AFRICAN SEA TURTLE NEWSLETTER

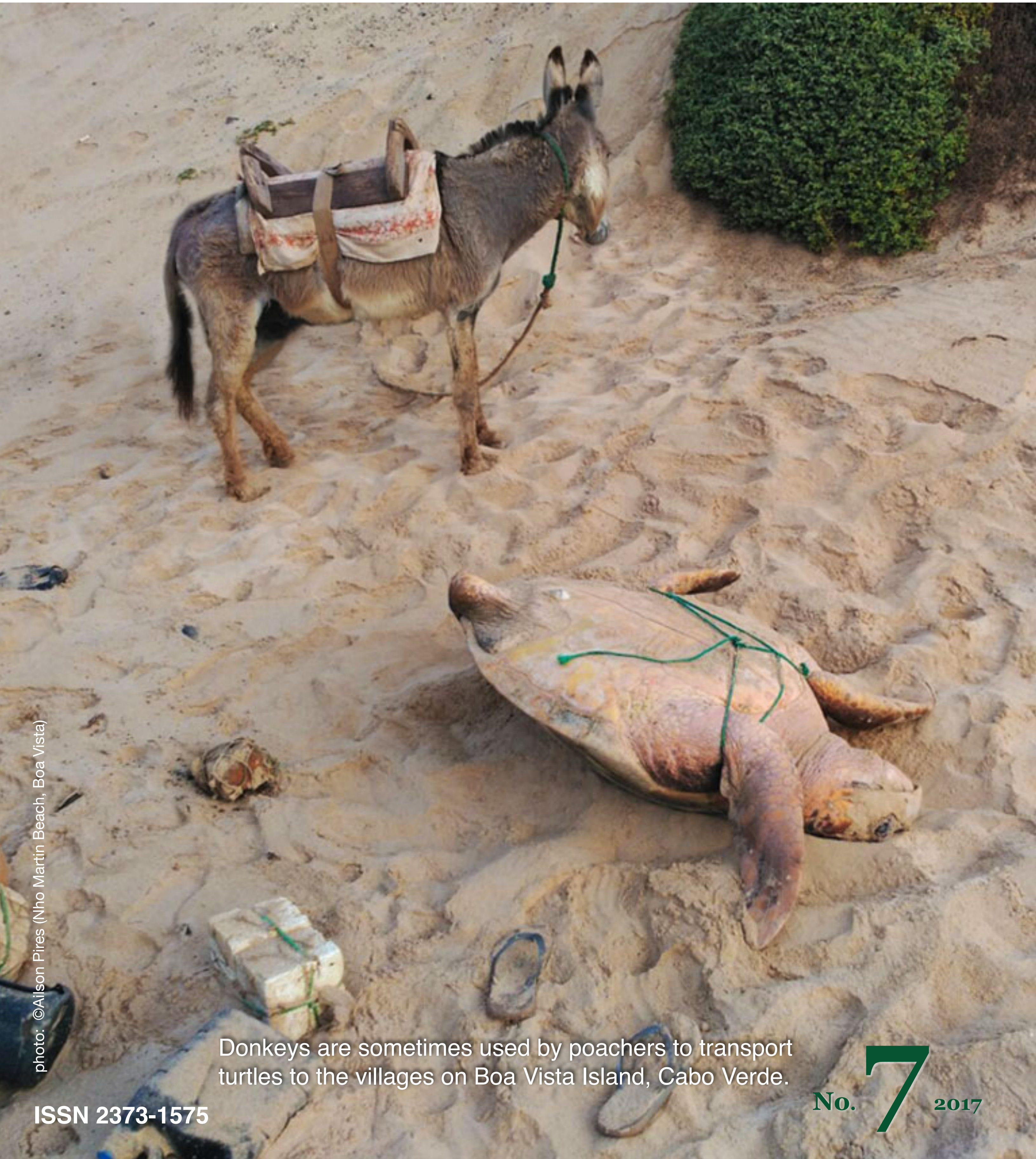

photo: ©Ailson Pires (Nho Martin Beach, Boa Vista)

Donkeys are sometimes used by poachers to transport turtles to the villages on Boa Vista Island, Cabo Verde.

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CONTENTS

CONGRATULATIONS TO ANDREWS AGYEKUMHENE!

Our heartiest congratulations to Andrews Agyekumhene from the Forestry Commission, Wildlife Division, Winneba, Ghana, for winning the Archie Carr Student Award for the best oral presentation in the Conservation category at the 37th Annual Symposium on Sea Turtle biology and Conservation in Las Vegas, USA (15 - 20 April 2017).

His presentation was entitled “Sea Turtle By-catch Reduction in Ghana’s Gillnet Fishery“ and his co-author was Phil Allman, Florida Gulf Coast University. The study described successful experiments with the placement of green LED lights on ten fishing vessels to reduce sea turtle bycatch.

Well done Andy! We are very proud of you!

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Minutes of the Africa Regional Meeting, 37th Annual Symposium on Sea Turtle Biology and Conservation, Las Vegas, USA (17 April 2017)

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Twenty-five people representing work in more than 15 countries attended this full-day Africa Regional meeting. Andrews Agyekumhene from Ghana chaired the meeting.

The meeting started with country presentations:

Cabo Verde: Leno dos Passos, Maio Biodiversity Foundation, described advances in sea turtle conservation efforts and MPA management on Maio Island. Ana Liria Loza, Natura 2000, provided an overview of sea turtle projects in Cabo Verde, and then focused on the efforts and challenges faced on Boa Vista Island.

Ghana: Phil Allman, Florida Gulf Coast University, provided a ten-year summary of the Ghana Turtle Research Project.

Nigeria: Felix Olusola Abayomi described how he started working with sea turtles, his education and outreach activities, and his future plans.

Cameroon: Jacques Fretey, Chélonée (presented by Manjula Tiwari on his behalf), described nesting beach work in southern Cameroon, efforts to create a National Marine Park, and the collaboration with the community association Tube Awù. Aristide Takoukam (AMMCO) and Isidore Ayissi (ACBM) talked about threats to turtles, drafting of a National Action Plan, and the development of an app that would facilitate data collection.

Equatorial Guinea: Shaya Honarvar, Indiana University-Purdue University, shared their nesting beach research as well as their economic and educational outreach work on Bioko especially with the local women. Dana Venditti, Drexel University, described the Bioko Biodiversity Protection Program's research, conservation, education, and outreach activities on Bioko Island. Jesus Mba Mba Ayetebe from INDEFOR provided an overview of the sea turtle work in Equatorial Guinea.

Gabon: Carmen Kouerey, Gabon Sea Turtle Partnership, presented an overview of their multi-faceted project that ranges from monitoring threats and nesting (through ground and aerial surveys) to conservation-based research, standardization of protocols, education and awareness, satellite tracking and reduction of turtle bycatch in local fisheries.

DR Congo: Samuel Mbungu, ACODES, described their sea turtle project in the Mangroves Marine Park, which includes nest relocation, monitoring patrols, community awareness, and lobbying along 40 km of coastline.

Brendan Godley talked about his childhood in South Africa and his first African sea turtle projects in Guinea Bissau and Cabo Verde. Now he works through his students and creates opportunities for others, and has projects in Madagascar, Gabon, Congo, and Principe. He helped create the Gabon Marine Biodiversity Atlas, and is working more on sustainable fisheries. He offered his help with technical tools and funding opportunities, and invited people to discuss Master's degrees with him.

Alexis Guilleux and Alexandre Girard from Rastoma presented an overview of the Central African Sea Turtle Network, which was created in 2012 and is supported by the French Global Environment Facility and IUCN (France-PACO). It covers 6 countries from Cameroon to DR Congo and consists of 25 members and a 6-member coordination team. They described their past, present and future meetings and activities.

