AFRICAN SEA TURTLE NEWSLETTER

First observation of albino green turtle hatchlings
Vamizi Island, Mozambique

photo: © Joana Trindade

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GUEST EDITORIAL

Conscious Sea Turtle Consultancy in Africa

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The school that I attended in my formative years had the motto: "*Non Sibi Sed Omnibus*"; which translates as "not for oneself but for all". It is something that did not seem to resonate too loudly in my youth, but having come across the motto again recently it perhaps became more ingrained than I had realised. It is a statement that is very much aligned with our company's business philosophy. I use the terms 'company' and 'business' intentionally as that is the best description of what we are, unlike most other contributors and readers of this newsletter who will sit more firmly within conservation, academia or government. 5OES is primarily an environmental consultancy firm with offices in the UK and Middle East. We deliver survey, monitoring, environmental assessment and environmental management studies for multi-sectoral coastal and marine developments internationally with a particular geographic focus in Africa and the Middle East. In addition to our consultancy work, individuals within our company have delivered long term conservation research work in Oman, and as such, as a company we act as a consultancy and conservation research organisation. It is a relatively unique position that has created a relatively unique company – and certainly a unique approach to how we deliver our work. We have a specific focus on sea turtle research and consultancy in West Africa and the following presents an outline of our approach.

It is fully acknowledged that many people may consider any input to both consultancy and conservation to present a difficult and conflicted position, and I would agree that it is not a simple course to follow – especially when opinions on the best way to protect the environment can be very belief driven and aligned with a position of activity. Our approach is independent, objective and pragmatic in whatever capacity we are involved. As a consultancy organisation we acknowledge our limited ability to stop development, especially in developing countries, but accept the responsibility to ensure that it happens in the best possible and most informed way. Also, it is notable that in many instances development has been determined prior to any environmental involvement. Governance systems should not allow for development to be confirmed until all appropriate assessments can be completed, but we have to acknowledge that this is not always the situation and in some places a rarity. It is therefore essential that there is appropriate engagement of environmental experts in the development process as this is where the potential for protecting the environment is potentially greatest – acknowledging the hugely important role of conservation and academic research to protect the important areas when they are known so that these areas are fully protected. We have no philosophical desire to stop development especially in the developing regions we are routinely involved. We understand the limited potential to influence that would be afforded to us from such a stance. Our position also provides direct access to developer proposals, which gives us opportunity to influence. We therefore actively seek involvement with development projects – our stance is to seek to promote environmental protection in a balanced way. We seek to influence rather than lobby or dissent. However, we always retain sufficient independence to state the facts clearly, even if

this makes development more difficult to achieve. My view is that most projects are successful if they have a positive environmental lead and some aligned connectivity with local communities, which seems obvious, but is not always a development goal. Our role is to try to embed this into decision-making and to promote this through the consistency of our approach, leading by example and by providing a positive contribution. Our aspiration is to ensure that development is not limited by narrow thinking, especially when limits relate to perception rather than the actual situation – we aim to promote a blank page approach to development decision-making. The extent of advice is limited by the broadness of the development's spectrum, but improvements can be made on the smallest projects. I believe our role is to add colour, inform, inspire, influence, reassure, engage, educate, understand, excite, present solutions and connect. This is our business, and in my opinion, it should be the core ethos of environmental consultancy and something that as a company we aspire to achieve – even if we don't always manage it as successfully as we would like. The boundaries between this ethos and conservation are not too dissimilar, which helps us to remove any perceived conflicts.

Our research links and collaborations enable us to drive decision-making using the best available scientific information. We can also act as a bridge between our research colleagues and developers. The nature of our position enables us to be fluid and flexible, and we can therefore provide support where it is needed. We are using the experience gained in supporting conservation action to promote similar actions by clients on their development projects. We are using the knowledge gained from our survey work and connections with local researchers to improve our advice to developers. This is of note when we are collecting data in areas that have been little studied previously or where data are not easily accessible. Developers must have access to good advice to ensure impacts are mitigated as far as possible. We take on that role. It requires robust scientific input to understand the issues, to answer questions that development raises, but also to ensure that approaches are pragmatic and fit-for-purpose. These points should not be forgotten as baseline, monitoring and management approaches can often be onerous, ill-conceived and simply duplicated as best practice across projects without understanding the issues at hand on a project level. This turns developers off from preserving the environment, can create an approach that seeks to maximise fiscal reward when delivering studies by the environmental industry; and can at worst, lead to tick-box approaches. It requires bridges to be built between consultancy and conservation research so that approaches make sense and answer the questions in the most efficient way.

In addition to the more 'standard' approaches that we would all expect (hope) most consultants to aspire to, we use the access to finances that our projects afford to independently support community-led conservation action and programmes. This is something we have achieved in West Africa and it forms a core component of our business philosophy. We do this because we can; we should; it makes the people we engage with happy; it helps to protect the environment and helps to offset developer impacts; and it helps to create the identity of who we are as individuals and as a group. The role aims to be complementary to the actions of conservationists; and it allows us to demonstrate alternative approaches to other consultancy organisations and actions that can be implemented by developers directly; and in this way we hope we can be a 'lighthouse' in the consultancy industry. Our approach is to deliver consultancy that is conscious of our position, ability to influence and responsibilities. After all, any alternative approach would clearly be at odds with the core ethos behind any environmental role – whether that is a position within consultancy, academia or conservation. Taking a conscious

approach is a requirement to meet the ethos set out above. It is interesting how often that is forgotten in the delivery of environmental business. We can all see that existing approaches have quite significant inefficiencies in preventing development. It is therefore important to try to align consultancy, conservation and scientific advice so that everybody wins more, including developers who need good advice and also access to the best information – as well as needing support in implementing their own environmental actions. It actually forms a key recommendation with International Finance Corporation Performance standards, which are used to guide best practice development approaches and decision-making. I am therefore very happy that we are working within and across the gaps between consultancy and conservation. I accept that our approach will raise some questions and I am happy about that too as that may lead to introspective consideration in how we all engage with development to protect the environment. Answers will follow questions after all; and I consider not doing the norm to be a positive step. Our company aims to ensure that our approaches are equally acceptable to consultants, developers and conservationists as this will enable us to work in collaboration across these fields. This is, of course, a difficult challenge, and we don't claim to be able to achieve it every time, but it is a challenge that we have taken on.

Whilst our approach and philosophy to sea turtle studies is longstanding, our delivery of sea turtle work outside of Oman is relatively new. We have increased our footprint of project work in Africa, particularly in West Africa, significantly in recent times. We are at the start of our story with respect to supporting the delivery of conservation action in Africa, but our intent has been demonstrated and we aim to deliver more as our project footprint increases. When we have delivered consultancy work in West Africa, we have not only involved local researchers directly in our work wherever possible, but we have also supported existing sea turtle conservation programmes by funding the development of local community facilities that have been required in return for sea turtle conservation action or by providing local sea turtle researchers with training, mentoring and/or equipment. These actions are undertaken independently from our consultancy projects and are self-funded by our company. We do not try to act as implementers of conservation action as we understand the requirements for long-term programmes to be established and we have limited resources to deliver conservation on the ground. The aim is therefore to support existing efforts being led by local groups rather than create new programmes. We provide funding for priorities that have been identified and have not been financially feasible due to a lack of funding. Our movement across Africa is very fluid and actions are related to relationships built on project work. This means that we do not have a specific local geographic focus, which creates great flexibility and increases the footprint of our influence. It also means our support can be ad hoc in nature and that is why we aim to plug into existing well-established programmes that will continue their efforts in the long term. Some examples of our conservation effort are provided below.

Improving Safe Drinking Water in Samuel Brown Town, Liberia: Sea Turtle Watch (STW), Liberia, approached us with a proposal to provide access to safe drinking water supply to the population of the Samuel Brown Town, in return for their support to sea turtle conservation in the area. Local community liaison undertaken by STW and Save My Future (SAMFU) Foundation at Samuel Brown Town indicated a priority need for drinking water. We therefore provided the funding for the construction of a water pump (Fig.1). In return, the local community would contribute to protecting nesting sea turtles and their habitats as well as releasing by-catch in the region. The initiative forms part of a sea turtle project in five coastal communities in the Grand Bassa County. The aim of the project is to protect sea turtles in partnership with local

communities. The relationship for this project was built upon the support of SAMFU in the delivery of a sea turtle survey for a development project in central Liberia.

Developing a Community Centre in the Mankoadze community in central Ghana:

Figure 1. Construction of the water pump underway in Samuel Brown town in Liberia (Photo: Manjula Tiwari).

The Ghana Research and Education Alliance for Turtles (GREAT), in collaboration with the Ghana Wildlife Division, promotes sea turtle conservation in the Muni-Pomadze Ramsar Site (MPRS) in central Ghana. The area is managed in coordination with local communities, including the Mankoadze community. The aim is to engage local fishing communities in the protection of sea turtles. As part of the local effort already being undertaken we have fully funded the development of a community centre (Fig. 2), which will act as a hub for trade, socialising, education and health care. Within the community there is a market, which is positioned in full sun and without shelter from rain. The centre will therefore provide a sheltered facility for trade. Community social gatherings will be held at the centre. GREAT will also implement regular training events at the centre. Government institutions like the Wildlife Division, Ghana Health Services, and Food and Agriculture Ministry will all benefit from the project by providing a venue for training/education and health check-ups. The Wildlife Division undertakes weekly and monthly education programs in schools and communities, respectively. Community officers of the Ministry of Health conduct weekly check-up and health programmes in all villages in the area. The Ministry of Food and Agriculture holds regular training events for farmers to introduce them to new environmentally-friendly farming practices (e.g. organic farming). Such programmes are currently held in unsheltered areas and are sometimes disrupted by sun and rain and the centre will provide a new facility to hold these meetings. Regular fishermen workshops that focus on sea turtle by-catch issues will also be conducted at the centre. It is hoped that the new centre will improve knowledge with respect to sea turtle conservation and help to engage people in protecting sea turtles. The relationship for this project was built upon the support of a local conservation scientist from the Ghana Wildlife Division in the delivery of a sea turtle survey for a development project in western Ghana.

