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A multi-stakeholder approach to the challenges of turtle conservation in the United Republic of Tanzania

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Introduction

Tanzania, located in tropical East Africa, has a coastline of 900km, supporting a diverse array of marine habitats including coral reefs, mangroves, sea grass beds, lagoons and offshore islands. Many of these habitats provide important foraging and breeding grounds for endangered marine turtles (Muir, 2005). Five species of turtle are present in Tanzanian waters: green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*) and olive ridley (*Lepidochelys olivacea*) but only green and hawksbill turtles are known to nest on Tanzania's beaches (Howell & Mbindo, 1996). Sea Sense monitors nesting activity in eight coastal districts which represents approximately one–third of Tanzania's coastline. Nesting density is relatively low across these districts with an average of 350 - 400 nests recorded per year (Sea Sense, unpublished data). Although afforded complete protection under national fisheries legislation, turtle populations in mainland Tanzania continue to face threats from subsistence harvesting for meat, poaching of eggs, incidental capture in gill nets and habitat disturbance (Bourjea *et al.*, 2008). Inshore commercial prawn trawlers also pose a significant threat (Joynson-Hicks & Ngatunga, 2009). Tourism development leading to destruction of nesting beaches is a major concern for turtle populations in Zanzibar (Bourjea *et al.*, 2008).

Challenges

There are many challenges facing turtle conservation in Tanzania. Although Tanzania has ratified several international treaties which pertain to marine turtle protection including the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973 and the Convention on the Conservation of Migratory Species of Wild Animals

(CMS), 1979, turtles continue to face major threats from anthropogenic activities in the coastal zone.

Key turtle foraging and breeding habitat in Tanzania is under threat from destructive fishing practices including industrial prawn trawling and seine nets (Muir, 2005). Poorly regulated coastal development threatens nesting beaches and disturbance from seasonal fisher camps has had an impact on turtle behaviour and nesting frequency (Muir & Abdallah, 2002). Despite clear conservation measures in Tanzanian legislation to protect turtles, there is little enforcement by relevant government authorities. Those who deliberately hunt or poach eggs, trade in turtle products or who use illegal fishing practices such as dynamite fishing are rarely apprehended or penalised.

A multi-stakeholder approach

Tanzania is a signatory state of the Indian Ocean South East Asia Marine Turtle Memorandum of Understanding (MoU). In recognition of the importance of a coordinated, multi-stakeholder approach to turtle conservation, Sea Sense is working closely with national and regional partners to implement priority actions and strategies of the MoU. The MoU has directed many of the collaborative efforts that Sea Sense has implemented and continues to be a valuable tool for guiding Sea Sense research and monitoring activities and community participation, capacity building and public education and awareness strategies.

Sea Sense is engaging with coastal communities, government authorities, academic institutions, the private sector and law enforcement agencies to address the challenges of turtle conservation in Tanzania. A community based turtle nest monitoring and protection programme was established in 2001 and now operates in eight coastal districts. Over 60 community members (mostly fishers) have been trained in data collection and practical field conservation techniques including identification of turtle species and their tracks, tagging of nesting females, egg translocation protocols, nest monitoring and hatchling release.

Sea Sense has elicited the support of District staff (Fisheries, Natural Resources and Education Officers) who contributes to training, awareness and education activities. Tanzania Fisheries Research Institute (TAFIRI) and the University of Dar es Salaam (UDSM) have collaborated with Sea Sense to conduct surveys into turtle bycatch and trade in turtle products. Hoteliers are participating in a turtle ecotourism initiative and supporting Sea Sense turtle conservation activities through donations and turtle viewing fees. Several meetings have been held with Tanzania Marine Police to lobby for action against dynamite fishing which is having a devastating effect on turtle foraging and breeding habitat (*pers. obs.*). Funds are currently being sought to conduct a marine conservation awareness seminar for law enforcement agencies and the judiciary.