Several topics were discussed during this meeting:

1) How do we communicate?

The following suggestions were made:

- Greater use of social media (Facebook).
- The Africa Sea Turtle Newsletter (ASTN) will maintain an updated list of groups working in Africa as well as a list of publications from Africa.
- More webinars.
- More thematic discussions on the Africa listserv.
- Greater use of the ASTN to publish data, stories and events that would otherwise have few other outlets.
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2) Unpublished data:

During this discussion the following opinions were shared:

- Unpublished data are often viewed as unreliable.
- Peer reviews ensure data quality. Unpublished data may not be checked for quality by your peers, which may risk biasing the picture or the interpretation.
- Sharing unpublished data also carries the risk of the original data owners not being recognized.
- Publish as soon as you can.
- Many good reasons to publish data—for the turtles, for the environment, for acknowledgement, for donors, and for improving your career. Data lead to actions and to conservation.
- Data are useful for the bigger picture and important issues.
- Don't let data perish on computers; share the data.

3) Symposium in Africa:

It was suggested that before a Symposium is organized in Africa, we should start with more regional meetings. Manjula Tiwari recommended Andrews Agyekumhene as a future Presidential candidate for a Symposium in Ghana given Andrews' experience on the Board of Directors of the International Sea Turtle Society. The regional meeting would be an excellent trial run and precursor to the Symposium. To fund and support the regional meeting, several suggestions were put forth: NGOs could support travel of their individuals from their grants, and funds for capacity building and training could be raised from oil companies, European Union cooperations in Africa, as well as Embassies. It was also suggested that expanding the regional meeting and collaborating with other committees that work on marine mammals, sea birds, etc. might be beneficial.

4) Coastal Urban Development:
The question on how to deal with this threat was raised. It was indicated that that this problem is not unique to Africa, and that there are many experts out there to help address this. However, Environment Impact Assessments (EIAs) are unfortunately very often just a formality. Governments need to be stricter. It is often effective to address this issue at the policy level. It is important to get good science published and hold countries accountable. In some cases consultancy companies may even provide funding to offset damage because those hired to do the EIAs need in-country partners.

5) Data gathering from in-water habitats:
Overall, besides bycatch work, in-water studies are not very prevalent in Africa. Participants at the meeting indicated that Cabo Verde has in-water captures and tagging and genetic studies, and Gabon has a foraging ground study on diet, stable isotopes, genetics, mapping, tracking, etc.

6) Funding for NGOs:
While some suggested that creating a network helped fund raising others felt that individual NGOs reaching out to potential funders was just as effective. The ASTN published a list of potential funders in a recent issue and will henceforth maintain an online database.

Photo: Angela Formia

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Combining Citizen Science and Photo Identification to Monitor a Key Green Turtle Feeding Ground in the Southern Egyptian Red Sea

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Citizen science, broadly defined as the involvement of non-specialists in scientific research activities (Socientize 2013), is an increasingly used approach to monitor the status of marine and terrestrial natural resources (e.g., Tulloch *et al.* 2013). This approach offers the enormous advantage of collecting data over large areas and long time periods. Furthermore, it increases public interest and awareness of environmental issues; by taking part in a data collection activity, people become more aware of the threats faced by the study subject and feel empowered to actively engage in leveraging policy making (Dikinson *et al.* 2010).

In recent years, with the development of new technologies, citizen science has often been coupled with photo-identification (or photo-id), a technique that allows the identification of individual animals within a certain species using natural markings (e.g., Markovitz *et al.* 2003). Contrary to other methodologies used to identify single individuals like tagging, photo-id has the advantage of being less intrusive and having less impact on the studied individuals (e.g., Reisser *et al.* 2008). This technique has been successfully employed in ecological and behavioural studies on dolphins (e.g., Currey *et al.* 2008), whale sharks (Brooks *et al.* 2010), manta rays (Kitchen-Wheeler. 2010), basking sharks (Gore *et al.* 2016), sea turtles (Reisser *et al.* 2008; Schofield *et al.* 2008) and cheetahs (Kelly 2001), among others. Photo-id uses photographs of species-specific body patterns, which need to be stable over time and different in each individual within the species. For example, individual dolphins can be distinguished using their dorsal fin (e.g., Currey *et al.* 2008), and whale sharks have a unique spot pattern on their flanks that does not change over time (Holmberg *et al*. 2009; Brooks *et al.* 2010). Previous photo-id studies revealed that for green turtles, *Chelonia mydas*, facial scute patterns could be used to identify individuals over time. Ideally, both left and right profiles are needed for a perfect match, but in some cases one profile is sufficient (Reisser *et al.* 2008; Schofield *et al.* 2008; Jean *et al.* 2010; Chassagneux *et al.* 2013; Carpentier *et al.* 2016). As photo-id for marine turtles requires only minimum equipment (an underwater camera) and minimum training (information about facial patterns to be photographed), it can be easily coupled with collection of other data, including species, size, behaviour, sex, etc. (Williams *et al.* 2015).

Thanks to the presence of a high number of divers and snorkelers in the Egyptian Red Sea, various citizen science initiatives have been carried out or are currently run to collect data on endangered ecosystems or species (e.g., the Red Sea Sharks project <www.redseashark.org>). In 2011, the Hurghada Environmental Protection and Conservation Association (HEPCA) initiated TurtleWatch Egypt, a citizen science-based marine turtle monitoring program, involving dive centres all around the Egyptian Red Sea, from Sharm El-Sheik to Wadi El Gemal National Park. The project aimed to collect information on marine turtles at dive and

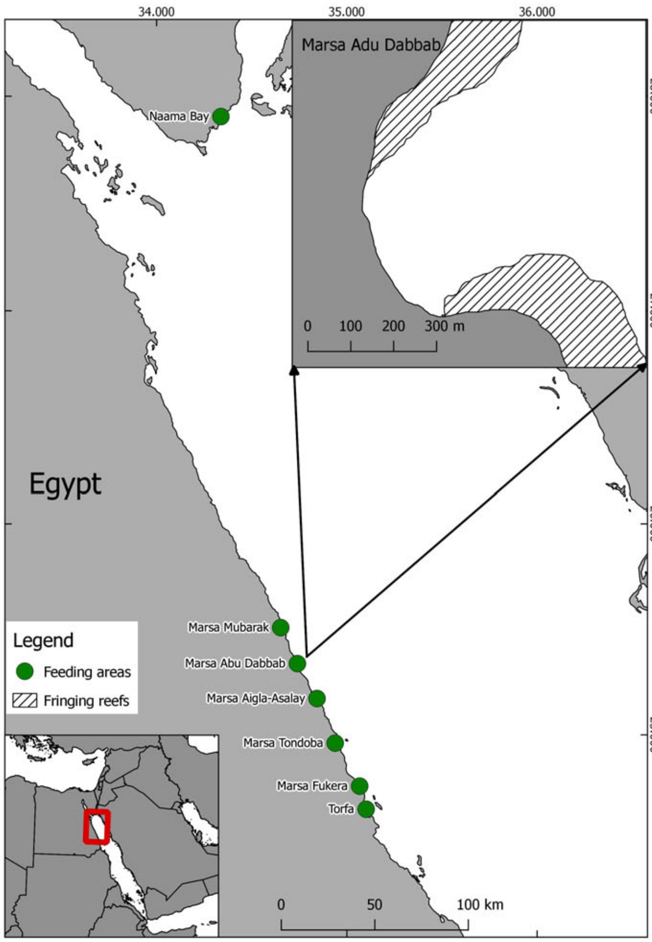

Figure 1. Green turtle feeding grounds identified during systematic and scientific surveys in the Egyptian Red Sea between 2011 and 2013 and close up of the study area, Marsa Abu Dabbab.

snorkeling sites on a regular basis, in order to better understand the abundance, distribution and movements of marine turtles at key feeding sites and to identify potential conflicts with human activities. The project also aimed to raise awareness about threats faced by marine turtles globally and locally (www.hepca.org).