Figure 2. Construction of the community centre underway in Ghana (Photo: Andrews Agyekumhene)

Acknowledgements: We are indebted to Manjula Tiwari for her support in building local relationships and delivery of conservation action in West Africa. It would not have been possible to implement anything without Manjula's support. We must note that our contribution to sea turtle conservation in West Africa is highly insignificant in comparison to the work of local conservation and government researchers. We greatly admire

the tenacity, dedication and resourcefulness of all those involved. Our local partners deserve all of the plaudits for the work that is being delivered in their role of local leaders, influencers and implementers. Special mention needs to be given to Trokon Saykpa and Andrew Tokpa for their support and continuing work in Liberia; and Andrews Agyekumhene and Phillip Allman for their support and continuing work in Ghana. Within Five Oceans, our sea turtle conservation work in Oman has been led by Robert Baldwin and Andy Willson and this work forms the foundation of what we deliver in Africa. The longstanding work and knowledge that is provided from our operations in Oman is essential to the delivery of what we do in Africa and needs special mention here.

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Minutes of the Africa Regional Meeting, 35th Annual Symposium on Sea Turtle Biology and Conservation, Dalaman, Turkey (19 April 2015)

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The half-day Africa Regional meeting started with a short introduction of the attendees; at least 35 people attended representing work in more than 11 countries.

This year's meeting started with a discussion about how we could achieve effective sea turtle conservation when conservation is not a high priority on the political agenda. The main questions during this discussion were: What is the best thing to do when there is no governmental support? Do we work from bottom-up in places where there is no government presence in the field? The discussion was led by Jess Williams (Mozambique).

Manjula Tiwari pointed out the following strategies that may be used for effective sea turtle conservation in Africa: 1) work with the local community, and the Chief of the village or community; 2) work with the relevant government agencies directly; 3) sensitize the people through open dialogue and awareness programs; 4) hold workshops for the government personnel, law enforcement personnel, etc. At all times keep the dialogue open.

Angela Formia added that budgets/operating funds are limited and there is a high turn over of personnel in governmental positions complicating the interactions even further. She added that in Gabon they mainly interact with the highest person (the President) about environmental issues. For instance, Gabon Blue is a government initiative, which is a top-down procedure.

Adolfo Marco commented that the good contacts in Cape Verde are the young people entering the government. There are now discussions about creating a law for sea turtle conservation. Tourism is also helping a lot in some of the islands. Adolfo also pointed out that Maio Island has had the highest poaching levels. After 2012 the government started to arrest the poachers. However, after the poachers were released they went right back to their activities and the poaching levels increased. Then in 2013, conservationists started working with the local people especially younger people. They managed to reduce mortality by 70% within a year; if you cannot reach the government you should reach out to the community.

Boniventure Mchomvu (Tanzania) added: In Tanzania they have a grassroots approach. Through community awareness they try to identify whom to contact and work with in the government. There are many incentives for community members, but the biggest challenge is finding ways to involve as many people as possible. For instance, by showing the community members that the turtles are worth more alive than dead, they have managed to increase income through ecotourism in the region. Information is power; if you inform the community then they can take action.

A colleague working in Comoros Island indicated that conservation by a village association started over 20 years ago. Now the government has reacted to that and is enforcing the laws. Other countries are looking to Comoros as an example. It takes time.

Impacts of by-catch and climate change on sea turtle conservation: The next topic on the agenda was to discuss the impacts of by-catch and climate change on sea turtle conservation: what are the impacts of warmer temperatures, sea level rise, increasing frequency of storms and extreme high tides on nesting beaches in Africa? The discussion was led by Adolfo Marco (Cape Verde).

Adolfo Marco started the discussion by giving a presentation about sea turtle populations in Cape Verde. In summary: Boa Vista is an important loggerhead nesting site with an average of 17,350 nests (6,400 to 31,150 nests are counted annually). Most of the nesting occurs on 20 km stretch of beach. Poaching for turtle eggs and meat is the main issue. Tourism is a big success and the government is collaborating with the conservationists. There are plans to develop the other side of the island mainly by building hotels. The solution for this island is tourism. Unfortunately, when you put pressure on the poachers on the beach they turn to poaching in the sea. Over 5,000 turtles are caught as by-catch each year, where 67% are caught by trammel trap. A large number of leatherbacks are by-caught/killed near Cape Verde. Artisanal by-catch (2,000 – 3,000 turtles annually) is about 80% loggerheads and a few leatherbacks. It might be that poaching has now shifted from the beach to the ocean. There are now 5,000 registered two-person small boats in Cape Verde.

One of the questions that came up during this presentation was how to estimate the number of artisanal boats if they are not registered? For instance in Morocco they do not register every boat, but in Cape Verde there are 5,000 registered boats.

On Cape Verde, 40-50% of the incubating eggs get destroyed due to inundation. In order to decrease mortality, conservationists relocate the nests. A number of black sand nesting beaches have very high sand temperature (34º – 38ºC) with almost 100% egg mortality. At these beaches the use of hatcheries is still being debated since the temperatures are so high. Marc Girondot mentioned the fact that turtles have phenotypic plasticity and may nest at different times. However Adolfo has not seen any change in the peak activity time. The nesting season is not moving and no trends are found when comparing the different islands to each other. They all seem to have September as the peak nesting time.

Regional collaborations: The third topic on the agenda was to discuss regional collaborations needed and to learn about new collaborations.

Marc Girondot briefly mentioned a new article in the Journal of Thermal Biology (Girondot and Kaska. 2014. Nest temperatures in a loggerhead nesting beach in Turkey is more determined by sea surface than air temperature). In order to build a temperature map of Africa and to predict sex ratios effectively, Marc pointed out the need to have a global view and collaborations at the scale of Africa. There is already a lot of information, but we need local calibration. Marc is looking for collaborators to deploy 5 data loggers in the sand at 5 locations on the nesting beach at 70 cm depth during one month. This is to calibrate the model for sand temperature reconstruction during the last 30 years.

In other topics, Jess Williams suggested a shared Dropbox folder where we can all share educational/informational materials such as brochures, poster, calendars, etc. with each other. This is mainly to share ideas in order to design effective educational and outreach materials. Alexandre Girard talked about the Central African network of sea turtle conservation professionals (RASTOMA). The global objective of RASTOMA is to develop

synergies among network members, reinforce capacities and recognition of the members in order to achieve the conservation of sea turtle in their habitats in Central Africa in the long term. Alexandre gave a short presentation about RASTOMA's goals and objectives.

Aimee Leslie (WWF International) briefly discussed the issues of increasing marine trade from East Africa.

Country presentations by participants:

- Boniventure Mchomvu, Sea Sense Project Officer (Tanzania). Sea turtle status and conservation efforts in United Republic of Tanzania.
- Mayeul Dalleau and Clair Jean (Reunion Island). Reunion Island Projects.
- Sara Viera (São Tomé). Sea turtle conservation on the Island of São Tomé.
- Sofie Pourcel and Alexandre Girard, RENATURA (Congo). Préservation des tortues marines et de leur habitat en République du Congo: Comment conciliar développement et biodiversité?
- Michel Nalovic. TED initiatives in Central African countries.
- Marc Girondot (Nigeria). A new terra incognita for marine turtles.

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The Use of Sea Turtles in Traditional Medicine in the Cape Verde Archipelago, West Africa

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Preamble: In modern times none of the uses for the below listed substances are justified. They simply are not accredited and modern western medicine is more effective. In order to take any type of medicine, it is highly recommended to get a prescription from a doctor first; at present sea turtles are not prescribed for the treatment of illnesses of any sort.

The use of sea turtle meat, eggs and other derivatives as a food source by humans is an old tradition in coastal communities around the world, mainly in developing countries (López-Jurado 2007; Loureiro and Torrão 2008). Likewise, this enigmatic animal has been used for its medicinal properties for centuries, and practices of this kind are still commonplace in some communities (Alves 2006; Fretey *et al.* 2007; Alves *et al.* 2008). The local knowledge on the supposed medical properties has passed down from generation to generation. In the West African region, the uses of sea turtles and their derivatives in traditional medicine and witchcraft seem to have persisted in coastal communities (Fretey *et al.* 2007).

The objective of this paper was to compile information on the variety of sea turtles products, as well as their associated properties for curing different diseases, in the Cape Verde Islands.

The Cape Verde Archipelago, located 500 km off the coast of Western Africa and composed of ten islands and several islets (Fig. 1), harbors one of the largest loggerhead turtle (*Caretta caretta*) nesting populations in the world, and the only substantial rookery in West Africa (Marco *et al.* 2012).

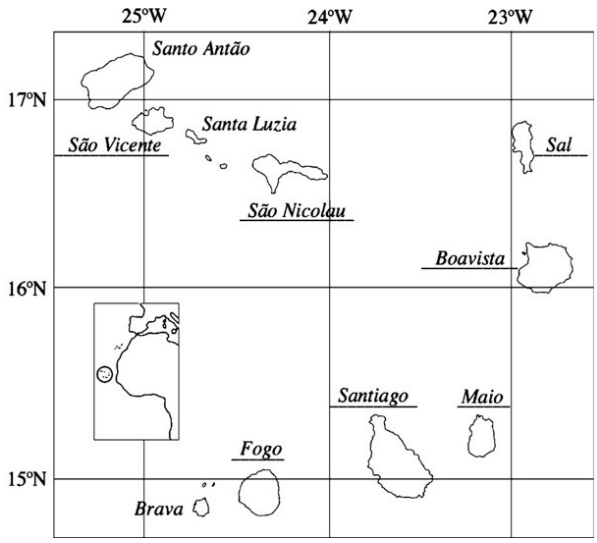

Figure1. Map of the Cape Verde Archipelago and its location in the West Africa Region. The islands sampled in this study are underlined.

For over 500 years, many sailors have kept logbooks in which they have reported on the use of sea turtles in traditional medicine in the Cape Verde Islands (Lopéz-Jurado 2007; Loureiro 2008; Loureiro and Torrão 2008).

In 1480, Eustache de la Fosse, a French merchant, reached the island of Santiago and wrote:

> "We reached the islands that are off Cape Verde (Senegal), one inhabited, on which islands man or leprous creatures are cured in two years (...); from these turtles the leper is cured by eating them and spreading blood and fat on all his meals (turtle fat) and thus, after two years, they are completely purged and cured of their leprosy (…)."