A broad, participatory approach to turtle conservation has proven to be an effective method of protecting turtles in neighbouring Kenya (Okemwa *et al.*, 2004) where similar challenges are faced. In Tanzania, significant progress has been made in engaging a range of stakeholders who are now participating in Sea Sense turtle conservation activities. There is improved understanding of the major threats to turtle survival although addressing the issue of law enforcement remains the greatest challenge at both a local and national level.

Community nest monitoring

In 2001, community based nest monitoring commenced in Mafia Island, a small island 120km south of Dar es Salaam. Beach surveys were undertaken and interviews were held with local fishers to help identify turtle nesting beaches (Muir & Abdallah, 2001). Since then, six community members have been conducting early morning foot patrols throughout the year, at five key nesting beaches. Data is collected on nesting species, nest location and frequency of nesting activity. Nests are located and identified by day track counts. Threats to nesting females and incubating eggs are also recorded and any nest under threat from poaching, predation or tidal inundation is translocated to a safer area. All nests are monitored until hatching and then excavated to assess hatching success. Standard protocols are used for all monitoring and protection techniques as described in Eckert *et al.* (1999).

In addition, opportunistic day and night patrols have been undertaken to nearby islands in the Mafia archipelago where turtle nesting has been reported by local fishers. Results indicate that Shungi-mbili is an important nesting site, particularly for critically endangered hawksbill turtles (Muir & Abdallah, 2002). However, seasonal fisher camps on the island have disturbed nesting females and those that do come ashore to nest are either slaughtered, or their eggs are poached (Muir & Abdallah, 2002).

Monitoring of turtle nesting beaches was scaled up in 2004. Monitoring protocols used in Mafia Island since 2001 are now being implemented in eight coastal districts (approximately one–third of the Tanzanian coastline, Figure 1). Data is being collected by a network of 45 community Conservation Officers throughout the year.

Figure 1: Sea Sense turtle nest monitoring sites. (Source: L. West, 2009)

Over 95% of turtle nests recorded in Tanzania are laid by green turtles. Mafia Island is the most important nesting site. In 2008, 252 nests were recorded from day track counts (West, 2009). Less than 10 hawksbill nests are recorded each year and are all recorded on offshore islands (Muir, 2005). However, it is likely that some hawksbill nests go unrecorded due to the inaccessibility of some of these islands at certain times of the year.

There are seasonal patterns in nesting activity with peak nesting for green turtles occurring in March, April and May at all monitored mainland sites (Figure 2). Peak nesting activity for hawksbill turtles appears to be in January and February although this data is taken from a sample of only 28 nests in Mafia Island. A total of 2,135 turtle nests have been identified and monitored since the implementation of the Sea Sense nest monitoring programme in 2001. Of these, 1,741 (82%) have been successfully protected and 146,713 hatchlings have reached the sea. Clutch size and hatching success rates were calculated according to Miller (1999), means are presented with standard deviations. Mean clutch size for green turtles was 117 ± 25 cm. Mean clutch size for hawksbills was greater at 143 ± 24 cm. A mean hatching success rate of 67 ± 29 % was recorded for green turtles and 73 ± 25% for hawksbill turtles.

In the mid 1970's, olive ridley turtles were known to nest on Maziwe Island in Pangani District (Muir, 2005). The island has since submerged and no further olive ridley nests have been recorded. However, there have been repeated reports of turtle tracks when the island is exposed at low tide. In April 2009, Sea Sense, in collaboration with local fisher associations, commenced regular patrols of the island. Ten green turtle nests have so far been translocated to the mainland to prevent inundation by the tide. No olive ridley nests have been recorded.