Five species of marine turtles inhabit the Egyptian Red Sea: the green turtle, the hawksbill turtle (*Eretmochelys imbricata*), the leatherback turtle (*Dermochelys coriacea*), the loggerhead turtle (*Caretta caretta*) and the olive-ridley turtle (*Lepidochelys olivacea*). Only green and hawksbill turtles are commonly observed and are known to feed and nest in the area (Frazier and Salas 1984; Hanafy 2012; Mancini *et al.* 2015a). Previous studies showed that green turtles aggregate at feeding grounds in shallow, coastal bays where seagrass meadows are abundant (Mancini *et al.* 2015a; Elsadek 2016). At least six important feeding sites were identified in the Southern Egyptian Red Sea: five in the Marsa Alam area, and one in the Northern Red Sea, near the tourist resorts of Sharm El-Sheik (Mancini *et al.* 2015b; Elsadek 2016; Mancini *et al. in press*; Fig. 1).

These studies showed that green turtles are present year-round at feeding locations and stay over long periods (Mancini *et al.* 2015b; Elsadek 2016). Systematic surveys conducted by researchers at 12 index sites in the Southern Red Sea provided an estimated population of 280 green turtles, with a majority of adult and sub-adult individuals (54%) and a higher presence of females (75% of the adult population) (Elsadek 2016). However, size-based selective habitat use was also found, with some areas used predominantly by juveniles (e.g., Marsa Fukera; Elsadek 2016). Additionally, preliminary analysis of data collected through TurtleWatch Egypt provided important information that in most cases confirmed scientific findings and also confirmed the presence of loggerhead and olive ridley turtles in the Northern Red Sea (Mancini and Elsadek *in press*).

TurtleWatch Egypt was stopped in 2014 as a consequence of the tourism crisis, due to a lack of volunteers in the field. In Summer 2015, with tourism slowly coming back to Egypt, a marine biologist located in Marsa Abu Dabbab, one of the major green turtles feeding grounds in the Southern Egyptian Red Sea, reinitiated a citizen science monitoring program based on the TurtleWatch Egypt protocol in order to monitor green turtles that were specifically using this bay. The project aimed at 1) having a better understanding of green turtle abundance, population structure, site fidelity, behaviour and seasonality, 2) increasing awareness about endangered green turtles among local communities and foreign visitors, and 3) testing the utility of photo-id techniques to characterize a green turtle population in a feeding ground. This paper presents the results of the monitoring program carried out in Marsa Abu Dabbab in 2015-2016, with a focus on data collected from January to December 2016, when the new protocol was validated after some tests in the field.

Methods: *Study area*—Marsa Abu Dabbab is a shallow bay located 35 km north of the town of Marsa Alam, in the Southern Egyptian Red Sea (N 25.316175; E 34.767308; Fig. 1). It stretches for about 600 m from the northern to the southern side and for about 400 m from the shore to the open sea. The bay is characterized by two coral reefs extending along the northern and southern part of the coast and by a seagrass area growing all over the basin of the bay, from the depth of 1 m by the shore down to a depth of 40 m at the point of the open sea. About a third of the seabed lies in shallow waters (1-6 m). The waters inside the bay are relatively quiet year-round as the northern coast acts as a shield against the prevailing winds and currents. The water temperature can vary between 21°C during winter (January-February) and 31°C during summer (July-August). Underwater visibility conditions are generally very good (20-50 m visibility), but they can vary substantially according to weather conditions. Due to the abundant seagrass meadows, the bay is used by green turtles and occasionally by dugongs (*Dugong dugon*). Moreover, green turtles nest sporadically on the beach.

Due to its easy access and rich marine wildlife, Marsa Abu Dabbab has become a famous tourist destination over the last 15 years. It is visited every day by tourists coming from the three resorts situated on the beach itself and from many others. Diving and snorkeling with dugongs and green turtles are the main attraction in the bay.

Marine turtle monitoring and photo-ID—A marine turtle monitoring program was re-initiated in Summer 2015, however the data collection protocol was tested and modified in the first months, therefore here we present the results related to the data collected from January to December 2016, with higher effort during the summer months, due to the high tourist season. Regular surveys were conducted by snorkeling or by scuba diving and generally lasted 40 minutes and involved a marine biologist or a trained guide and tourists. All regular surveys took place during the daytime between 9 am and 5 pm, following a standardized transect. During snorkeling surveys, attention was focused on the shallow part of the bay (0 to 12 m), while scuba dive surveys allowed exploration of the deeper area in the middle of the bay (up to 30 m in depth).

Each time a turtle was found, the observers collected the following data:

1) Photographs of right and left facial sides, when possible, from a distance of about 1 m
2) Approximate straight carapace length (SCL)
3) Sex
4) Activity at first sight
5) Approximate location in the bay
6) Time
7) Depth
8) Water temperature
9) Surface activities (i.e., presence of speedboats)
10) Water conditions
11) Presence of other divers or snorkelers

The approximate SCL was used to estimate the reproductive stage of observed turtles. Green turtles with a SCL $<$ 70 cm were considered juveniles; turtles with a SCL between 70 and 90 cm were considered sub-adults, and turtles with a SCL $>$ 90 cm were considered adults (Hirth 1997).