The use of turtle derivatives in the cure of leprosy in Cape Verde was popular and apparently effective for a long period of time (Lopéz-Jurado 2007; Loureiro and Torrão 2008). In 1506 and 1508, Valentim Fernandes also made reference to sea turtles and lepers:

> "There is in these islands a great abundance of turtles, which the lepers cure in salt. These islands were initially so healthy that any lepers arriving there were cured (...)."

Many years later, another reference to sea turtles appears in Peter Simmond's 1885 book on wild animals used for food. The author writes:

> "In Portugal, syphilitic patients are often sent to the Cape Verde islands to be cured by feeding on turtle flesh."

The use of sea turtle products and their derivatives is popular even nowadays; however, it is not always for the same purpose as before. On some islands, turtles are highly sought out almost entirely by immigrants (MADRRM 2008) seeking to experience aphrodisiac effects (Loureiro and Torrão 2008; MADRRM 2008), a reason that has made sea turtles very lucrative at present, despite the fact that they are protected by national law (Loureiro 2008).

During our work with sea turtles from 2011 to 2014, we collected information from all the main ports and fishing communities on the islands of Santiago and Fogo, and from all the artisanal ports and communities on the islands of São Vicente, São Nicolau, Sal, Boa Vista and Maio during the sea turtle nesting season, which begins at the end of May and extends until October. The study was conducted by visiting the ports and interviewing the fishermen who work there. All questionnaires and interviews were carried out by marine biologists with previous training for this study. Illustrations of sea turtles were used for species identification. More than 50 fishermen were interviewed from each island. The following information was compiled from the interviews:

Carapace and plastron: Only on the island of Santiago did locals use turtle carapaces and plastrons. Normally they boil the carapace and then bathe with the water in which it has been boiled. They believe that it protects them against the evil eye. Plastrons are used against witchcraft and in the treatment of bronchitis, asthma, heart diseases and intestinal disorder. The plastron is boiled and then cooked with "cachupa" (a famous traditional dish from the Cape Verde islands). Only loggerhead turtles are used (Fig. 2).

Figure 2. Loggerhead sea turtle plastrons drying in the sun to be used to make "cachupa" (a famous traditional dish from the Cape Verde islands). Photo used with permission of the maritime police from the city of Praia.

Oil: Turtle oil is a much-sought substance. Derived from the carapace of leatherbacks (*Dermochelys coriacea*), it is exposed to sunlight for several days, and is then used to treat rheumatism and for massage for painful bruises, arthritis, thrombosis, bronchitis, asthma and intestinal disorders.

Penis: On all islands, everyone we interviewed reported that the penis is used for aphrodisiacal purposes. They believe that this male sexual organ will help boost sexual drive, and will help intestinal disorders and hepatitis. After being removed from the turtle, the penis is dried for several days and is then introduced into "grogue" (a Cape Verdean alcoholic beverage obtained from sugarcane, Fig. 3). The organs that locals use come almost exclusively from loggerhead turtles.

Gallbladder and liver: The gallbladder and liver are used to cure hepatitis, swelling and anemia. The gallbladders are preserved in bottles and mixed with "grogue" (Fig. 4).

Figure 3. Loggerhead penises inside "grogue" bottles sold in local bars. The paper in fronts says, "earth medicine, turtle penises, gives power" – in the local language it is "remedio de terra, penis de tartaruga, dá tesão". (Photo: A. Liria).

Blood: Blood is usually used fresh, straight after the animal has been killed. People think that ingesting the fresh blood will increase longevity, and it is also used in the treatment of asthma, anemia and thrombosis.

Figure 4. The gallbladder of a loggerhead preserved for use in traditional medicine. Photo taken in Santiago Island by F. Rocha.

Meat, eggs, skull, bone and other derivatives: All of the interior parts of sea turtles (meat, eggs, organs, and blood) are used as food on all the islands. In the southeast region of Santiago, we found that people cook a soup of turtle organs and meat, and that this broth is given to children to drink. They believe that it cleans the intestines and makes children healthier. Finally, the claws of male loggerheads are used as charms to be more attractive to women.

We are aware that this report does not cover all the islands and local communities in Cape Verde. However, it can be expanded through surveys on other islands and into inland areas where we think there may be different uses for turtle derivatives in traditional medicine. During these surveys we made it clear that we do not want to encourage the use of sea turtle meat and any derivatives, and that we are aware of the possible hazards associated with their consumption (Aguirre *et al.* 2006). We also found that many other marine species are used in traditional medicine, such as the Cape Verde endemic goose barnacles (*Pollicipes caboverdensis*), sea birds and their eggs, raptor eggs, and shellfish. On the island of Fogo, residents believe that the endangered Fea's Petrel (*Pterodroma feae*) cures rheumatism (Hazevoet 1994). We found

that in the inland areas of Santiago people believe that there are spiritual stones in the nests of ospreys (*Pandion haliaetus*), and that possessing these stones will free you of the evil eye and plague. The rampant use of some of these species has caused the loss of many important colonies on some islands and the disappearance of various species of raptors, seabirds and sea turtles (Hazevoet 1994; Loureiro and Torrão 2008; Marco *et al.* 2012).

Increasing our knowledge of the traditional uses of endangered species like sea turtles in local communities throughout Cape Verde is very important for establishing conservation plans for the sustainable use of sea turtles that respect the socio-cultural aspects in these communities.

Acknowledgments: The work was part of the study supported by the U.S. Fish and Wildlife Service and the FAO. We also thank the local people and fishermen for participating in the survey and Ana Liria for providing the photos.

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Hurricane Fred: Beach Camps Operating Again on Boa Vista Island, Cape Verde

Hiltrud Cordes

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On Monday, 31 August 2015, a hurricane swept over Cape Verde. In the morning hours, on the Island of Boa Vista the storm reached peak wind speeds of 120–135 km (75–85 miles) per hour. On the southern coast, waves piled up to seven meters above sea level.

The safety of our colleagues in the camps of Boa Esperança, Lacacão, and Canto could not be guaranteed any more because objects were flying around and tent and shading scaffolds collapsed. We had to immediately evacuate the camps. Personal valuables could be taken, but we had to leave behind the tents together with kitchen and other equipment.

We are very happy that none of our staff and volunteers was harmed! Thanks to the careful and prudent action of our team the worst was avoided.

By the next day (Tuesday, 1 September) the teams of Canto and Boa Esperança were able to return to the beaches and immediately started with the cleanup work (Figs. 1-3). Some crew tents were patched up so that they could be used until the end of nesting season in mid-October. For smaller common areas we still had spare material left that was immediately ready for use.

Figures 1-3. Boa Esperança camp being rebuilt.

Figure 2.

Figure 3.

Also the Lacacão team returned to the beach a bit later. Since this camp was more heavily damaged than the others, and a great heat wave immediately followed the storm, the cleanup has been even more exhausting. During a tough three days, the team managed to rebuild the camp from its remnants so that a makeshift operation is guaranteed up to the end of the nesting season (Fig. 4). On Friday, September 4, the night beach patrols were resumed.

Figure 4. Lacacão camp being rebuilt.

The hatchery at Lacacão fortunately was far enough away from the sea to avoid being flooded. However, it is possible that crabs invaded the hatchery since its fences had been covered over by high sand drifts (Fig. 5). Presently, there are 55 nests incubating in the hatchery, and we expect the first hatchlings from 16 September onwards. We now keep our fingers crossed that the eggs, buried deeply in the sand, endured the storm undamaged!

In order to again having three functional camps on the beaches in the coming year, in the next months we have to spend significant but unplanned funds for new tents, shades, refrigerators, and other equipment.

We are estimating the damage caused by the storm at about 30,000 Euros.

Last but not least some good news: On the beach of Boa Esperança a young pig was straying aimlessly – it had got lost in the storm and now was at the end of its tether. Our team took it to the camp, where it was given the name Freddy (Fig. 6) and now enjoys the protection status of a mascot!

Figure 5. The hatchery near the Lacacão camp after the storm.

Figure 6. Freddy our new mascot.

The Turtle Foundation says a great big Thank You! to our marvelous Boa Vista team! With team spirit and hard work it succeeded in restoring operational status of our camps in no time.

Photos: ©Turtle Foundation

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Discovery of an Unusual Use of Leatherback Fat as an Insect Deterrent In Mauritania

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Traditional use of sea turtle fat: For centuries, indigenous people from tropical regions have used sea turtle fat for many purposes including cosmetics. When Europeans settled in these regions and discovered turtle oil, they first used it for cooking and then as a lubricant or lamp oil (Simmonds 1879). The derived cosmetic products were first manufactured in Germany and France in the 1930s. The commercial value of these products then increased as turtle fat was recognized as a powerful rejuvenating cream (De Navarre and Ruszkowski 1933). The fat was therefore added to a wide range of cosmetics such as perfumes, soaps, facial creams and mascara. The use of sea turtle fat stopped at the beginning of the Second World War, but the product remained on the market until the 1970s. Recently, Chacón (2002) indicated the use of hawksbill, *Eretmochelys imbricata*, green turtle, *Chelonia mydas,* and olive ridley, *Lepidochlys olivacea,* fat in Belize, Guatemala, Honduras, Nicaragua, Costa Rica and Panama. Additionally, he reported the trafficking of dermatological creams containing sea turtle fat between Guatemala and Belize.

In India, in the Lakshadweep Islands and the mainland coast, green turtle fat was used as boat coating ("*odhum*"). A single turtle can provide the right quantity of oil (i.e. between 10 and 20 liters of oil) for coating an entire pirogue (Tripathy and Choudhury 2007). Sea turtle fat was further used as treatment for asthma, convulsions and different kinds of body pain (Murthy 1981).

