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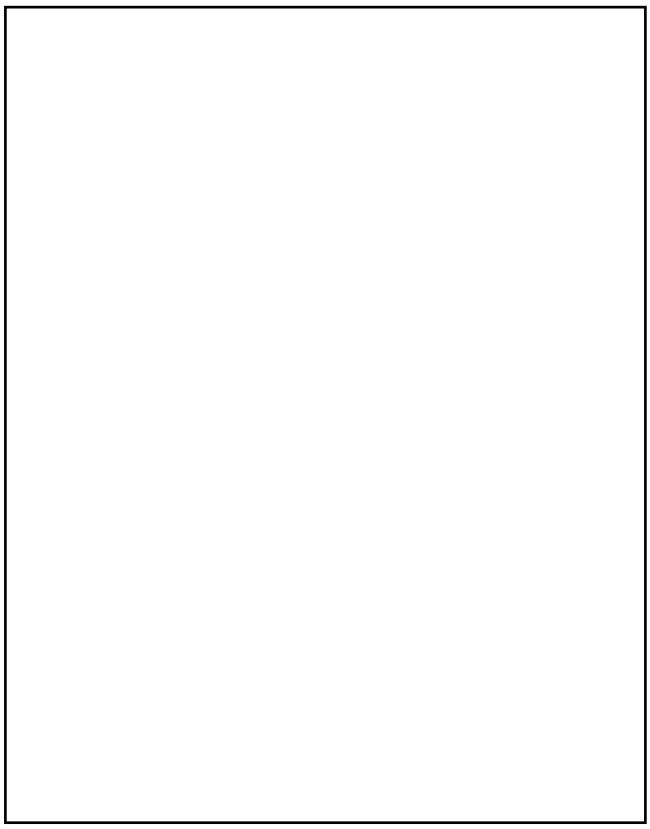

Measuring a male green turtle captured by
Benga fshermen in Gabon (photo by Manjula Tiwari).

SPECIAL FOCUS ISSUE - MARINE TURTLES IN ATLANTIC AFRICA

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Guest Editorial: Proceeding to the Future

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I would like to take this opportunity to respond to several points presented in the Guest Editorial by Peter Pritchard (MTN 115:1-2).

The first clarification regards decision-making related to the Proceedings. The Board, membership, or any other body of the International Sea Turtle Society (ISTS) has never voted to keep or abandon the Proceedings. The production of the Proceedings is entirely at the discretion of each President of the ISTS. This typically includes assigning one or more volunteers the task of compiling the submitted abstracts in to a print-ready document. The compilers do make an effort to "improve the quality and fluency" of the submitted abstracts, but there is no editorial or peer review. Proceedings typically take two or more years to complete following each Symposium. Further, printed distribution of the Proceedings would not be possible without support from the National Marine Fisheries Service in publishing the Proceedings as a NOAA Technical Memorandum. If that support disappears one day, it will cost the Society $10,000-$20,000 to print and distribute the Proceedings.

Additionally, I am not aware of any vote or even suggestion to "cease to publish the Proceedings" by anyone associated with producing them. What has been the topic of ongoing discussions is (1) moving from printed to electronic-only distribution; (2) the ISTS self-publishing a Book of Abstracts instead of a Proceedings; and a range of options in between. These discussions are ongoing and will no doubt continue to evolve. As Dr. Pritchard noted, one thing that has definitely changed is the move from extended to short abstracts, a move in which I have played a personal role. Figures and tables greatly complicate and extend the compilation process. It was hoped that moving to short abstracts would result in a faster turn-around time. This hope has not bourn out as yet. We are still awaiting Proceedings from the Costa Rica (three years ago) and Savannah (two years ago) symposia. I am in no position to point fingers as I personally took nearly three years to produce the Proceedings of the Philadelphia symposium, but hope to improve that track record this year. For the record, a Book of Abstracts was distributed at the Symposium on Crete (2006) and has been freely available for download online since June 2006. Production of Proceedings is still under discussion. A Book of Abstracts was also produced in advance of the 2007 Symposium, and as President I intend to produce a Proceedings, with short abstracts.