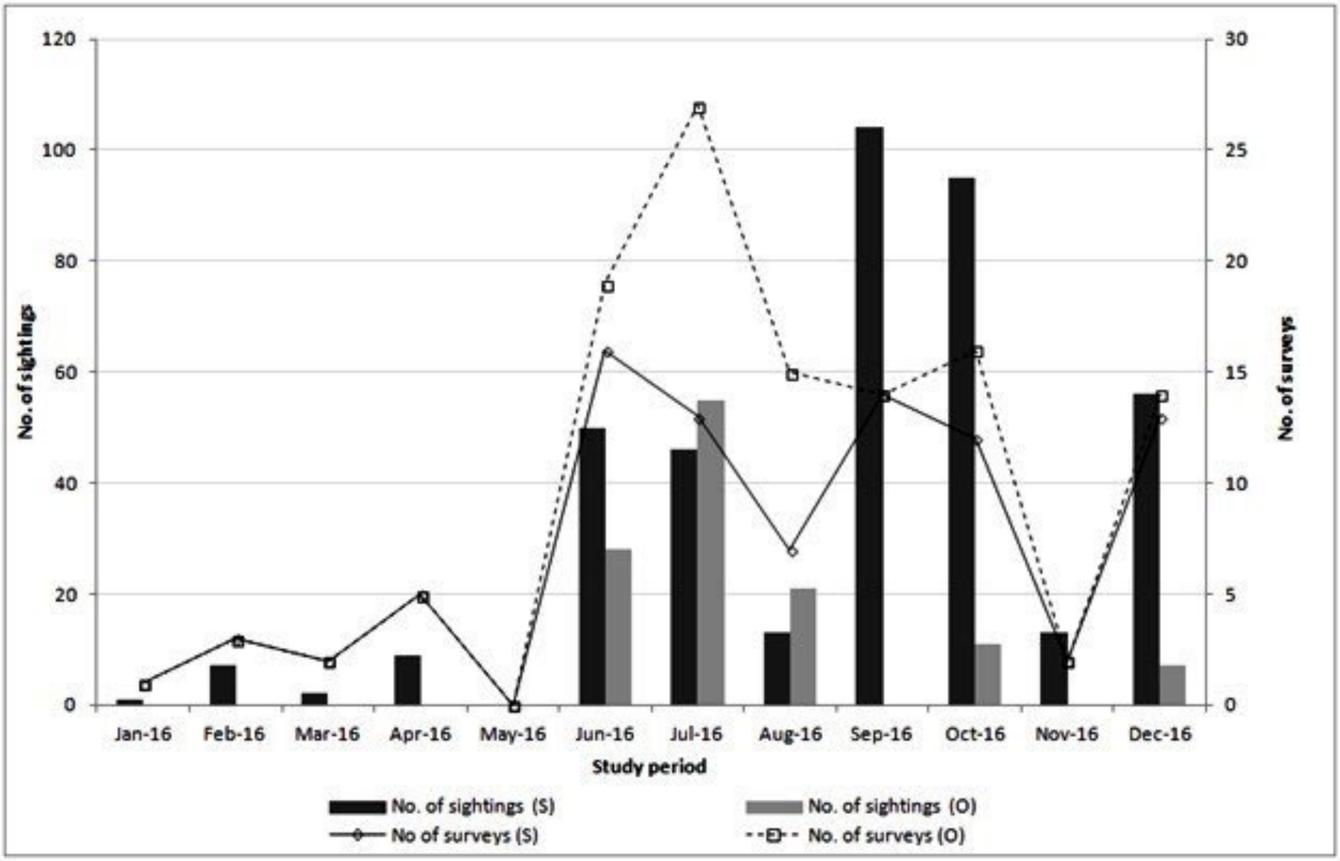

Figure 2. Number of green turtle sightings per survey during regular (S) and opportunistic (O) monitoring that took place in Marsa Abu Dabbab from January to December 2016.

In addition to the regular monitoring, opportunistic data were collected by enthusiastic divers who after receiving a briefing and participating in the regular turtle surveys, decided to collect information during their solo (i.e., without a marine biologist or trained guide) snorkeling or diving trips. In this case, only the total number of sightings, the date of the survey and the photos were collected. Opportunistic data were grouped in a separate dataset and analysed separately, due to some overlap in dates and times with the regular monitoring effort. In this study, we report only on the number of observed green turtles per survey, their sex and approximate size, and the analysis of the photos.

Results and Discussion: *Overall results*—In total, 88 official surveys were carried out over the study period that resulted in a total of 396 sightings of green turtles. Twelve trained citizen scientists carried out a total of 30 additional opportunistic surveys, reporting a total of 122 sightings. Due to the irregular survey effort, it is not possible to make conclusions on the relative abundance of green turtles in the bay or on the seasonality of sightings. A more consistent level of effort is needed, especially during the winter months, when fewer visitors go to Marsa Abu Dabbab. Nevertheless, we can say that the bay is used year-round, and the number of sightings per survey seems to increase towards the end of the nesting season, starting in September (Fig. 2).

Photo-identification—Through photo-id, a total of 38 individuals were identified. Twenty of these individuals had been previously reported during systematic surveys in 2011-2013, while out of the newly identified individuals, seven were observed over multiple months and eleven were seen only over a month or two.

Population structure—Out of the individual turtles recorded during the surveys, 53% were classified as adults (n = 20), 21% were classified as sub-adults (n = 8) and 18% were classified as juveniles (n = 7). For 8% of the turtles (n = 3), information on the carapace length was not available (Fig. 3). Sex was determined for all the 20 adult green turtles. The female:male ratio was 0.5:1. This result is different to the previously reported 1:1 female:male ratio for the Marsa Abu Dabbab area (Mancini *et al.* 2013), but can be the result of a more intensive survey at the beginning and at the end of the nesting season (May to September) when males have been more frequently observed at feeding grounds (Mancini *et al.* 2013).

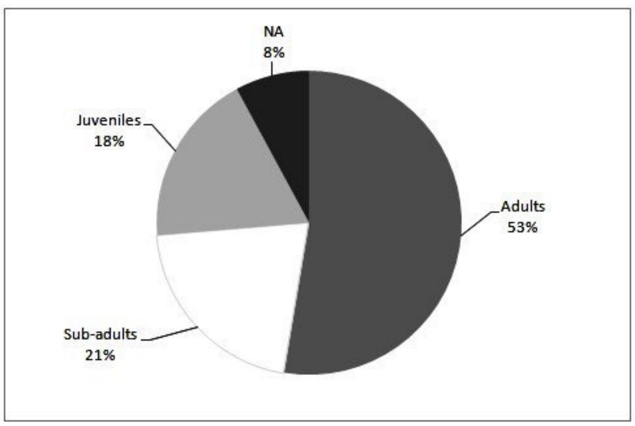

Figure 3. Age class of individual green turtles identified during the surveys from January to December 2016.

Residency—The use of photo-identification at the same site over time allowed us to identify long-term green turtle residents (i.e., 20 individuals that were observed at first during 2011-2013; Mancini *et al.* 2013). It also allowed us to follow up on individual growth rates and sexual maturity; three turtles that were considered juveniles or sub-adults during the 2011-2013 survey reached the sub-adult or adult stage, which allowed us to identify their sex (one male and two females). Furthermore, a long-term resident of the bay was found dead, possibly as a consequence of a shark bite (Fig. 4).

Finally, a newly observed turtle was identified carrying a flipper tag from a nesting beach in Saudi Arabia (Fig. 5). While this migration is not new, it highlights the importance of feeding areas on the Egyptian Red Sea coast for adult green turtles in the region.

Figure 4. The use of photo-id techniques over multiple years allowed us to identify a long-term green turtle resident of Marsa Abu Dabbab that was found dead (Photo: M. Montagna).

People's perception and behaviour—The visitors who were involved in the turtle monitoring showed a great interest in the project and saw this as further motivation to engage in water activities like diving or snorkeling with the dive centre (Fig. 6).

They also showed great enthusiasm for learning about the threats marine turtles are facing and took over the role of 'turtle ambassadors' during their solo surveys, contributing to the prevention of

Figure 5. The use of photo-id coupled with flipper tagging allowed to identify a transient female green turtle coming from nesting grounds in Saudi Arabia (Photo: M. Montagna).

misbehaviour like touching or grabbing turtles while at the bottom, and explaining the best ways to approach turtles to uninformed tourists. This aspect is particularly important in Marsa Abu Dabbab where hundreds of tourists are sent into the water with no proper briefing or information and sometimes take serious risks for a 'selfie' with a turtle.

Figure 6. Visitors who took part in the marine turtle monitoring program showed great interest and enthusiasm and initiated an opportunistic survey (Photo: A.R. Taher).

Conclusions and future work—Underwater marine life is one of the main attractions of the Egyptian Red Sea; however, extensive awareness programs are needed to inform dive and snorkeling guides, as well as most tourists, on the correct way to observe and interact with wildlife. The use of citizen science data collection protocols coupled with photo-identification seems to have the potential to not only improve our knowledge of endangered species in the region, but also to serve as a positive and active way to promote behavioural changes in tourists.

In the future, we hope to add a seagrass monitoring program to better understand green turtles' use of Marsa Abu Dabbab. Furthermore, we hope to continue to involve visitors in our marine turtle monitoring in a more consistent way and have a better idea of how many turtles inhabit the bay regularly and occasionally in order to provide important information to the authorities that can be used to implement targeted conservation measures.

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Marine Turtle Bycatch in Artisanal Fisheries in Yemeni Red Sea Waters

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Industrial and artisanal fishing are one of the major threats facing marine turtles (Laurent *et al.* 2001; Lewison and Crowder 2007; Donlan *et al.* 2010; Wallace *et al.* 2010; Casale 2011; Benhardouze *et al.* 2012; Riskas and Tiwari 2013). Wallace *et al.* (2010) compiled a comprehensive database on marine turtle bycatch reported in gillnet, longline, and trawl fisheries worldwide between 1990 to 2008, and reported that bycatch was approximately 85,000 turtles, but that even this was possibly an underestimate by two orders of magnitude.