In Africa, the natives of the Bijagos archipelago call sea turtle fat *grassura*. The fat is mainly used as cooking oil to improve the taste of meat (e.g. of turtle meat and fish) and also as a medicine, massage oil and for reducing sprains (Bernatets 2009; Regalla 2012). On Roume Island (Loos Islands, Guinea), the fat is also used as food (e.g. cooked with rice) and as an ointment to apply in the case of sprains and fractures (Fretey *et al.* 2006). The Imraguen fishermen in Mauritania extract the fat from the killed sea turtle, melt it and then mix it with the meat being cooked. The melted fat may also be stored in plastic bottles as oil for future use. The Imragen women use this oil to treat diseases such as diabetes, headaches, lumbago, rheumatism and constipation. Mixed with corn or rice porridge, the oil is used to treat digestive diseases. Among the seasonal Senegalese migrants in southern Mauritania, the oil is preserved to “wash the body” (i.e., deworming practice) to eliminate stomach parasites (Fretey and Mint Hama 2012).

Traditional use of leatherback fat: The leatherback sea turtle, *Dermochelys coriacea*, has a ~40 mm thick pseudo-shell-formed by a mosaic of small dermal bone and fat-saturated connective tissues containing trans-6-hexadecenoic acid. All the phospholipids derived from the fatty deposits are enriched in arachidonic acid (Ackman *et al*. 1972), which was used in cosmetology (e.g., in dermal creams and lotions to treat skin rash).

In West and Central Africa, traditional practitioners commonly use leatherback fat because it is believed to contain bioactive molecules with health benefits. In Côte d’Ivoire, ethnic groups use the fat in traditional pharmacopoeia to treat mouth ulcers, oral

sores and rheumatism as well as for joint massage. In Togo and Benin, the freshly killed leatherback turtle is hung vertically and left in the sun to allow the oil to drain from the carcass into a bowl placed underneath (Dossou-Bodjrenou *et al*. 1999; Fretey *et al*. 1999); about 40 liters of oil can be collected from a single carcass. When mixed with honey, this oil is used to cure fevers, fainting, chickenpox, convulsions, tetanus seizures, malaria as well as hepatic disease. In Togo, farmers mainly used the leatherback fat as food, massage oil and treatment for fractures. Additionally, they make the *suh* from this fat, an agricultural tool used in rice fields (Sabinot 2003). In Cameroon, the Iyassa villagers used leatherback fat as cooking oil; north, in the Batoke village near Limbé, marabouts use the fat to prepare remedies for their secret pharmacopeia to cure all kinds of problems and diseases (Fretey 1999). On the nearby island of Bioko, the species is exclusively captured for its fat (Butynski 1996); to date, no records or interviews are available for identifying the use of the leatherback fat in that region. Nevertheless, it is most likely that the local people use it for purposes described above.

Outside Africa, in the Persian Gulf and Indian Ocean Islands, for example, the leatherback fat was used as a sealing material for caulking the inside of boat hulls (Kinunen and Walczak 1971; Tripathy and Choudhury 2007); in Papua New Guinea, as lamp oil (Spring 1982); in the Caribbean (i.e. US Virgin Islands, British Virgin Islands, Grenadines, Panama (U.S. Fish and Wildlife Service 1981)) as medical remedy. In Panama, the leatherback is called *baúla* and its oil was reported to have extraordinary curative powers, particularly against chills and infantile asthma (Hastings 2003).

An unknown use of leatherback fat in Mauritania: The present study was conducted at the end of October 2014, in Mauritania, north and south of Nouakchott. Fishermen from the Lévrier Bay were interviewed to identify the frequency at which sea turtles were encountered at sea. A fisherman indicated that one leatherback sea turtle stranded in February 2014 on a nearby beach. This observation was interesting since leatherback strandings are uncommon in Mauritania (Maigret 1983; Fretey and Mint Hama 2014).

Figure 1.The Mauritanian fisherman interviewed shows us his bottle containing 1 liter of leatherback oil (© J. Fretey).

The fisherman told us that he collected the stranded turtle, extracted the oil by melting the fat tissue and then put the oil into bottles. He showed us fragments of the leatherback shell that were still present on the beach and took us into his cabin and showed us some of the bottles containing the leatherback oil (Fig.1). He explained that the oil was used to coat the sides of fresh fish fillets to avoid attracting insects (e.g. ants and flies) when fish are dried in the sun on the metal roof of his cabin (Figs. 2-3).

Figure 2. Leatherback oil is applied with a brush on the fish (© J. Fretey).

Figure 3. The fish is now protected against insects will be placed in the sun on the roof of the house (© J. Fretey).

To our knowledge, this is the first record of the use of leatherback fat as an insect deterrent. It is likely that such practice is widespread across Africa. It would be worthwhile to identify historical events that led to such a use by the Mauritanian fishermen. Additionally, it would be interesting to study the effectiveness of leatherback fat as an insect deterrent.

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Report on a Turtle and Cetacean Assessment Survey to the Kunene River Mouth, Northern Namibia – January 2014

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Project Background: The Benguela Current Large Marine Ecosystem (BCLME) off the coast of Namibia is one of the highest regions of marine productivity in the world. A characteristic of the northern BCLME is the high biomass of jellyfishes (Roux *et al*. 2013), a potential food source for several species of marine turtles. Although the climate of coastal Namibia is too cold for successful nesting to occur, the BCLME may act as a regionally important feeding area for turtles. Leatherback turtles (*Dermochelys coriacea*) have been found in Namibian waters for many years, most often in the summer months (Hughes 1989, Elwen and Leeney 2011), with records dating back several decades at least (Namibian Dolphin Project Strandings Database). In recent years, tag returns and satellite telemetry have provided growing evidence that leatherbacks from several globally significant nesting populations in the Atlantic (De Padua *et al*. 2014) and the Indian Ocean (Lambardi *et al*. 2008) use Namibian waters as an important foraging ground, probably because of the abundance of jellyfish in these waters (Lynam et al. 2006).

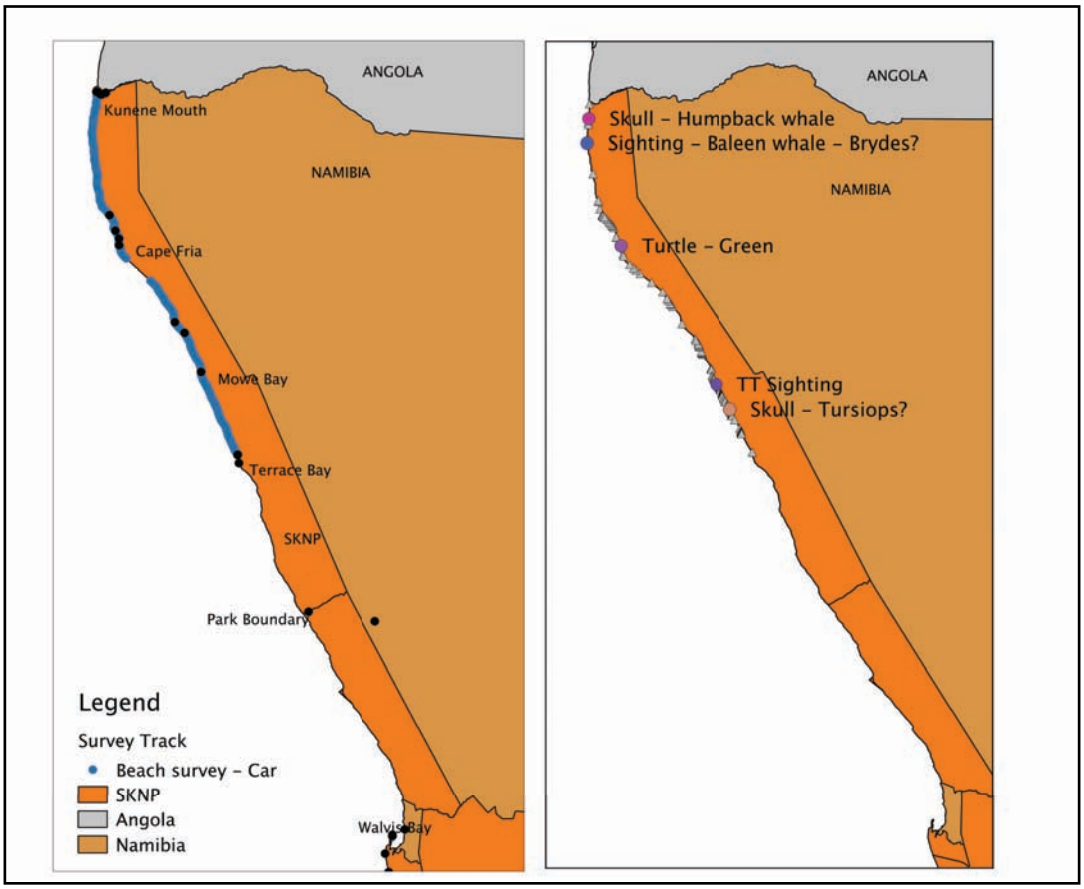

Figure 1. Maps showing study area and survey tracks (left), and (right) location of live sightings and whale and turtle remains. “TT Sighting” shows location of probable live sighting of 2 common bottlenose dolphins (*Tursiops truncatus*).

In addition, the Kunene River mouth plays host to at least two species of turtles, the green turtle (*Chelonia mydas*) and the Nile softshell turtle (*Trionyx triunguis*), which are known to aggregate (probably for feeding) in the river mouth and occasionally haul out on land (Tarr 1987, Simmons *et al*. 1993, Weir *et al.* 2007). The Kunene River is the southern most point on the Atlantic coast of Africa where either of these species can be encountered with any regularity.

The Kunene River mouth lies at the Angolan-Namibian border and at the very northern limit of the Skeleton Coast National Park in Namibia. No roads run north of Möwe Bay (Fig. 1) and accessing the coast beyond this point is limited to driving on tracks or the beach with 4x4 vehicle access only. In addition, diamond exploration at several points within the National Park means that additional clearance permits are required to access the northern limits of the park for research purposes. The area is thus logistically challenging to access.

Survey goals:
1) To assess the density, number, species and distribution of turtles using the Kunene River mouth area.

2) To assess number and species of stranded cetaceans (whales and dolphins) and turtles along as much of the Skeleton Coast National Park as possible, with a focus on the more remote northern areas.

Research Protocol: A seven-day trip was undertaken from Swakopmund to the Kunene River mouth by 4x4 vehicle, following a coastal route. The northward leg was a fast transit achieved in one day by the majority of the team. Three nights were spent at the Kunene Mouth allowing for two days of surveying of the river and surrounds, and three nights at Möwe Bay to allow for surveying of the beaches for stranded cetaceans.