Specific points made by Dr. Pritchard that I must take issue with include:

(i): I disagree that the Proceedings include "detailed" and "up-to-date information on all aspects of marine turtle science." By definition, the abstracts (extended or otherwise) submitted for inclusion in the Proceedings lack detail. Also, one would be hard pressed to consider them up-to-date since the Proceedings generally take two or more years to produce. This is as long or longer than the slowest peer-reviewed journals. The sea turtle research and conservation community would be better served sending their extended abstracts out for peer-review. I also take issue with the statement that the Proceedings "constitute the single most important information resource available." I am associated with producing both the Proceedings and the MTN, and I think the MTN comes much closer to fitting that description.

(ii): I find these arguments to be dangerously misguided. How many of you are properly storing your printed copies of the Proceedings so that they last several centuries? Dr. Pritchard admitted that he keeps his on a shelf. I would suggest that it is more likely that you will be leave your printed Proceedings behind or bin them the next time you move. The Proceedings are not printed on acid-free paper, or using archival inks, and only registered participants and a few libraries receive copies, which means there only a few hundred to a thousand printed copies of any given volume in circulation. Meanwhile the NMFS Office of Protected Resources and the ISTS websites[1] host every volume of the Proceedings in electronic PDF[2] format. Tens of thousands of copies of these files, if not more, have been downloaded to computers around the world. Google, Harvard, Oxford, Stanford, the US Library of Congress, to name just a few, are rapidly digitizing the sum of human printed knowledge. It shows a lack of understanding of the modern world to suggest that electronic documents "are suitable only for relatively short-term preservation of information." If the current PDF standard is ever replaced, it is a good bet that a procedure will be developed to convert the countless existing PDF documents into the new format.

(v): I take significant issue with the statement that "publication of the presentations in MTN [sic] would be better than nothing." To my mind publication in the MTN would be far superior. The short turn-around time (measured in months instead of years), an extremely helpful editorial staff, and peer review for all manuscripts submitted to the MTN help make it an excellent alternative. If a high percentage of Symposium presentations are eventually submitted to the MTN I will happily work with the editors to expand both the scope and capacity of the MTN to accommodate the influx. All of this and you get your short abstract in the Proceedings!

(vi): I am not really sure where this argument comes from. No one involved with the Symposium Proceedings has suggested the addition of a peer-review process. What I have been advocating is that abstract authors with important information to share do so outside of the Proceedings. There are a variety of suitable journals and newsletters with peer-review, and popular publications with no peer review. Either option will result in much wider distribution than the Proceedings alone. Proceedings abstracts, extended or short, are not an acceptable alternative to proper publication and have become a crutch for our community. Given that our topic of choice involves protected species, I believe we have a collective obligation to share the results of our work as quickly and reliably as possible.

So what is the take home message? The Symposium Proceedings, in some form or function, are here to stay. If you have important information to share about sea turtles you should do so in a peer-reviewed or other popular publication. The MTN provides a perfect outlet for such outputs. Your information will receive peer-review, you will receive help from the editors if needed, and

your information will be published much more quickly than has historically been the case for Symposium Proceedings. There are a number of other publications that would serve the same purpose, including the Indian Ocean Turtle Newsletter; Herpetological Conservation and Biology; Contemporary Herpetology; Endangered Species Research; etc.…

Finally, while I have your attention I would like to take this opportunity to make a few points of my own.

I feel that scientific knowledge should be free, particularly with regard to protected species. There is a disturbing trend of peer-review journals aggregating in to large publishing houses. This has resulted in individual companies controlling access to large amounts of scientific information, requiring subscription or per article access fees. For example, ScienceDirect (http://www.sciencedirect.com/) charges $20 per article, or substantially more for an institutional subscription. This is fine and good if you are lucky enough to be affliated with an organization that has institutional subscriptions to the major publishers, but what of our colleagues doing important work based in the developing world?

In the end these large publishing houses are businesses trying to make money. Is that really where you want to share your important information, where only academics from wealthy nations have easy access? Fortunately, an increasing number of journals are either launching as or converting to open-access formats. This is made possible by reducing the costs associated with production and distribution of content. New electronic workfows are allowing progressive journals such as the new *Endangered Species Research* (http://www.int-res.com/journals/esr/) to publish submitted manuscripts in unprecedented time. Digital workfows not only speed up the submission, review and publication process, but electronic distribution completely changes the business model by reducing printing and mailing costs. This has also led to a massive increase in the volume of information that is being published. The sooner we accept these changes the sooner we will all realize the potential benefts. If the large publishing houses do not adapt to the changing times I predict that you will see many of their cornerstone titles begin to lose relevance to open-access titles.