Yemeni Red Sea waters and the Gulf of Aden are important fishing grounds and many diverse fisheries such as gillsnets, purse seines, and trawlers operate in these waters. The Red Sea fishery is dominated by artisanal fisheries ranging from small non-mechanized to relatively large (10-15 m) boats with inboard engines. More than 90% of the total landing in the Red Sea is by artisanal fisheries (PERSGA/GEF 2004). Some of the boats are used to trawl for shrimp, mainly *Penaeus semisulcatus*. The gear most commonly used for fishing are driftnets and longline. Indian mackerel (*Rastrelliiger kanagurta),* king fish (*Scomberomorus commerson)*, jackfish (*Caranx spp*.), emperor (*Lethrinus spp*.), barracuda (*Sphyraen spp.)* and shark (*Carcharinus ssp*.) are dominant in the catch. Extensive subsidies has made fishing very profitable and allowed their dramatic expansion even to the waters of neighboring countries. The industrial trawlers in Yemen target mainly shrimp; and there are joint ventures with foreign companies (Tesfamichael 2012).

The common sea turtle species in the Western Indian Ocean such as the green turtle, *Chelonia mydas,* the hawksbill, *Eretmochelys imbricata*, the olive ridley, *Lepidochelys olivacea*, the loggerhead, *Caretta caretta,* and the leatherback, *Dermochelys coriacea,* are found nesting or foraging in Yemen (Ross and Barwani 1982). However, there is a lack of information and studies about marine turtles bycatch in Yemeni Red Sea waters. Data on bycatch rates across fisheries are essential for management and for highlighting conservation priorities. Therefore, the objective of this study was to interview fishermen and form a basic understanding of marine turtle bycatch and artisanal fisheries in Yemeni Red Sea waters.

Study area: The coastline of Yemen is approximately 2,500 km long (Fig. 1). The Red Sea coastline is approximately 450 km long (Chakraborty 1984), and has 181 offshore islands. More than 90% of the total landing is by the Red Sea artisanal fisheries in the Yemeni Red Sea (PERSGA/GEF 2004; Ministry of Fish Wealth, Houdayda Branch).

Methods: Interviews with primarily fishermen were carried out from February to March 2015 in Hudaydah city and other nearby areas. People interviewed included 10 fishermen, two people who belonged to fishermen cooperatives, and three who were researchers at the Ministry of Fish Wealth.

Figure 1. The Red Sea coast of Yemen.

We asked a series of questions about turtle bycatch in the region (species, area, month and number of captures, and impact of gear type) as well as about boats and fishing gear (type and length of boat, engine type, number of crew, total catch/trip, number of trips /month, mesh size, and net length). Turtle photos were distributed to help fishermen with species identification.

Figure 2. Artisanal shrimp trawl (Photo: Fahd Darasi ©).

Results and discussion: During the interviews five fisheries were identified that appear to have significant marine turtle bycatch: gillnets, shrimp trawls, long lines, purse seines and stake nets, with shrimp trawls, gillnets and stake nets having the greatest impact. The majority of those interviewed indicated that turtle bycatch occurs because these three fisheries mostly fish near areas where turtles forage or nest.

The artisanal shrimp trawl has a rope between 15 to 20 m in length, mesh size of 30 mm, net length of nearly 20 m, and doors that are about 120 cm in length and 45 kg in weight. All the engines on this type of trawler are inboard and use diesel fuel. The length of the boats are between 12—20 m, and have 4 to 8 fishermen as crew on each trip. Totals numbers of boats that work on shrimp trawls in Hudaydah and Saleef harbors are about 50 and 100 boats, respectively (Fig. 2).

Bycatch by artisanal shrimp trawls occurs particularly in north Hudaydah (between Gbana and Ras Katib) and south Hudaydah around Turfaa Island, as well as in Saleef and Luhayyah (Fig. 1). Shrimp trawl boats operate from August to May every year during the shrimp season. The number of trawls per day are approximately three trawls, once in the morning and twice at night. The estimated catch is usually 100-300 kg per trawl including shrimp. The net shrimp weight is 50 kg per trawl and the rest is bycatch (fish, crabs and some bivalves). According to fishermen, turtles occur in the shrimp trawl accidentally, maybe twice a year, but not all boats encounter turtles.

Gillnet boats are between 5 to 20 m in length and have 2 to 12 fisherman as crew on each trip. The engines commonly used can be small (40 HP) or large (75 HP); the latter is used to cover long distances and transport a heavy load with more than 20 fishers per boat. Gillnets are the common gear used along the Yemeni Red Sea coast. Gillnets are deployed after sunset and pulled out six hours later, then deployed again until sunrise. Total catch is between 10 to 100 kg per trip. They are used throughout the year in some areas. From time to time some fishermen find turtles entangled in their nets, and they claim to release the turtles although they are sometimes found dead in the net.

Stake nets are composed of nets and many sticks fixed in the sea. The net goes around the sticks and holds them together like a cage open from the top. They are used to catch some fish, sepia, and crabs in the intertidal zone. Stake nets are commonly used in lagoons and are used throughout the year. Stake nets are always installed in lagoons like Khor Al Katib and Khor Gulifikha (Fig. 1), where fishermen and inhabitants have noted the presence of marine turtles.

Finally, according to the fishermen, an estimated total of 50 marine turtles may be captured in one year in shrimp trawls and gillnets taking into account that not all boats operate at the same time. During the nesting season, this number may increase. Sometimes fishermen catch turtles to sell in the city, but overall there appears to be no active hunting for marine turtles in the Yemeni Red Sea. Artisanal fisheries may be the only fisheries active in the Yemeni Red Sea waters at the moment because commercial fishing vessels, such as Egyptian boats, are no longer fishing here due to the war in Yemen.

Acknowledgements: We are grateful to the researchers at the marine center for helping us with the field work, and to the local people and fishers who so gladly provided the benefit of their expertise and knowledge of marine turtles.

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First Record of a Green Turtle, *Chelonia mydas,* Nest on Maio Island, Cabo Verde

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The Cabo Verde archipelago supports a globally important nesting population of loggerheads, *Caretta caretta,* and important foraging grounds for hawksbills, *Eretmochelys imbricata*, and green turtles, *Chelonia mydas* (Marco *et al.* 2011; Monzon *et al.* 2010). Green turtle nesting in Cabo Verde is extremely rare. There is one well-documented green turtle nesting event from Sal Island, and another reported from Boa Vista Island (Cozens *et al.* 2013). Here, we describe the first green turtle nesting recorded on Maio Island by Maio Biodiversity Foundation (FMB).

On 3 September 2016 at around 2200 hrs, FMB's sea turtle protection team from Pedro Vaz came across a visitor very different from the ones they normally encounter in Praiona (Praia Gonçalo): a nesting green turtle! The team followed the entire nesting process. The turtle placed her nest at the top of the beach in the middle of the vegetation (23°6,699'N and 15°15,728'W). She deposited a total of 89 eggs. The curved carapace length was 99 cm and the curved carapace width was 93.4 cm. The female was tagged with a PIT tag and also with a metal tag on each front flipper.

As the nest location was not threatened by flooding, the eggs were not relocated. A net was placed around the nest to protect it from crab predation. The nest was monitored every day until the last hatchling emerged.

Incubation period was 46 days with the first hatchlings emerging on 19 October 2016 at 2046 hrs. After 3 days of hatchling emergence, the nest was excavated and the hatching success was 71.9%.

Acknowledgements: We would like to thank all the guards from Pedro Vaz, all the volunteers for their help in monitoring the nest, and Adolfo Marco for advice on how to protect and monitor the nest.