Surveys at the Kunene River mouth were undertaken by the co-authors on foot or by boat (4 m rigid inflatable). Almost the entire coast between the Kunene River mouth and Möwe Bay was surveyed by the co-authors using a 4x4 vehicle with one observer on the back. The survey ran on either the high or low beach depending on tide. Due to the length of coastline surveyed and number of very old whale skeletal remains, not all specimens were examined in detail. Basic data including position and remains type (e.g. balaenopterid skull, balaenopterid jaw bone, delphinid skull) were recorded for all observed cetacean and turtle remains. All fresh or reasonably fresh cetacean and turtle remains were examined in greater detail to take a suite of standard measures and genetic and stable isotope (bone or skin) samples where possible.

Results: *Kunene River Mouth Survey—* Conditions at the Kunene River mouth: The river widens considerably into a flood plain in the last 2-3 km prior to meeting the sea, however, only a narrow channel, approximately 100 m wide actually exits to the sea. The majority of the flood plain area near the mouth of the river is very shallow with extensive sand banks making boat based surveys very challenging, especially at low tide, while in the mouth exit channel there is a strong current, especially on a dropping tide. The river was very muddy throughout the survey and nothing could be observed below the surface, potentially decreasing the ability to spot turtles. The presence of crocodiles in the river makes foot-based traverses of the river unwise (Fig. 2).

Figure 2. Green turtle and Nile crocodile in the mouth of the Kunene River.

Only two days were available for surveys of the Kunene River. A single survey up river from the Diamond Camp to the first rapids, revealed no turtles (Fig. 3). A one-hour shore based observation from the Camp site area (approximately 1.6 km upstream from the mouth) revealed only a single large Nile softshell turtle (Fig. 4).

At low tide, we observed a maximum count of 9 – 12 green turtles and 3-5 Nile softshell turtles all clustered in the mouth area. At high tide, turtles were observed to come much further into the lagoon, with animals observed regularly at least 500 m upstream from the mouth.

Figure 3. Angled google earth view of the Kunene Mouth from river mouth to furthest point surveyed.

The co-authors conducted several shore based watches at the river mouth itself, spending some time developing an appropriate technique to assess the number of animals using the area; counting them being complicated by the short surfacing times, long dive times and total lack of underwater visibility.

Two assessment periods were conducted during low tides (mornings of 29th and 30th) and one at high tide (afternoon of 30th). During low tides, all turtles were aggregated in or very close to the river exit channel with some animals (a count not possible due to distance and waves) seen further out to sea on the back of the breakers. The entire river exit channel can be easily surveyed by two observers.

A thorough count using naked eyes for the channel and binoculars for the lagoon areas (scanning slowing across the entire lagoon with 15 sec per binocular viewing area before moving to the adjacent segment) resulted in a maximum count of 46 turtles in the lagoon and a further ~20 in the exit channel, suggesting a total of 60-70 green turtles at least within ~500 m of the river mouth and a further 5 -7 Nile softshell turtles. Throughout observations, the vast majority of turtle surfacings occurred facing into the river current suggesting that animals were feeding on items washing down in the current (Fig. 5).

Beach surveys for stranded cetaceans and turtles: Almost the entire beach was surveyed by 4x4 between the Kunene River Mouth and Terrace Bay. Due to the distances involved and challenges of travelling on the high

beach, it was preferred to travel on the low beach at low tide whenever possible. It was not always possible to simultaneously observe both the entire low beach (where fresh strandings are more likely) and high beach (where longer term remains are more likely) from the vehicle, thus the data presented here should be considered a minimum and not an exhaustive count of cetacean and turtle remains in the northern parts of the Skeleton Coast National Park.

Figure 4. Nile soft shelled turtle in the Kunene River mouth.

Figure 5. Green turtle surfacing facing into the river current.

No fresh cetacean strandings were found. A single stranded green turtle was found (Table 1; Fig. 6). A single live balaenopterid whale, probably a Bryde's whale (*Balaeoptera edeni*) was observed 1 km offshore near Rocky Point on 28 January, in conjunction with many feeding seals and sea birds suggesting that it was feeding.

Counting only skulls where more than half was present, 108 Balaenopterid skulls were counted, mostly in two areas north of Angra Fria and north of Möwe Bay. One humpback whale skeleton was found at Rocky Point. The jaw bone of a single sperm whale was found approximately 10 km south of Angra Fria. In addition, the remains of three smaller animals were found, one entire back bone which could not be identified to species, and the skulls of two delphinids, one an unidentified blackfish (e.g. killer whale, pilot whale or false killer whale) and one tentatively identified as a bottlenose dolphin.

Summary and suggestions for future work: Although brief, our surveys of the Kunene River confirm previous observations (Tarr 1987, Simmons *et al*. 1993) of the high numbers of green turtles using the river mouth. Given the high currents, murky water and presence of crocodiles, catching turtles for taking samples or fitting satellite tags would be very challenging. Anglers have reported some success with catching turtles on a rod and line with turtles both taking bait and becoming entangled in lines. Using a net would be challenging due to the high currents, however it might be feasible to set a small area, large mesh net in the river mouth and control it by having ropes anchored on both sides of the river mouth.

Figure 6. Freshly dead green turtle north of Cape Fria.

Table 1. Details of the green turtle stranding

Description		Length	Unit
Species - Green Turtle			
Sex – Male			
Date Attended – 31 January 2014			
Location – 10 km N. of Cape Fria – 18° 22.854' S 12° 0.142' E			
SOL - Straight Overall Length		75	cm
COL - Curved Overall Length		82	cm
SCL - Straight Carapace Length		57	cm
CCL - Curved Carapace Length		61	cm
SCW - Straight Carapace Width		46	cm
CCW - Curved Carapace Width		57.5	cm
TTL - Total Tail Length (from Plastron)		5	cm
MBD - Max Body Depth (straight)		23	cm
SFF - Straight Flipper to Flipper (tips)		88	cm
CFF - Curved Flipper to Flipper (tips)		95	cm
Flippers - Wrist to Tip	L: X	R: 36	cm
Weight		X	kg
Tag presence?		X	
Tag Details		X	

Beach surveys found only a single freshly-dead animal. However the majority of the coastline has an eroding nature so there is a low likelihood than animals would remain on the beach for long unless stranded near the spring high tide mark. The vast majority of older skeletal remains are very old, suggesting they are a result of animals killed in commercial whaling activities in the 18th, 19th and 20th centuries. If DNA can be extracted from these remains, they provide a potentially valuable resource for comparison of haplotypes with extant stocks.

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Marine Turtle Conservation in the Eritrean Red Sea

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Situated on the eastern horn of Africa and bordering the Red Sea, Eritrea has a mainland coast stretching over 1,300 km, as well as over 350 offshore islands with an additional coastline of some 1,950 km. All of the marine turtle species recorded in the Western Indian Ocean region occur in Eritrean waters of the Red Sea: green turtles *(Chelonia mydas),* hawksbills *(Eretmochelys imbricata),* olive ridleys *(Lepidochelys olivacea),* loggerheads *(Caretta caretta)* and leatherbacks *(Dermochelys coriacea).* Three species – the green, hawksbill and olive ridley are known to nest. The hawksbill turtle is the most common nesting species in Eritrea. Nesting has been recorded at more than 110 islands and coastal sites. The green turtle is the second most common nesting species. Little is known about the status of the olive ridley turtle and the last known nesting records are from 2004. Loggerhead and leatherback turtles are relatively rare in Eritrea and there is no indication that they nest.

Eritrea signed the *Indian Ocean South-East Asian Marine Turtle Memorandum of Understanding* on 1 February 2006. Over the past seven years, the Ministry of Fisheries has been working to conserve marine turtles through the Marine Resources Research Division and the Eritrea Coastal Island and Marine Biodiversity (ECMIB) Project. Research and conservation teams have surveyed more than 120 islands and coastal sites to identify marine turtle nesting habitats. Quantitative nesting data indicate that concentrated nesting activity occurs on Mojeidi and Aucan Islands in the southeast of the Dahlak archipelago as well as at Dissei, Dehil, Dahret and Sigala (part of the Dahlak archipelago). Islands of Fatuma and coastal areas such as Urubia, Ras Tarma, Salafi (Berasole) and Gahro in the Southern Eritrean Red Sea have also been identified as turtle nesting sites. However, surveys and assessments have not been conducted systematically. Additional surveys are necessary to identify feeding grounds and migratory routes so that conservation efforts can be targeted more effectively.

To date, marine turtle conservation and management efforts have focused on the offshore islands of the Dahlak archipelago, particularly Mojeidi Island. The island is characterized by its abundant halophytes and sandy and sparse rocky coralline beaches. Nesting sites are concentrated mainly on the western side of the island. There is minimal human disturbance on the island so egg poaching is not a threat. Birds and crabs pose the biggest threat to emerging hatchlings. In 2006 and 2007, a total of 143 nesting hawksbills were flipper tagged on Mojeidi Island during the nesting season from January to May, as part of the Eritrean Marine Turtle Conservation Programme (1998-2008), which was initiated by a GEF-funded project.

In April 2014 a survey of Mojeidi Island was conducted in collaboration with the Department of Environment (Ministry of Land, Water and Environment) as part of a biodiversity survey for the preparation of Eritrea's 5th National Biodiversity Report. During a night patrol of the island, several female hawksbills were observed nesting including one individual with flipper tags that were known to the surveyors. Historical tagging data showed that the turtle was one of the females flipper tagged eight years previously in May 2006. This observation represented the first and only record of a tagged female returning to nest in Mojeidi Island. Morphometric data were collected from the turtle in 2014 for comparison to data collected when she was first tagged in 2006 (Table 1).

Table 1. Comparison of morphometric measurements from a recaptured hawksbill turtle.

Date (dd/mm/yyyy)	Time of observation (24h)	CCL (cm)	CCW (cm)	SCL (cm)	SCW (cm)
5/26/06	22:40	66.5	61	60	47
4/27/14	23:30	68	62	60	47

During a survey of Mojeidi Island conducted in April 2015 by a group of marine biologists from the Ministry of Marine Resources, 430 recent hawksbill nests were recorded during a one-day stay at the island. This density of nesting suggests that the islands of Dahlak Archipelago and specifically Mojeidi Island could support one of the most significant hawksbill rookeries in the region.