This is the 116th issue of the MTN, each of which is freely available and fully searchable online. The MTN website has been accessed more than five million times from 179 countries since its inception in January 1998. And there have been nearly 200,000 PDF file downloads. That said production of the MTN is not without expenses. It will cost almost $8,000 to print and mail 1,500 copies of this issue to recipients around the world. Of those 705 will be shipped to addresses in the United States. Another 213 are shipped to addresses in Australia, Canada, Japan, New Zealand, and Western Europe. That means that fewer than 40% of all printed copies of the MTN are shipped to addresses in the developing world. Production of the MTN costs approximately $32,000 per year. While the sponsors listed on the inside front cover provide a large percentage of the necessary funds, it is not enough. Unfortunately contributions from the readership have been steadily dropping, from a peak of $5,423 in 2003 to only $895 last year.

If you are holding a mailed copy of the MTN and live in one of the countries mentioned above, when was the last time you made a contribution to the MTN? If you are not sure I can look it up for you. If you want to continue receiving printed copies of the MTN, or support distribution to our less fortunate colleagues, then we need to do better.

Readers can find a detailed audio discussion of issues related to the Sea Turtle Symposium Proceedings online at: http://www.seaturtle.org/twist/000525.html

[1]http://www.nmfs.noaa.gov/pr/species/turtles/symposia.htm
http://www.seaturtle.org/ists/Proceedings.php

[2]Portable Document Format (PDF) is a file format created by Adobe Systems in 1993 for desktop publishing use. Each PDF file encapsulates a complete description of a 2D document that includes the text, fonts, images, and 2D vector graphics that compose the document. PDF is an open standard and is now being prepared for submission as an ISO standard. *Source: Wikipedia*

Guest Editorial: The Oldest Place Where There is Always Something New

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Semper aliquid novi Africam adferre
(often quoted as '*Ex Africa semper aliquid novi*')

"Africa always brings something new."
Pliny the Elder 23-79 CE: *Historia Naturalis*

There is so much that is incredible about Africa that there is always something new to be discovered – particularly for those who think of this vast, diverse land mass as just some other place. The second largest of continents, delimiting the south eastern border of the Atlantic Ocean, the western shores of the Indian Ocean, the western side of the Red Sea, and the southern coast of the Mediterranean Sea, the African region also includes major island territories in the eastern Atlantic and the western Indian Ocean. All told, this vast region includes 54 sovereign States, as well as territories administered by four European nations, with a tremendous diversity of cultures, languages, religions, environments, and wildlife. Hence, Africa represents many unique things to specialists in marine turtles.

The history of marine turtles in Africa is exceptional: the oldest known evidence of human-turtle interactions comes from this continent. Eight marine turtle bones were identi f ed from excavations at Sibudu Cave, KwaZulu, South Africa, and dated from the Middle Stone Age, estimated to be between 49,000 and 50,000 BP (Plug 2004; *in litt*. 5 March 2007). The oldest know artifacts of tortoise-shell, from the Badarian and Naquada II Periods, about 5,200 to 6,000 years ago, were found as grave goods in Egypt (Andrews 1981; Needler 1984). Queen Hatsheput's expedition to Punt is thought to have brought tortoise-shell back to Egypt nearly 3,500 years ago (Hourani 1995), so the trade and use of this commodity, at least in some parts of Africa, dates back to ancient times.

The account of Agatharchides of Cnidus from the third century BCE includes descriptions of enormous turtles being caught, pulled onto shore, cooked in the sun, and used in diverse ways by "turtle eaters" (*Chelonophagi*), a primitive group of people who lived on islands, apparently in the southern extreme of the Red Sea (Burstein 1989). An enigmatic manuscript from the time of Christ known as the *Periplus Maris Erythraei* gives detailed instructions on trading in Africa and elsewhere in the Indian Ocean, and tortoise-shell is the most frequently mentioned commodity (Mathew 1975; Casson 1989). During ancient times, traders and explorers from Egypt, Arabia, and China sought the coasts of East Africa in search of various goods, notably tortoise-shell that was highly valued and traded in a well-developed and wide-ranging network (Al-Mas'udi in Freeman-Grenville 1962; Trimingham 1975; Wheatley 1975). So important were marine turtles to regional trade that these reptiles, and particularly their shell, may have been essential exchange items for societies in the Comoro Islands more than 1,000 years ago to obtain imported ceramics (Wright 1984).