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Coordination of Sea Turtle Conservation Efforts in Kenya

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Five species of sea turtles occur in Kenyan waters: green turtles (*Chelonia mydas),* hawksbills *(Eretmochelys imbricata),* olive ridleys *(Lepidochelys olivacea),* loggerheads *(Caretta caretta)* and leatherbacks *(Dermochelys coriacea).* The green turtle is the most common species nesting in Kenya, constituting approximately 97% of reported nests, followed by hawksbills (2.5%) and olive ridleys (0.5%) (Olendo *et al*. 2016). In Kenya, the Wildlife Conservation and Management Act 2013 accords sea turtles similar protection to elephants and rhinos and classifies them as 'endangered species' under the Fourth Schedule of the Act.

The islands of the Lamu Archipelago and the Malindi – Ungwana Bay area (Fig. 1) host the most important sea turtle nesting areas. Notable in-water concentrations of turtles have been observed at Mpunguti/Wasini, Takaungu, Watamu, Ungwana Bay and Lamu (Morley *et al.* 2011); most of the turtle conservation work occurs in or near MPAs.

In Kenya, sea turtles face pressure from poaching, incidental bycatch, and habitat alteration due to infrastructure development as well as insufficient empirical data on sea turtle behaviour. The current port development at Lamu will lead to habitat alteration and there is likely to be a decrease in nesting activity. Some beaches will no longer be accessible by Turtle Conservation Groups (TCGs) for monitoring and surveillance activities.

Sea turtle conservation in Kenya is largely uncoordinated with multiple organizations carrying out stand-alone initiatives in various parts of the coast. The Kenya Sea Turtle Conservation Strategy 2011 - 2015 was developed at a time when devolution was

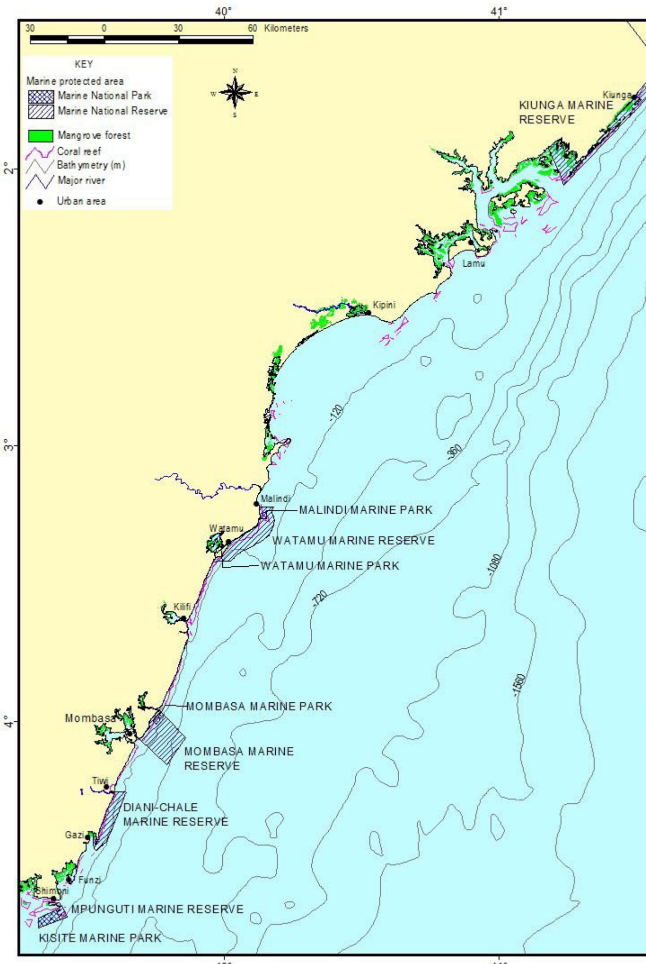

Figure 1. Map of the Kenya coast showing the Marine Protected Areas.

taking place in Kenya and other than the launch event, resources were not invested in creating awareness about the strategy's objectives, resulting in a lack of ownership by stakeholders. Furthermore, the strategy did not have clear fundraising mechanisms for its implementation, and hence did not achieve the synergized approach to sea turtle conservation in Kenya that it intended.

Kenya Wildlife Service (KWS) is mandated to conserve and manage wildlife in Kenya and to enforce related laws and regulations. However, sea turtle conservation in Kenya is complex. Its jurisdiction is vast, traversing many administrative boundaries (county and national) and is governed by multiple legislative frameworks and policies.

Despite these challenges, WWF Kenya Marine Programme is leading efforts to develop a coordinated approach to sea turtle conservation as well as harmonised data collection protocols along the whole coast. Efforts are currently concentrated in the Lamu Seascape and Tana Delta.

WWF seeks to strengthen the capacity of stakeholders to carry out sea turtle conservation by:

- Championing the harmonization of sea turtle conservation protocols for data collection. WWF Kenya is working with four peer organizations (Baobab Trust, Watamu Local Ocean Trust, Serena, LamuCot) and KWS to create awareness on the need for harmonized protocols and is advocating for their adoption in coastal Kenya.
- Providing equipment to four TCGs that monitor nesting beaches within Kiunga MPA.
- Conducting refresher training for KWS rangers in Marine Protected Areas on sea turtle conservation protocols (Fig. 2).
- Providing judicial and prosecution training for KWS personnel. Two cases of sea turtle poaching have been successfully prosecuted since the training.
- Holding consultative meetings with four peer organizations working on sea turtle conservation in Kenya
- Enhancing data collection and coordination in Lamu Seascape including revised data collection metrics to highlight the importance of collecting effort data.
- Strengthening engagement with County Wildlife Conservation and Compensations Committees (CWCCC) along the coast. CWCCC establishment is anchored in the Wildlife Conservation and Management Act 2013 with their key role being to ensure coordination of wildlife conservation and management initiatives. WWF Kenya has collaborated with the Committees to enhance awareness of the Wildlife Conservation and Management Act 2013 and deter sea turtle poaching.
- Collaborating on sea turtle research with Kenya Marine Fisheries Research Institute (KMFRI) and Technical University of Mombasa.

WWF Kenya strongly believes that equipping the right people with knowledge and skills to protect sea turtles and synergizing conservation initiatives will ensure thriving populations of sea turtles into the future.

Figure 2. Training for KWS Rangers (Photo: Lily Dali /WWF Kenya).

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Illegal Take and Consumption of Leatherback Sea Turtles (*Dermochelys coriacea*) in Madagascar and Mozambique

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There is a long history of artisanal fishers taking sea turtles (either targeted or as bycatch) for meat within Madagascar, Mozambique (Rakotonirina and Cooke 1994; Humber *et al.* 2011) and across the wider southwest Indian Ocean (SWIO) region (IUCN MTSG 1996; Bourjea 2015; Williams *et al*. 2016). Despite long-standing national legislations to protect sea turtles, illegal take and consumption remain prevalent in Madagascar (Humber *et al*. 2015) and Mozambique (Williams *et al*. 2016). This paper reports on three recent captures of mature-sized leatherback sea turtles (*Dermochelys coriacea*), from Toliara Province, southwestern Madagascar and Inhambane Province, southern Mozambique (Fig. 1).