Current information indicates that the main sources of marine turtle mortality in the Eritrean Red Sea are trawling, long lines and gill net entanglement. Shrimp trawling is considered to pose a major threat due to the location of the main shrimp fishing grounds, which are situated close to nesting and foraging grounds. A total of 3,342 reports of marine turtle bycatch were recorded during ten years of data collection (1994-2004) from industrial shrimp and fish trawlers operating at different fishing grounds of the Eritrean Red Sea.

During the 2013 fishing season (January – May) data obtained from the Monitoring, Control and Surveillance department of the Ministry of Marine Resources indicated that more than 60 marine turtles were captured incidentally by fish and shrimp trawling vessels. However, during a small random sampling exercise in 2013 by onboard observers from the Research Division, 48 captured turtles were recorded which signifies the level of under-recording of incidentally captured marine turtles. All five species of marine turtle present in the Eritrean Red Sea were recorded as incidental catch by the observers. Of those, 23 were greens, 17 were hawksbills, six were loggerheads, one was a leatherback and one was an olive ridley. Three of them were found dead (two hawksbills and one green).

All 48 individuals were released back to the sea in line with the Eritrean Fisheries Proclamation. Prior to release, five turtles were flipper tagged (two hawksbills, two greens and one olive ridley).

One of the major successes of marine turtle conservation in Eritrea came at the beginning of 2015. Realizing the national, regional and international value of marine turtles as a model flagship species for conservation, together with their apparent contribution to balance in nature, their unique behaviour and their struggle to survive, the Northern Red Sea Regional Administration (Figs. 1-2), one of the six regional administrations of the State of Eritrea, declared the turtle as its trademark. It was officially announced in February during the commemoration of the 25th Silver Jubilee Anniversary of the Fenkel Operation, which was one of the fiercest battles for the Eritrean People's Liberation Front (EPLF) who fought to liberate Massawa in 1990 from the Ethiopian Regime.

Figure 1. Map of Eritrea highlighting the Northern Red Sea Region.

Figure 2. The Northern Red Sea Regional Administration logo.

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Evidence of Loggerhead Turtle (*Caretta caretta*) Predation on Sea Urchins (Echinodermata) in Watamu, Kenya

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Introduction: Loggerhead turtles (*Caretta caretta*) have a wide spread distribution in the Indian Ocean yet they nest in relatively few areas. Known nesting beaches are located in South Africa, Mozambique, Madagascar, Western Australia and Oman (Spotila 2004). Loggerheads are present in Kenyan waters, but are not considered common. Since the inception of its turtle conservation programmes in 1998, the Local Ocean Trust (LOT) has conducted over 13,000 turtle rescues from entanglement in fishing gears, but has encountered only 11 loggerheads (Curved carapace length (CCL) ranging from 63.5 cm to 93.5 cm).

Loggerheads are a carnivorous species that feed on a wide range of prey. Studies have shown that prey items include a variety of crustaceans, mollusks, fish, marine plants, sea horses and insects (Dodd 1988). However, relatively few studies on the diet of loggerheads in the Indian Ocean have been conducted and published research has not occurred in decades (e.g., Hughes 1974).

The diversity of prey taken by loggerheads allows them to thrive in different habitats or similar habitats with different community compositions. In areas with sustained high fishing pressure, preferred prey items of the loggerhead may be depleted. The unprotected inshore ecosystems of Kenya have endured consistently high fishing pressure and subsequent community wide impacts have ensued (O'Leary and McClanahan 2010). Increases in sea urchin populations in overfished, shallow reef habitats along the Kenyan coast have been widely documented (e.g., McClanahan and Muthiga 1989; McClanahan and Shafir 1990; McClanahan and Mutere 1994. The shallow reef and lagoon habitats in the Malindi-Watamu Marine National Reserve (MWMNR) and the Watamu Marine National Park (WMNP) are currently experiencing high densities of the sea urchin, *Tripneustes gratilla* (Linnaeus, 1758). Large areas of sea grass inside these protected areas have been heavily grazed, especially *Thalassodendron ciliatum (*C. van de Geer, pers. obs.).

A full understanding of the diet of loggerheads will assist in effective conservation planning and the development of management strategies. This paper presents observations from the sea turtle conservation efforts by LOT in Watamu, Kenya and discusses the implications of these observations in the context of coastal ecology.

Observations: On 14 July 2015, LOT personnel of the Bycatch Release Programme (BCRP) were informed by local fishers that they had found a loggerhead turtle entangled in their net. The turtle was landed in Watamu and collected by LOT personnel. It was measured and weighed and had a CCL of 82.0 cm, a curved carapace width (CCW) of 74.0 cm and a weight of 74.81 kg. Visual inspection revealed that the turtle was female and had not been flipper tagged so one tag was applied to each front flipper (KEL0003 and KEL0004). The carapace had a large number of barnacles attached to it and there were some minor wounds on the front flippers. Therefore, the turtle was admitted to the LOT Turtle Rehabilitation Centre (TRC) for treatment and observation.

The loggerhead turtle defecated twice during the time in the TRC and large amounts of solid fragments were observed in the feces. It was immediately evident that the majority of the fragments were of sea urchins, characterized by spines, teeth and fragments

of urchin shell known as “tests”. All fragments were collected, rinsed and dried in the sun. The urchin fragments were separated from the rest and weighed. The urchin fragments weighed 545 gm. The other materials consisted of small (<0.5 cm) barnacles, rubble and crustose coralline algae (Figs. 1-2) and weighed 25 gm. Urchin material was further separated into teeth, test fragments and spines (Figs. 3-5). The teeth ranged in size from 10 mm to 22 mm (Fig. 6).

Figure 1. Big solid fragments.

Figure 2. Smaller solid fragments.

Discussion: Studies conducted in the North Pacific Ocean, Atlantic Ocean and Mediterranean Sea have quantified the frequency of occurrence of different prey items and show that loggerhead turtles are opportunistic feeders with the most common prey items being crustaceans, molluscs, fish, jellyfish and tunicates (Table 1). However, loggerheads sampled during the summer months in the Mediterranean had a high percentage occurrence of sea urchins in the gut contents and feces (Casale *et al*. 2008).

Figure 3. Sea urchin spines.

Figure 4. Test fragments.

Published literature that describes loggerheads feeding on sea urchins in the Indian Ocean is limited to Hughes (1974), who stated that loggerhead turtles fed on *Prionocidaris baculosa* and “spiny sea urchins” and Deraniyagala (1939), who stated that adult loggerhead turtles fed on “unspecified Echinodermata”.

Table 1: Top prey items occurring in gut contents of loggerhead turtles from six studies.

	Food Item						
Study	Crustaceans	Molluscs	Fish	Jellyfish	Tunicates	Sea Urchins	Study Region
Armanasco *et al* . (2010)	X	X	X				Mediterranean Sea
Casale *et al.* (2008)	X	X				X	Mediterranean Sea
Tomas *et al* . (2001)	X		X		X		Mediterranean Sea
Parker *et al* .(2005)	X	X					North Pacific Ocean
Wallace *et al* . (2009)	X		X	X			Atlantic Ocean

Although the evidence presented in this article is from one individual, it provides a valuable insight into the dietary plasticity of this species.

Figure 5. Sea urchin teeth.

The turtle appeared to have eaten large numbers of sea urchins, which are currently very abundant in the area where the turtle was captured. The combined weight of the spines, test and jaws of a sea urchin is approximately 25 gm, although this is a crude estimation. Based on this estimation, the two stools of this loggerhead represent the remains of at least 20 individual urchins. In reality, this figure is likely to be higher because the teeth recovered were from a wide range of urchin size classes, meaning that smaller urchins were also consumed.

It is not clear whether the preference for sea urchins was voluntary or that the turtle was driven to eat sea urchins because human overfishing had depleted usual prey items.

Figure 6. A range of teeth sizes.

The evidence presented here highlights the potential role of loggerhead turtles in suppressing outbreaks of sea urchins. In Kenya, the typical predators of sea urchins are triggerfish (Balistidae) and octopus (Octopoda). Since these are economically important species, they are prone to over-exploitation, which can then lead to outbreaks of sea urchins (McClanahan and Muthiga 1989; McClanahan and Mutere 1994).

Photos: Casper H. van de Geer

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Marine Turtles in Mozambique: Results from the 2014/15 Nesting Season

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In Mozambique, marine turtles have been protected since 1965 (Diploma Legislativo 2627 of 7 August). The first nest monitoring programme was initiated in 1988 at Inhaca Island by Eduardo Mondlane University through the Marine Biological Station (UEM-EBMI). These efforts expanded in 1994, where a section between Ponta Dobela to Ponta Malongane was monitored during the peak nesting season (Fig. 1).

A decade after the first monitoring programme began another programme was initiated at the Bazaruto Archipelago National Park. Following this, in 2005, the Primeiras and Segundas Islands and São Sebastião also implemented monitoring programmes (Fig. 1). Three years later, monitoring started in Vamizi and Rongui Islands and in the Quirimbas. Each season, the monitoring coverage and locations varied.

