS35.

Additional gratitude goes to: The schoolchildren and teachers of Muğla Province for their participation in our outreach program. ALL OF THE VOLUNTEERS FROM ISTS AND THE PAMUKKALE UNIVERSITY! Those of you un-named here, but who gave freely of your time, toil, and enthusiasm when I called you.

RESOURCE OF INTEREST

QUESTIONNAIRE-BASED SURVEY TOOL TO COLLECT DATA ON SEA TURTLE BYCATCH AND INTERACTIONS WITH FISHERS

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Sea turtle biologists and conservationists interested in collecting data on sea turtle bycatch and turtle-fisher interactions should consider the UNEP/CMS- Abu Dhabi Standardised Dugong Catch/Bycatch Questionnaire, which is also appropriate for use with cetaceans (Pilcher & Kwan, 2012). Predominantly based on protocols developed by the Project GLoBAL Rapid Bycatch Assessment (http://bycatch.env.duke.edu/), Phuket Marine Biological Center (Thailand), San Francisco State University (USA), and James Cook University (Australia), the survey tool was designed, reviewed and tested to ensure it was widely applicable across regions, scientifically valid, and culturally sensitive. Examples of its successful use in sea turtle studies can be seen in reports by West & Mchomvu (2015) and Phillott *et al.* (2015) in this issue of IOTN.

This resource includes more than the questionnaire; the accompanying project manual outlines methods for data collection, including importance of random sampling, entering data to standardized table, and creating graphics, and outlines appropriate interview training and methods. The questionnaire itself provides an introduction statement to ensure informed consent, and captures information on interviewee background and fishing experience, sea turtle, dugong and/or cetacean catch/bycatch, fishery information, and interviewee perceptions about population sizes and trends and seagrass areas. The complementary table for data entry has dropdown boxes to ensure data quality and standardization, and step by step instructions for creating graphics using Google Earth and saving Google Earth files compatible with GIS analysis programs are provided.

From my personal experience in using the survey with undergraduate students and graduate assistants to interview fishers in Bangladesh, I highly recommend this resource. However, we benefitted from adding images of fishing gear, as fishers commonly misidentified their gear (longline, gill, seine, trawl net etc) from our description when we compared responses with that they were currently repairing. Our interviewees were also unable to identify their fishing locations on a map, and we asked additional questions about direction, speed and length of travel to more accurately determine fishing areas. Researchers utilising the survey tool may wish to consider the literacy and familiarity with maps of their interview subjects, and provide additional resources where required.

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ANNOUNCEMENTS

36TH ANNUAL SYMPOSIUM ON SEA TURTLE BIOLOGY AND CONSERVATION, FEBRUARY 29–MARCH 04, 2016, IN LIMA, PERU

JOANNA ALFARO SHIGUETO

President International Sea Turtle Society; Director ProDelphinus; Associated Researcher University of Exeter, UK and Professor Universidad Científicadel Sur, Peru.

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Mi Casa essu Casa: Bienvenidos al Peru! The Annual Symposium on Sea Turtle Biology and Conservation hosted every year by the International Sea Turtle Society (ISTS) is moving to South America for the first time. This event gathers multidisciplinary participants from around the world with a shared interest: conserving sea turtles and their environment.

The 36th Annual Symposium will be held from February 29- March 04, 2016, at the Maria Angola Convention Center and Universidad Cientifica del Sur, both located in the capital of Peru, Lima, a city full of rich flavors, unique experiences, and the mystic union of the past and the present. Besides providing common advantages of a big city, Lima gives you the opportunity to learn about the Peruvian culture and as a coastal city, it reflects how we have related to the sea for many years. It may also serve as a starting point towards other Peruvian natural destinations such as the Amazon rainforest, Andes Mountains and northern subtropical beaches.

We expect over 700 participants from around the world. This year the Symposium's theme will be 'Crossroads', highlighting the need for multi-disciplinary, multi-taxa, multi-national, and multi-gender efforts in advancing marine conservation worldwide. This meeting seeks to break down barriers and boundaries between people and countries in order to achieve marine conservation through its most global flagship, the sea turtle.

Our website will contain all the vital information about the 36th symposium (www.internationalseaturtlesociety.org), and will be updated throughout the year. Here you will find important information about Lima and Peru, as well as registration, costs, and general information regarding the symposium. We hope you find it useful.

Mark your calendars, start practicing your Spanish, and begin planning your trip to the 36th Symposium on Sea Turtle Biology and Conservation!

GHOST GEAR WORKSHOP

MARTIN R. STELFOX

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On February 29th 2016, at the 36th Annual Symposium on Sea Turtle Biology and Conservation in Lima, there will be a special workshop on ghost gear and the need for collaboration within the Indian Ocean. Lost, discarded or abandoned fishing gear (also referred to as ghost gear) is an important threat to sea turtles in the Indian Ocean. The UN estimates around 640,000 tons of fishing gear are lost globally each year. While efforts are in place to try to quantify and stem the effects of ghost gear within various parts of the world, gaps in data on quantity and type of gear lost and its effects on marine

life still exist in the Indian Ocean. The transboundary nature of ghost gear means that turtle habitats are often encroached on and reports of turtle entanglements are frequently reported throughout the Indian Ocean

This workshop will explore the need for a collaborative approach to tackle this problem. Currently the Olive Ridley Project [as part of the Global Ghost Gear Initiative (GGGI)] is working towards quantifying the amount of gear lost and developing best practices for ghost gear removal and recycling. The workshop will teach standardised data collection protocols developed by ORP and the IUCN detailing how to record data on ghost gear and entangled turtles. The session will also look into fisher surveys that can be used to understand why gear is lost in the first place, in order to see gaps in data and identify problematic areas. The session will end with a series of discussions on how to fine tune data recorded to accommodate various fisheries found in the region. Workshop participants will be invited to discuss their experience with ghost gear and sea turtle entanglements.