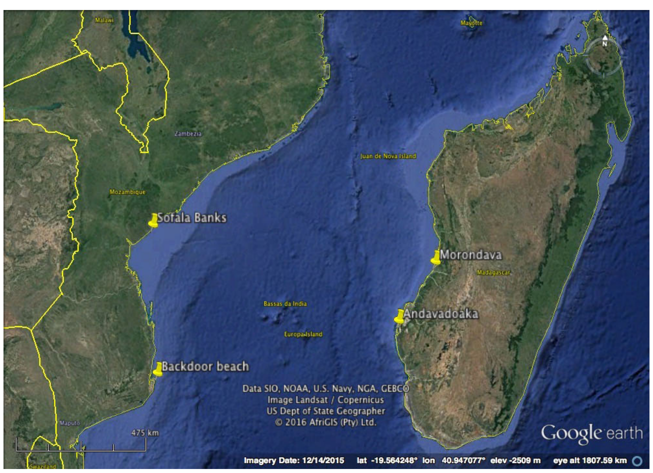

Figure 1. Locations of illegal take of leatherback turtles (Nov 2016- March 2017), southern Madagascar and southern Mozambique. Sofala Banks, a coastal residential foraging ground, is also displayed.

The first incident was recorded in Morondava, southwest Madagascar (-20. 29 °S, 44.30 °E), in November 2016. The leatherback turtle was captured in a gillnet. Upon detection of the entangled turtle, fishers proceeded to untangle the animal, kill it and bring it back to shore. On return to the village, the turtle was cut up and the meat was distributed and eaten by the community (Figs. 2-4).

Figure 2. Leatherback captured by coastal artisanal net fisheries in Morondava, southwest Madagascar (Photo: Michel Strogoff).

The second report occurred a few weeks later, approximately 220 km further north along the coast in the community of Andavadoaka (-22.07°S, 43.24°E). On the 8th of December, a mature-sized leatherback turtle was found dead, entangled in a gillnet. This second turtle was also taken back to the village, cut up and consumed by the community.

Figure 3. A front flipper of a leatherback turtle caught in a gillnet at Morondava, Toliara Province, Madagascar (Photo: Michael Strogoff).

Figure 4. Morondava fishers cut up a leatherback and distribute/sell the meat. (Photo: Michael Strogoff).

The sex of each animal was not confirmed and neither animal from Madagascar was tagged.

In 2011, Humber *et al.* (2011) estimated an annual artisanal catch rate of 11,000 – 16,000 turtles per year from the same southwestern province of Toliara. Green turtles (*Chelonia mydas*) were estimated to contribute towards 93% of the catch composition. Interestingly, the Humber *et al.* (2011) study using community monitors to report turtle landings in 12 villages surrounding Andavadoaka, did not report any landings of leatherback turtles within a 12-month study period.

The third incident of illegal take occurred on the 27 March 2017 on a small beach known as Backdoor Beach in Tofinho, Inhambane Province, southern Mozambique (Fig. 5). Here, a leatherback carapace 1.6 m in length was detected. The carcass is assumed to have washed ashore, given the lack of evidence of drag marks or tracks on the beach. The carapace showed clean knife marks and all the flesh had been carefully cut away. It is suspected that fishers found the animal whilst out at sea, then cut it up and discarded the carapace. The discarded carapace was found washed ashore a few days later, as the residual tissue layer lining the carapace was in the early stages of decomposition.

While the illegal take of sea turtles in-water and at nesting beaches is common throughout Inhambane Province, very few records of the illegal take of leatherbacks have been documented (Williams *et al. in prep*.). Leatherbacks are present in coastal waters around Tofo, Inhambane and are sighted by local dive operators relatively regularly (J.L. Williams *pers. comm*.). Whilst not species specific, the spatial overlap between artisanal fishers and turtles has been demonstrated to occur in this same area (Williams *et al.* 2017).

Figure 5: Carapace of leatherback found washed ashore at Backdoor Beach, Tofinho, Inhambane Province, southern Mozambique (Photo: Jess Williams).

Sea turtles using coastal reefs near Backdoor Beach and further south are likely to have the highest risk of interaction and capture by fishers (Williams *et al.* 2017).

Further north along the Mozambican coast, Sofala Banks (Fig. 1) and the broader Mozambican Channel have been shown to host important foraging grounds for leatherbacks (Lambardi *et al.* 2008; Robinson *et al.* 2016). This regional population demonstrates two foraging strategies: coastal resident foragers and oceanic foragers (Robinson *et al.* 2016). Satellite tracking studies have shown that the 'coastal group' of leatherbacks show habitat preferences for Sofala Banks, in Mozambique and Toliara Province and beyond to the northwest coast of Madagascar (Robinson *et al.* 2016). Coastal foraging behaviour is far more common in the SWIO leatherback population than previously thought (Robinson *et al.* 2016). With this in mind, reports of bycatch, entanglement, and illegal take of leatherbacks in these important foraging areas (Sofala Banks, southern Mozambique and the southwest coast of Madagascar) will be key to understanding risks associated with turtle-fisheries interactions in coastal waters. Prioritising and strengthening data collection in these areas will be invaluable for improving conservation and management efforts for this regional population. In light of this new insight into the preference for coastal habitats by SWIO leatherbacks, future research and monitoring should focus on quantifying the interactions between fishers and turtles in these regions, as coastal artisanal gillnet fisheries may pose a more significant threat to this population than previously thought.

Acknowledgements: Sincere thanks to the filmmaker Chris Scarffe, (chrisscarffe.com) for recognising the importance of such incidents and passing along the information. Incident reports and photos were collected by Michel Strogoff.

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A Review of Recent Marine Turtle Strandings at the Quirimbas National Park, Northern Mozambique, and a Call for Action

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The Quirimbas National Park (QNP) was proclaimed in June 2002 "*given the ecological characteristics, […], and endemic and endangered wildlife*" to "*re-enforce the protection and conservation of natural resources in order to ensure the perpetuation of ecological processes and preservation of natural values*" (Decree 14/2002 of 6 June). The declaration of the Park was hailed as a bottom-up process and was a response to a request from local communities and other stakeholders who live within and around the archipelago. The Park has a total area of 7,500 km^2, of which 1,500 km^2 encompass the marine environment (Fig. 1). The QNP is home to foraging and nesting green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles (Costa *et al*. 2007; Garnier *et al*. 2012). Although the olive ridley turtle (*Lepidochelys olivacea*) was very common in the past (Hughes 1971), it is very rare at present and no sightings have been reported recently (Fernandes *et al*. 2016).

Figure 1. Location of the Quirimbas National Park in northern Mozambique and sites of marine turtle strandings (red dots). Adapted from Google Earth.

There is a long history of marine turtle consumption along the northern Mozambique coast. Hughes (1971) reported that marine turtle meat was readily available at markets in Pemba, Nacala, and Mozambique Island. Green, hawksbill and olive ridley turtles were targeted for their meat. During the 2006-2008 seasons, at least 44 turtles were captured by artisanal fishers and at least 19 were killed (Videira *et al*. 2008).

The available data on recent marine turtle poaching activities within the QNP are both scattered and unreliable. Annual marine turtle conservation reports for the 2014/2015 and 2015/2016 monitoring seasons which run from September to March (Fernandes *et al*. 2015; 2016) do not accurately reflect the situation. In fact there were no reports of turtle poaching in these two seasons as data were unavailable. However, there are frequent reports of marine turtle poaching from fishers, members of local communities as well as staff from NGOs. Currently, marine turtle conservation initiatives within the QNP focus on education and awareness campaigns, which target community members involved in the Management Oriented Monitoring System (MOMS) and fishers in general. These are carried out by the Park authority in coordination and with the support of different implementing partners, but there is very little evidence of active enforcement or conservation actions on the ground.

Here, we report on several cases of marine turtle poaching at the QNP, which took place in 2016. Marine turtle stranding data were collected non-systematically between August and December. Some data were extracted from the MOMS supported by the World Wildlife Fund (Moto *et al*. 2016), and other data were generated from personal accounts from relevant individuals and from a field visit conducted in November 2016 (Louro *et al*. *in prep*.). Data include whenever possible the species, date, location, carapace measurements, individual marks, tags and an assessment of the potential cause of stranding.