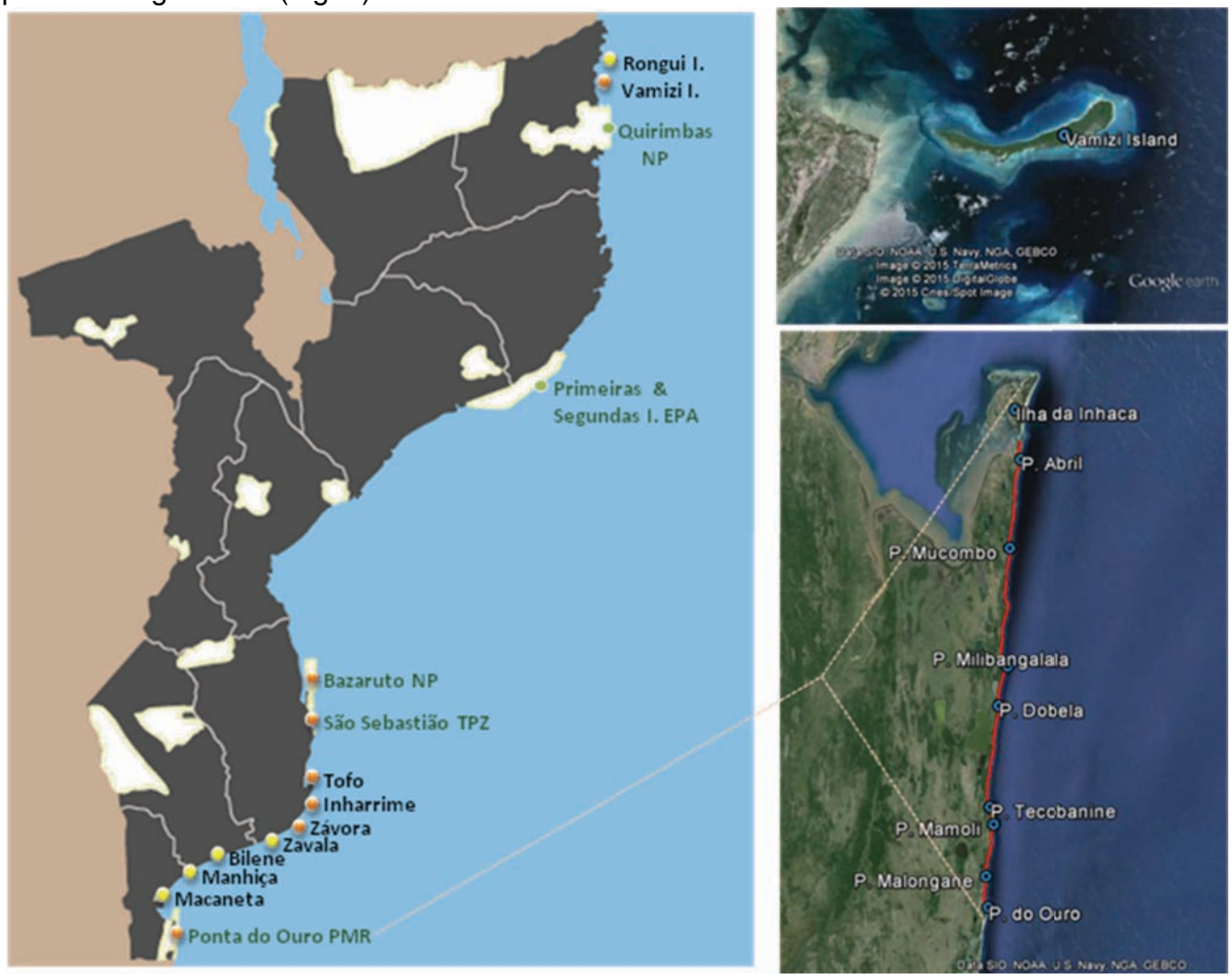

Figure 1. Protected areas in Mozambique (white areas and green text) and marine turtle nesting beaches with data for the 2014/15 season (orange circles). Yellow circles represent nesting beaches with historical data. NP – National Park; EPA –Environmental Protected Area; TPZ –Total Protected Zone; NR –National Reserve; PMR –Partial Marine Reserve. Vamizi Island (top right) and POPMR beaches (bottom right).

Table 1. Methodology and temporal coverage per monitoring area during the 2014/2015 season (*=occasional patrols).

Area	Method	Distance (km)	Period
Ponta do Ouro - Malongane	Patrol on foot	8	01 Sept 14 – 31 Mar 15
Malongane – Dobela	Patrol by car	32	01 Sept 14 – 31 Mar 15
	Patrol on foot		01 Sept 14 – 31 Mar 15
Dobela – Mucombo	Patrol on foot	30	01 Sept 14 – 31 Mar 15
Mucombo – Sta Maria	Patrol on foot	20	01 Sept 14 – 31 Mar 15
Závora – Praia Manhame	Patrol on foot	10*	01 Oct 14 – 30 Apr 15
Tofo -Paindane	Patrol on foot	*	01 Oct 14 – 30 Apr 15
São Sebastião	Patrol on foot	25	09 Oct 14 – 15 Feb 15
PNA Bazaruto	Patrol on foot	*	01 Oct 14 – 30 Apr 15
Vamizi	Patrol on foot	12	01 Aug 14 – 31 May 15

However, during the most comprehensive season in 2010/2011 as much as 25.7% of the potential nesting area in the country was covered. The 2010/11 nesting season included several beaches in the south of Mozambique, namely Macaneta, Manhiça Bilene, Zavala, Závora and Tofo. In the subsequent season, the coverage reduced to 18.5%. The decline in monitoring effort continued into the 2014/15 season with a further reduction in the number of monitoring sites and the total length of beach patrolled from 137 km (~11.4 % of the potential nesting area) to 127 km (~10.6% of the potential nesting area).

The declines are a direct result of funding constraints and availability of local partners to support the implementation of monitoring programs. During the 2014/15 season, monitoring took place from September 2014 to March 2015 in the southern part of the country, and from August 2014 to May 2015 in the northern part. Data were collected during night patrols by foot or by car for nesting females and during day patrols for hatchlings (Table 1). Tracks and nests of loggerhead (*Caretta caretta)* and leatherback (*Dermochelys coriacea)* turtles were recorded along the stretch of coastline between Ponta do Ouro and Bazaruto Archipelago and green turtles (*Chelonia mydas)* were reported at Vamizi Island. Interestingly, not a single hawksbill turtle (*Eretmochelys imbricata*) was reported this season.

A total of 1,054 nests were recorded, of which 84% (885 nests) were from POPMR, 14% (144 nests) from Vamizi Island and the remaining were from Inhambane (2%, 25 nests). Loggerhead turtles were the most abundant nesting species (846 nests), followed by green turtles (144 nests) and leatherback turtles (43 nests). Twenty-one nests were reported in São Sebastião but were not identified to species level.

Patrols in Závora, Praia de Inharrime, Tofo (Paindane) and at the Bazaruto Archipelago National Park were not conducted on a regular basis. Unfortunately, data on monitoring effort are not available for these areas. Data on eggs and hatchlings were collected consistently for a section of the Ponta do Ouro Partial Marine Reserve (POPMR; Mucombo to Santa Maria) and Vamizi, where each nest was marked. When logistically possible, the number of eggs and hatchlings were recorded to estimate hatching success. Hatching success was 84.2% for loggerheads (68 nests with 8,389 eggs laid), 86.9% for leatherbacks (nine nests with 1,005 eggs laid) and 99.2% for greens (41 nests with 4,177 eggs laid).

In general, data on nest loss, either by natural or anthropogenic causes were not collected,

except at Vamizi Island, where 14 nests were destroyed by inundation and for Malongane-Dobela section where 161 nests were raided by bush pigs.

Titanium flipper tagging took place at the POPMR. In total, 180 marine turtles were tagged, of which 98% were loggerhead turtles and the remaining 2% were leatherbacks. Within the POPMR, 97% of the tagging was done at the Ponta Malongane-Ponta Dobela section. Recaptured turtles were also observed at POPMR of which 259 were loggerhead and 19 were leatherback turtles, including 43 turtles tagged in previous nesting seasons at the POPMR and in South Africa. These data should be carefully analysed with adequate software such as MARK that also models scenarios of survivorship.

Despite the fact that loggerhead turtles were the most common nesting species, they have low nuclear allelic diversity based on microsatellite analysis from samples collected at POPMR (Fernandes 2015). However, this population still warrants protection as there are no data available on gene flow between Indian Ocean populations (e.g. between South Africa/Mozambique, Madagascar, Oman and Australia; Fernandes 2015) and on clear growth trends for the southern Indian Ocean population discrete segment.

In Mozambique, poaching is particularly prominent, hampering efforts to protect marine turtles. Marine turtle monitors and tourism operators reported a total of 26 adult marine turtle mortalities during the 2014/15 season. From this, six cases were attributed to anthropogenic causes: harvesting of nesting females (two loggerheads) and accidental catches by artisanal fisheries (three hawksbills and one green). Hawksbill carapaces were on sale at a curio market in Maputo (Fig. 2) at a price of 300.00 – 1000.00 Meticais each (~ U$ 7.50 – 25.00). Mortality data collected in 2014/15 are considered to be a significant underestimation of mortality rates as many coastal areas do not have ongoing marine turtle monitoring programs. Also, accidental captures of marine turtles in industrial and semi-industrial fisheries are usually not reported. Law enforcement is also a major concern; apprehensions and prosecutions for marine turtle poaching are rare along the coastline.

Figure 2. Hawksbill carapaces were on sale at a curio market in Maputo.

For full access to the monitoring, tagging and conservation of marine turtles in Mozambique Annual Report 2014/15, please visit Centro Terra Viva's webpage through the following link: http://www.ctv.org.mz/wp-content/uploads/2015/08/MT-ANNUAL-REPORT-S2014_15-final-EN-CSS.pdf

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First Observation of Albino Green Turtle (*Chelonia mydas*) Hatchlings on Vamizi Island, Mozambique

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Vamizi Island is the biggest known green turtle (*Chelonia mydas*) rookery in Mozambique. Since 2002, a nest monitoring project has been ongoing, with nesting and hatching events recorded during daily foot patrols. Every year, close to 200 nests are laid on the island on four beaches that total 11 km of nesting grounds.

When a nest is close to its hatching date, it is checked frequently for any signs of emerging hatchlings. This is usually identified as a small depression in the sand above the egg chamber, indicating hatchling movement within the nest. In Vamizi, the tidal range is approximately 4.6 m with the high spring tide reaching the margins of the beach vegetation where females usually nest. When a nest has hatched it is immediately excavated to rescue any trapped hatchlings that would be at risk if the nest chamber flooded.

While excavating a nest that had hatched on 27 May 2015, four albino hatchlings were observed in the nest, two of which were still alive, together with three other hatchlings with normal pigmentation. This is the first time that albino hatchlings have been recorded in Vamizi during 13 years of monitoring, making it quite a special discovery. One of the hatchlings with normal pigmentation had supernumerary scutes. To avoid exposure to high temperatures and bright sunlight, the hatchlings were kept in a basket with sand in a dark and quiet place until after sunset when all five hatchlings were released.