Nest poaching and predation

Nest poaching has occurred in Tanzania for generations and is not generally perceived to be contravening the law. However, at sites where effective monitoring and conservation education are underway, the threat of egg harvesting has been significantly reduced. During the first year of monitoring in Mafia Island, 33 out of 70 recorded nests (47%) were poached by local fishers. In 2002, the incidence of poaching fell with eight out of 162 nests (5%) poached (Muir & Abdallah, 2002). This can most likely be attributed to the implementation of a community nest protection incentive scheme

and a public awareness campaign. Poaching in Mafia remains at approximately 2% with four out of 252 nests poached in 2008 (West, 2009). The frequency of poaching at other key mainland sites (Temeke District) has also reduced over the past four years of monitoring. In 2005, three out of 68 nests (4%) were poached compared with two out of 143 nests (1%) in 2008 (Sea Sense, unpublished data). Anecdotal reports from Tanga Region in the north of Tanzania indicate that nest poaching is more widespread although these reports have not been verified.

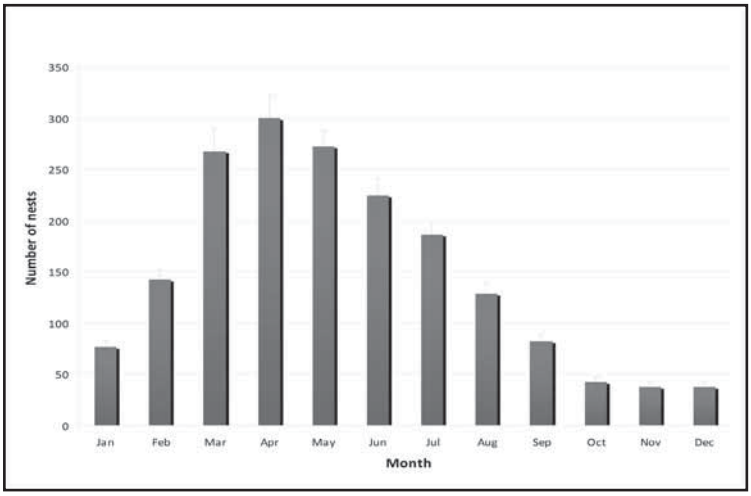

Figure 2: Nesting seasonality in green turtles (*Chelonia mydas*) in Tanzania, 2001 - 2008

Development and survival of turtle hatchlings are threatened by natural predators such as monitor lizards (*Varanus spp*), mongoose (*Herpestes javanicus*), honey badgers (*Mellivora capensis*), termites (Isoptera) and feral dogs (*Canis spp*). Ghost crabs (*Ocypode spp*), Indian house crows (*Corvus splendens*) and other birds prey on hatchlings as they emerge from the nest. In 2008, due to high levels of predation by mongoose, honey badgers and monitor lizards in Temeke District, Sea Sense placed protective nets over several nests using techniques described in Boulon, Jr, 1999. Such strategies have proven reasonably effective in deterring some predators. Twenty-six out of 428 nests (6%) were predated in 2008 (West, 2009) compared with 39 out of 305 nests (13%) in 2007 (Muir, 2007). However, predation by ants (Solenopsis spp) remains an ongoing problem due to the ants' ability to establish underground trails to turtle nests (Buhlmann & Coffman, 2001).

Mortality

Sea Sense began recording turtle strandings in 2004. On average, 230 – 250 mortalities are recorded each year. Many dead turtles are washed up on beaches and show evidence of net entanglement. There is also a high incidence of turtle slaughter in Tanzania and discarded carapaces are often found close to villages or fisher camps. Based on carapace determination, most mortalities (79%) are attributed to green turtles. Hawksbill turtles represent 12% of all recorded mortalities, olive ridley, 4%, loggerhead, 2% and the remaining 3% are unidentified.