STUDY SITES NEEDED TO INVESTIGATE ARTISANAL BYCATCH

KIMBERLY RISKAS

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Dear IOTN readers,

I am a PhD student at James Cook University, Australia, and would like to take this opportunity to ask for your collective knowledge and assistance.

My PhD project aims to investigate how fisheries bycatch impacts sea turtle populations in the Indian Ocean. Part of my data collection will entail on-ground case studies of artisanal (subsistence) fisheries where turtles are caught as bycatch.
However, to ensure the success of these case studies, it is vitally important to choose sites where turtle bycatch is high enough to furnish meaningful data for my thesis. As the Indian Ocean is a vast region encompassing the coastlines of nearly forty countries and territories, I am reaching out to the IOTN readership asking for suggestions for countries and/or specific areas that you believe would provide suitable study sites for investigating artisanal turtle bycatch.

I am particularly enthusiastic to connect with all of the following:

1. Individuals or organisations working in areas where turtle bycatch in artisanal fisheries is believed to be high (i.e., turtles are caught incidentally—not intentionally—on a regular or seasonal basis).
2. Contacts within artisanal fishing communities and national fisheries management agencies in any country in the Indian Ocean region.
3. Anyone with suggestions for on-ground support during field work and possible collaborations with existing projects.

Thank you in advance for your valuable input. Please email your suggestions for countries and/or specific areas, as well as any other helpful information, to Kimberly Riskas kimberly.riskas@my.jcu.edu.au or Dr Mark Hamann mark.hamann@jcu.edu.au, James Cook University, Australia.

INSTRUCTIONS FOR AUTHORS

Please refer to the style requirements listed below. Manuscripts should be submitted in MS Word or saved as text or rich text format. Appropriate files should be submitted by email to: iotn.editors@gmail.com. For further details please see www.iotn.org or consult a recent issue of IOTN.

Language and spelling: Please follow British spelling and grammar conventions.

Author names: Please provide full names of authors, e.g. Stanely T. Asah

Author affiliations: Please provide Department/ Centre/ Laboratory. Institution/ University/ Organisation, City, State or Province, Country, E-mail address of corresponding author. The symbol "#" in superscript may be used to denote corresponding author.

Tables and figures: Figures should not be embedded in the text file, they may be sent separately as JPEG, TIFF, BMP or PNG files. All figures and tables should carry a caption. Figures and illustrations must be accompanied by the appropriate credit/source. High resolution figures may be requested after acceptance of the article.

References in text: References should appear first in chronological then alphabetical order.

Two authors to be separated by '&' symbol, e.g., as Rai & Sahu, 2001

More than 2 authors: first author *et al.* (*et al.* in italics) e.g., *Roy et al.*, 2004

Two publications of the same year for the same author(s), the reference in the text should be Sharma 1960a, b not 1960a, 1960b and the two publications should be dated accordingly in the references.

Multiple references to be separated by a semi colon and in chronological order (Zade, 1995; Mathew, 1996a, b, 1998; Sharma, *et al.* 2004; Forman & Gordon, 2005, 2007)

Page numbers are essential when quoting or referring to some aspect or information from a report (Sharma 1960: 22 or Sharma *et al.* 1960: 22).

References that are long and/or have acronyms: Only acronym in text, e.g., INRA 2008

List personal communication references in text only. e.g. (Hariya pers. comm., 2011)

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

References in list: References should appear first in alphabetical then chronological order.

For references with more than 7 authors: first 7 names, *et al.*
Use complete page ranges. e.g., 371–379 (not 371–9); 227–235 (not 227–35).

Reference that are long and/or have acronyms: Full name followed by acronyms in parenthesis in reference list, e.g.,
Instituto Nacional de Reforma Agraria (INRA). 2008.

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

Examples:
Vijaya, J. 1982. Turtle slaughter in India. *Marine Turtle Newsletter* 23: 2.

Silas, E.G., M. Rajagopalan, A.B. Fernando & S.S. Dan. 1985. Marine turtle conservation and management: A survey of the situation in Orissa 1981/82 & 1982/83. *Marine Fisheries Information Service Technical & Extension Service* 50: 13-23.

Pandav, B. 2000. Conservation and management of olive ridley sea turtles on the Orissa coast. Ph.D. thesis. Utkal University, Bhubaneswar, India.

Kar, C.S. & S. Bhaskar. 1982. The status of sea turtles in the Eastern Indian Ocean. In: *The Biology and Conservation of Sea Turtles* (ed. Bjorndal, K.). Pp. 365-372. Washington, DC: Smithsonian Institution Press.

Forman, R.T.T. & M. Gordon (eds.). 1986. *Landscape Ecology*. New York: John Wiley.

Ozinga, S. 2003. Parks with people. World Rainforest Movement/FERN. http://www.fern.org/pubs/ngostats/parks.htm. Accessed on February 25, 2006. ■