Since this was the first time that albino hatchlings were observed on Vamizi, and as was later discovered, in Mozambique, photos of the hatchlings were taken in order to document the finding. A total of seven dead hatchlings were found inside the nest (two albino and five with normal pigmentation) so tissue samples were collected from each individual in order to run genetic analyses, which will hopefully shed some light on the

mechanism behind albinism in sea turtles as well as provide information about the hatchling's parents and the population they belong to.

Since the discovery of the albino hatchlings, the team on Vamizi has been trying to find other records of true albinism in sea turtles in other populations. Even though other records exist (Marcovaldi 1995; Türkozan and Durmuş 2001; Sönmez and Özdilek 2011) many of them are incorrectly classified as albinism and are instead other pigmentation abnormalities that do not have all of the characteristics of true albinism (e.g., red eyes). This makes the finding in Vamizi very exciting, including the possibility of furthering our insight into the genetics behind albinism in sea turtles.

Photos: ©Joana Trindade

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A book:

Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. CMS Technical Series No. 6. UNEP/CMS Secretariat, Bonn, Germany. 429 pp.

A chapter or article in an edited volume:

Brongersma, L.D. 1982. Marine turtles of the Eastern Atlantic ocean. Pp. 407-416. *In*: K.A. Bjorndal (Ed.) Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington DC. 583 pp.

Tables/Figures/Illustrations

All figures should be stored as separate files: Excel, .tif or .jpeg format. Please contact the Editors if you do not have access to scanning or other necessary electronic facilities. Tables and figures should be given in Arabic numerals. High resolution images may be requested after acceptance—final files should have a minimum resolution of 1200 px or >250 dpi.

INSTRUCTIONS POUR LES AUTEURS

Le bulletin d'information, African Sea Turtle Newsletter (ASTN) est une publication électronique internationale gratuite et biannuelle qui traite de la biologie et de la conservation des tortues marines en Afrique, de même que des expériences de personnes qui travaillent sur elles dans ce continent si vaste et diversifié, avec ses iles côtières. Cette publication vise à encourager la communication et la collaboration entre tous ceux qui travaillent sur les tortues marines en Afrique—les scientifiques, les écologistes, les politiciens, les directeurs de projets, les membres de communautés diverses, les étudiants, les professeurs, tous! Aussi vise-t-elle à disséminer les nouveautés entre les membres de la communauté internationale qui travaille sur ces espèces.

Nous acceptons des contributions diverses y compris des articles scientifiques, des observations dans la nature, des opinions, des anecdotes, des mythes locaux, des informations d'utilisation dans les pharmacopées, des légendes, des expériences personnelles de terrain, des ateliers, des activités pédagogiques et des annonces d'évènements. Nous accepterons et publierons des contributions en anglais, français, espagnol et portugais pour que tous puissent s'exprimer dans la langue dans laquelle ils sont plus à l'aise.

LES CONTRIBUTIONS

Nous vous invitons à suivre les instructions pour les auteurs et d'envoyer vos contributions au Rédacteur Régional approprié :

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Angela Formia
Courrier électronique: aformia@wcs.org
Pays: Côte d'Ivoire, Guinée Équatoriale, Gabon, Sao Tomé et Principe, Congo-Brazzaville

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Toute contribution devra s'adresser aux rédacteurs régionaux et non pas aux membres du conseil éditorial.

Nous acceptons les contributions en anglais, français, espagnol et portugais pour représenter les quatre langues principales du continent.

Nous réviserons le contenu de même que le format de toute contribution. Chaque contribution devra fournir une adresse d'expéditeur pour chaque auteur de même qu'une adresse de courrier électronique qu'on pourra utiliser pendant la révision de la contribution.

Le Texte

Pour assurer une évaluation rapide de la contribution, nous demandons qu'elle se fasse dans la forme d'un dossier MS Word (ou dossier texte) adjoint à un courrier électronique (email). Si un auteur n'a pas accès au courrier électronique, il devra communiquer avec les rédacteurs pour trouver une autre manière de faire envoyer la contribution. S'il n'y a pas d'internet ou d'ordinateurs disponibles, vous pouvez envoyer une copie papier aux rédacteurs, soit par courrier soit par fax.

Les noms scientifiques doivent être écrits en lettre cursives/italiques (e.g. *Dermochelys coriacea*) et porter le nom latin du genre complet seulement dans sa première apparence dans le texte.

Les notifications dans le texte doivent se faire d'abord dans l'ordre chronologique et après alphabétique (Fretey 2001; Formia *et al.* 2003; Tiwari and Dutton 2006). Nous vous prions de noter le format de chaque style de notification (auteur unique, deux auteurs ou auteurs multiples) dans le texte.

Votre bibliographie devra comprendre seulement la littérature citée dans votre texte, selon les formats suivants:

Un article dans un journal académique:

Weir, C.R., T. Ron, M. Morais, and A.D.C. Duarte. 2007. Nesting and pelagic distribution of marine turtles in Angola, West Africa, 2000–2006: Occurrence, threats and conservation implications. Oryx 41: 224–231.

Un livre:

Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. CMS Technical Series No. 6. UNEP/CMS Secretariat, Bonn, Germany. 429 pp.

Un chapitre ou un article dans un volume édité:

Brongersma, L.D. 1982. Marine turtles of the Eastern Atlantic ocean. Pp. 407-416. *In*: K.A. Bjorndal (Ed.) Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington DC. 583 pp.

Tables/Chiffres/Illustrations

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INSTRUÇÕES AOS AUTORES

O Boletim African Sea Turtle Newsletter (ASTN) é uma publicação electrónica internacional bianual, gratuita, sobre a biologia e conservação das tartarugas marinhas em África e das histórias de pessoas que com elas trabalham neste vasto e diversificado continente e suas ilhas. Esta publicação pretende aumentar a comunicação e colaboração entre todos aqueles que trabalham com tartarugas marinhas em África - cientistas, conservacionistas, políticos, gestores de projectos, membros das comunidades, alunos, professores, todos! – assim como compartilhar notícias com a comunidade internacional do ramo.

As contribuições podem variar desde artigos científicos originais e observações sobre história natural a opiniões, histórias, mitos locais, tabus, farmacopeia e lendas, bem como experiências de campo, oficinas, atividades de educação e sensibilização e anúncios. Iremos aceitar e publicar contribuições em Inglês, Francês, Espanhol e Português para que todos se possam expressar na língua em que mais se sentem confortáveis.

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Todas as submissões devem ser enviadas para o Editor responsável pelo país de onde provêem as informações e não para os membros do Conselho Editorial.

As inscrições são bem-vindas em Inglês, Francês, Espanhol e Português para representar as quatro principais línguas do continente.

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Para garantir uma revisão rápida, pedimos que todas as submissões sejam em formato electrónico, na forma de um arquivo do MS Word (ou arquivo de texto) anexado a um e-mail. Se o e-mail não estiver, disponível os autores devem contactar os Editores para se procurar uma alternativa. Se nem internet nem instalações com computadores estiverem disponíveis, uma cópia impressa do artigo pode ser enviada para os Editores por correio ou fax.

Os nomes científicos devem estar em itálico (por exemplo, *Dermochelys coriacea*) e o nome completo em latim dado apenas na primeira aparição.

As citações no texto devem ser listadas em ordem cronológica e, em seguida, ordem alfabética (Fretey 2001; Formia *et al* 2003;. Tiwari and Dutton, 2006). Por favor tenha em atenção o formato de cada tipo de referência (simples, múltipla, ou dois autores) dentro do texto.

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Um artigo numa revista científica:

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Um livro:

Fretey, J. 2001. Biogeography and conservation of marine turtles of the Atlantic Coast of Africa. CMS Technical Series No. 6. UNEP/CMS Secretariat, Bonn, Germany. 429 pp.

Um capítulo ou artigo num volume editado:

Brongersma, L.D. 1982. Marine turtles of the Eastern Atlantic ocean. Pp. 407-416. *In*: K.A. Bjorndal (Ed.) Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington DC. 583 pp.

Tabelas / Figuras / Ilustrações

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INSTRUCCIONES PARA LOS AUTORES

El boletín, African Sea Turtle Newsletter (ASTN) es una publicación electrónica internacional gratis y bianual que apunta a divulgar novedades sobre biología y conservación de tortugas marinas en África, en base a experiencias de los investigadores que trabajan con estos reptiles en dicho continente, sus islas y su litoral tan vasto y diverso.

Esta publicación aspira a fomentar la comunicación y la colaboración entre todos que trabajan con las tortugas marinas en África (científicos, conservacionistas, personas políticas, gerentes de proyectos, miembros de comunidades locales, estudiantes, profesores, todos!) Además de compartir las novedades que surjan entre los miembros de la comunidad internacional que trabajan con estas especies.

Se aceptan contribuciones al boletín desde artículos científicos hasta observaciones sobre el mundo natural, opiniones, anécdotas, mitos locales, farmacopea, leyendas, experiencias personales en el "campo", talleres, actividades pedagógicas y anuncios de varios eventos. Se publicarán contribuciones en inglés, francés, español y portugués para que todos puedan expresarse en la lengua más conveniente.

LOS ENVIOS

Por favor siga las instrucciones para los autores y haga su envío al Redactor Regional apropiado:

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Los nombres científicos se deben escribir en letra bastardilla/cursiva (e.g. *Dermochelys coriacea*) y llevar el nombre latino completo sólo la primera vez que se usa en el texto.

Las citas dentro del texto se deben alistar primero en orden cronológico y luego alfabéticamente (e.g. Fretey 2001; Formia *et al.* 2003; Tiwari and Dutton 2006). Favor de notar el formato de cada tipo de notificación (autor único, dos autores o autores múltiples) dentro del texto.

La bibliografía debe incluir sólo la literatura citada dentro del texto, de la siguiente forma:

Artículo en un diario académico:

Weir, C.R., T. Ron, M. Morais, and A.D.C. Duarte. 2007. Nesting and pelagic distribution of marine turtles in Angola, West Africa, 2000–2006: Occurrence, threats and conservation implications. Oryx 41: 224–231.

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Capítulo o artículo en un volumen redactado:

Brongersma, L.D. 1982. Marine turtles of the Eastern Atlantic ocean. Pp. 407-416. *In*: K.A. Bjorndal (Ed.) Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington DC. 583 pp.

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