Industrial prawn trawlers are considered to be responsible for more sea turtle deaths than any other human-related activity (Muir & Ngatunga, 2009). A two year ban on trawling in Tanzania was implemented in January 2008 due to reduced prawn stocks, high levels of bycatch and commercial non-viability of the fishery (Bourjea *et al.*, 2008). In 2007, Sea Sense and TAFIRI conducted a survey of turtle bycatch in the Tanzanian industrial prawn trawl fishery. The survey was conducted over a three month period and data was gathered from three licensed vessels in three fishing zones. Each month, vessels trawled for 20-26 days, with 4-5 hauls per day. During the survey, a total of 16 turtles were captured, most of which were green turtles (62.5%).

Both male and female turtles were captured and all but one was captured live. Based on these results, it is estimated that over a trawl season of seven months and a fleet of 10 vessels conducting 4-5 hauls per day (number for 2007), the turtle catch rate is estimated to be 54 turtles a year (season). The use of Turtle Excluder Devices (TEDs) in prawn trawl vessels is not mandatory under current Tanzanian fisheries legislation. However, Sea Sense continues to lobby for the incorporation of TEDs into Tanzanian fisheries law.

Trade in turtle products

In 2008, as a result of several unverified reports indicating that trade in turtle products (meat, shells and live specimens) in Tanzania is commonplace, Sea Sense and UDSM conducted a survey of the trade in the Dar es Salaam area (Sea Sense & Mwangi, 2008). Forty-eight people were informally interviewed over a period of seven weeks by an undercover investigator to avoid suspicion. The survey revealed that turtle products (meat, shells, oil) are sold both openly and in secret at the main landing sites in the Dar es Salaam area.

Turtles are reported to be caught daily in fishing nets and with hand lines. The turtles are brought in to landing sites live for sale, normally early in the morning or late in the evening, to avoid detection. Many of the turtles come from other coastal districts as well as local fishing grounds. Turtle meat is sold regularly at six of the survey markets and is believed to improve the immune system. Turtle scutes are ground down and used to treat pregnant women and turtle oil is used to cure ear ache in children. Turtle carapaces are sold for between TSh 4,000 and 15,000 (USD3 – USD12) depending on the size. The shells are usually varnished and then sold for decoration to Tanzanians.

Fishers and traders are aware that trade in turtle products is illegal but due to the lack of enforcement there is no deterrent. Sea Sense has been working with District Fisheries Officers and law enforcement agencies to ensure those responsible for the illegal turtle trade are apprehended. At present three cases are being heard at a court in Kilwa for the illegal sale of turtle meat.

Turtle ecotourism

Turtle ecotourism, if well managed, has been identified as a valuable way to conserve endangered marine turtles and their habitats as it encourages communities to place a high value on live turtles. Sea Sense has been working with hoteliers and local communities to initiate turtle-based tourism activities in the vicinity of key turtle nesting sites. There are currently nine hotels participating. Visitors who witness a turtle hatching event are encouraged to make a donation to Sea Sense or for a modest fee, adopt a turtle nest, receiving an adoption certificate, details of their adopted nest and photos of the hatchlings. Half of monies raised from visitor donations and nest adoptions are used to support Sea Sense turtle conservation work. The remaining revenue is used to fund local community development projects. Sea Sense has established Village Environment Funds in two villages adjacent to turtle nesting beaches. In 2008, US$3,600 was raised through turtle ecotourism activities and has been used to refurbish a local primary school, install a clean water supply and improve health care services.

Awareness and education

Sea Sense conducts regular awareness and education programmes. Primary and secondary school art, drama and song competitions have been held in several coastal districts and 'Village Olympics' were recently held, targeting local fishers. The competitions are organised in partnership with District Education Officers and marine park authorities and have proven to be an effective method of raising awareness of endangered marine species conservation and the importance of sustainable marine resource use. Educational materials have also been distributed including leaflets, posters, t-shirts and DVDs. An annual 'Day of the Turtle', similar to that held in other countries in the Western Indian Ocean region (Comoros and Mayotte) is currently being considered.