During the five-month period, a total of 14 marine turtles were found stranded or were killed within the boundaries of the QNP (Table 1). Of these, the green turtle was the most common (n = 8; Fig. 2) and included both adults and juveniles. Only one hawksbill was reported (Fig. 3). This adds to previous claims that the area is an important foraging ground for these species (Costa *et al*. 2007; Garnier *et al*. 2012). In the remaining five cases, the species were unidentified.

Figure 2. Adult green turtle (Chelonia mydas), poached by artisanal fishers within the Quirimbas National Park, December 2016 (Photograph: Courtesy of Lara de Abreu).

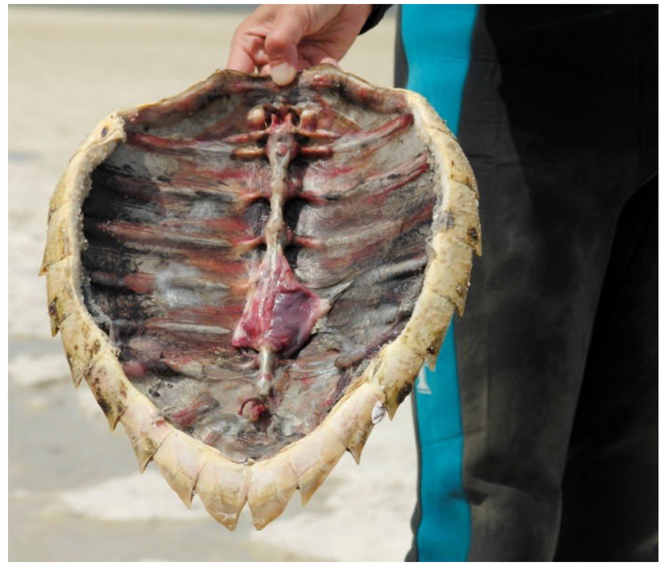

Figure 3. Carapace of a juvenile hawksbill turtle (Eretmochelys imbricata) found in October 2016, at Paquissanga sandbank, immediately after being consumed between Ibo and Quirimba Island, QNP, Mozambique (Photograph: Carlos Litulo).

Three turtles were captured and killed by fishers, as confirmed by community members involved in the MOMS program. A fourth turtle was captured by fishers, but found alive in the fishing boat. Two turtles were found dead floating close to shore and are believed to have been accidentally caught in nets and released (Moto *et al*. 2016). The cause of death of the remaining eight turtles was unknown, but it is likely that they were poached for their meat. Remains of carapaces and bones were found scattered amongst mangroves around Quissanga, a locally important disembarking site (Fig. 4). There were also reports of turtle meat being used as bait in fish and crab traps (Fig. 5).

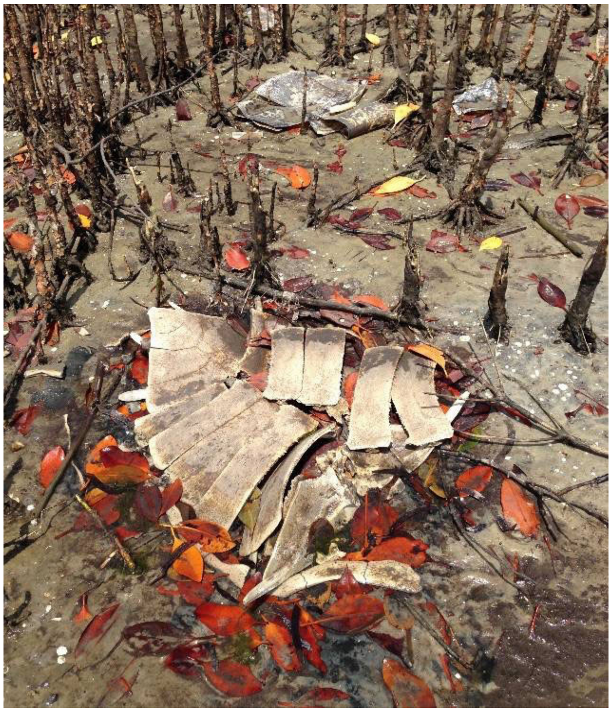

Figure 4. Remains of a carapace of an unidentified species of marine turtle found in November 2016 in the mangrove forest at Quissanga District, Qurimbas National Park, Mozambique (Photograph: Cristina Louro).

Figure 5. Turtle meat being used as bait in fish traps at the Quirimbas National Park, July 2016 (Photograph courtesy of Lara de Abreu).

Moto *et al*. (2016) confirmed the presence of a turtle graveyard within the Cumuamba Community mangrove forest at Ibo Island where the killing and processing of marine turtles for consumption is a common occurrence. Moto *et al*. (2016) also reported that in the great majority of cases turtle poaching within the QNP are perpetrated by the local community and not by migrant fishers. This reveals a pressing need for active and immediate enforcement as well as engagement with local communities by the Park authority.

The implementation of a research and monitoring program to better understand and quantify the interactions between artisanal fisheries and marine turtles, including the improvement on control of illegal activities also constitutes a priority. Fifteen years after the establishment of the Park, these findings suggest that conservation initiatives and efforts are far from reaching the overall goal for which the Park was proclaimed. Therefore, we urge that a vigorous, hands-on, and participatory approach is taken in order to ensure the conservation and protection of marine turtles and other species of biodiversity value.

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Table 1. Marine turtle strandings and mortalities reported in the QNP, August to November 2016 (Cm = *Chelonia mydas*; Ei = *Eretmochelys imbricata*; Ni = Not identified).

Date	***Species***	***Stage/Size***	***Cause***	***Site***	***State***
08 Aug 16	1xCm	-	Caught intentionally by artisanal fishers	Mefunvo Island and Arimba seashore, in between the channel	Alive and returned to sea
08 Aug 16	1xCm	-	Caught intentionally by artisanal fishers	Mefunvo Island and Arimba seashore, in between the channel	Dead with head injuries
09 Aug 16	1xCm	Juvenile	Unknown	Matemo Island, Pangueleze beach	Dead, decomposing and floating
10 Aug 16	1xCm	Adult	Unknown	Matemo Island, Okaya beach	Dead, decomposing and floating
12 Aug 16	3xCm	2 Adults 1 Juvenile	Unknown	Ibo Island, Aldeia Cumuamba, Paloco mangrove forest	Recently killed and processed (head, carapace, meat and guts)
29 Oct 16	1xNi	-	Unknown	Ibo Island, Ibo Inner coral reef	Carapace and bones
31 Oct 16	1xEi	Juvenile	Killed by fishers	Ibo and Quirimba Islands, Paquissanga in between sandbank	Carapace with meat remains
01 Nov 16	1xNi	-	Unknown	Quissanga, mangrove forest north of the port	Carapace and bones
01 Nov 16	1xNi	-	Unknown	Quissanga, mangrove forest north of the port	Carapace and bones
01 Nov 16	1xNi	-	Unknown	Quissanga, mangrove forest north of the port	Carapace and bones
01 Nov 16	1xNi	-	Unknown	Quissanga, mangrove forest north of the port	Carapace and bones
23 Dec 16	1xCm	Adult	Caught intentionally by artisanal fishers	-	Carapace with meat remains

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The African Sea Turtle Newsletter (ASTN) is a free, bi-annual international electronic publication about the biology and conservation of sea turtles in Africa, and the stories of people who work with sea turtles on this vast and diverse continent and its offshore islands. This publication hopes to increase communication and collaborations among all those working with sea turtles in Africa –scientists, conservationists, policy-makers, project managers, community members, students, professors, everyone!—as well as share news with the international sea turtle community.

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