Law enforcement

Some progress has been made with law enforcement at a local level following the development of Beach Management Units (BMUs) in several coastal

districts. BMUs are at various stages of developing and implementing their own fisheries related by-laws in accordance with Village Resource Use Management Plans (VRMPs) and in support of existing fisheries laws and regulations. Sea Sense has participated in consultations on draft BMU guidelines to ensure appropriate turtle protection measures are designed and incorporated. Frequent meetings have been held with village councils and BMU leaders to elicit support for the measures and promote full participation in decision making processes. This continued collaboration will ensure any future policy measures are fully supported by the local community and will facilitate identification of training and resource needs in order to strengthen capacity for effective implementation and enforcement of local bylaws.

Conclusion

The participation of a range of stakeholders has made a significant contribution to turtle conservation in Tanzania over recent years. In particular, a community based nest protection and monitoring scheme has provided employment, training and education opportunities for coastal communities and empowered them to take ownership of their natural resources. It has also generated a small but sustainable source of income through turtle ecotourism.

However, there remain many challenges to address. There is an urgent need to strengthen capacity of government authorities and law enforcement agencies through training and provision of resources (vehicles, boats, communication equipment). Without adequate capacity within these sectors, the development and implementation of appropriate policy measures will be ineffective and there will be no long term commitment to enforcement.

There are also large spatial and temporal gaps in information on turtles in Tanzania. Important foraging and developmental areas remain unidentified and there is limited information on turtle migratory routes and areas of high risk, particularly from fisheries bycatch. This information is fundamental to the conservation and management of different breeding populations and to ensuring resources are focused effectively.

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Discovering behaviour of open sea stages of sea turtles: working flipper on hand with fishermen in Réunion

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Sea turtles are under pressure from a number of natural and anthropogenic factors, both in the terrestrial phase of their life as well as in marine environment. Conservation efforts will only succeed if the major threats can be managed, and fisheries interactions constitute one of these. The small offshore longline fishery of the French islands of the Indian Ocean (30 offshore longliners) seems to have a limited impact on sea turtles (Bourjea *et al.*, 2008). In 1999, a three-year study showed that less than 0.004 turtles per 1000 hooks were by-caught by this fishery (Miossec & Bourjea, 2003). Trawling and gillnets are not used in Réunion. However, in order to be able to further reduce current and future interactions between sea turtles and fisheries, it is necessary to gain as much understanding of the biology of turtle species during the pelagic stages of their lifecycle as possible.

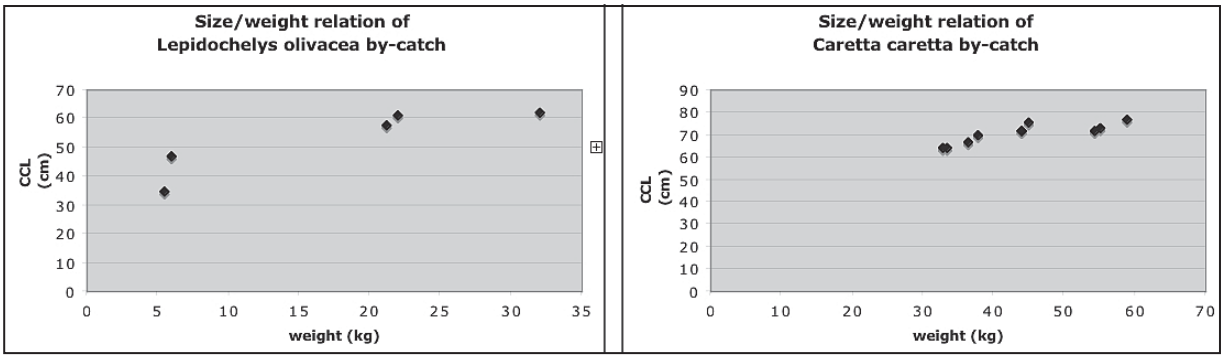

Figure 1: Size and weight of marine turtles in by-catch from 2004 to 2008 by longliners in the waters of Réunion.