Today we know that f ve species of marine turtles nest in the African region, which provides globally and regionally important nesting beaches for four of these reptiles. One of the largest nesting aggregations of *Dermochelys coriacea* in the world was recently discovered in Gabon (Fretey & Giradin 1988). Island States in the western Indian Ocean, Reunion and Seychelles in particular, have some of the world's largest nesting aggregations of *Chelonia mydas*, namely on Europa and Tromelin islands and Aldabra Atoll; and the large nesting aggregations on Ascension Island and Guinea Bissau are of great regional importance (Seminoff 2004). The nesting of *Eretmochelys imbricata* in the granitic Seychelles is also of global importance (Meylan and Donnelly 1999). Large nesting aggregations of *Caretta caretta* on Cape Verde are important for the East Atlantic (Fretey 2001). Rapid surveys in eastern Libya found nesting by this species in numbers that are relatively large for the Mediterranean (Laurent et al. 1997), and although there is no accurate estimate for this area (Venizelos et al. 2005), it seems that the Libyan coast may host important nesting beaches for this species in the Mediterranean Sea (Hamza *in litt.* 8 March 2007; Margaritoulis *in litt.* 9,10 March 2007).

Both *C. caretta* and *D. coriacea* from eastern South Africa can cross into the Atlantic (e.g., Luschi et al. 2006). In addition, there are two lines of genetic evidence for movement of *C. mydas* between Indian and Atlantic Oceans: DNA sequence variants, or haplotypes, typical of Indian Ocean rookeries are also found in foraging turtles in the eastern Atlantic (Formia 2002), and haplotypes typical of Atlantic rookeries are also found in turtles from Indian Ocean rookeries (Bourjea et al. 2007). Hence, although the African continent separates the Atlantic and Indian Oceans, some turtles seem to be able to move freely around its southern tip, traversing from one ocean to another.

To this list of notable prehistoric, historic, and biological attributes must be added other critical aspects relevant to understanding marine turtle populations and the integration of society with research and conservation initiatives. One of the challenges with marine turtle research – world wide – is being able to understand the tremendous variations that occur from year to year, season to season, and place to place. Long-term monitoring provides a unique means for evaluating the status and trends of the populations of these slow-maturing, long-lived, complex reptiles. Remarkably, the longest monitoring programs for *C. caretta* and *D. coriacea* – anywhere – are still active after more than four decades in Kwa-Zulu, South Africa (Hughes 1996; *in litt.* 12 March 2007). Also of global importance are the monitoring programs carried out on several islands in the Seychelles. Of note is the monitoring of *E. imbricata* on Cousin Island, Seychelles, that has been going on since 1970 (Mortimer and Bresson 1999); surveys of *C. mydas* nesting on Aldabra Atoll were begun in the late 1960s, and there has been continual monitoring on the Atoll – if with varying intensity – since the end of 1980 (Mortimer et al. 2006).

The integration of community-based conservation and community development with research and conservation initiatives is essential for effective work with marine turtles (Frazier 2005), and this approach is actively pursued in several African countries. On the

Atlantic coast there are many emerging projects that directly involve communities, such as in Cameroon, Sao Tomé & Principé (Fretey 2004), and Benin (Dossou-Bodjrenou et al. 2003; 2005). On the Indian Ocean coasts there are well-developed community-based projects in countries such as Kenya (Okemwa et al. 2004; Zanre 2005; Nuzuki 2006) and Tanzania (Muir 2004; Muir and Abdallah 2006). Especially encouraging is the work going on in French-speaking islands of the western Indian Ocean, where professionally trained social scientists are working with coastal communities as central components of turtle conservation programs. The detailed ethnographic studies of Lilette (2002; 2006) will strengthen the development of integrated conservation and development activities in western Madagascar and Comores; and these should help set the scene for similar work throughout the region and globally.

At the other end of the political scale are international negotiations and instruments. The first multilateral environmental agreement to come into effect that is focused specifically on marine turtles is the Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa, and all but one African State on the Atlantic coast (South Africa) is signatory to this MoU. On the other side of the continent, more than half of the States on the eastern coast of Africa are signatories to the sister agreement, the Memorandum of Understanding on the Conservation and Management of Marine Turtles and Their Habitats of the Indian Ocean and South-East Asia (IOSEA) – the most active and advanced of the international instruments focused on marine turtles.

Clearly, there is a growing need to compile and synthesize the diverse and burgeoning information on marine turtles in Africa. After two monographic works on western Africa (UNEP/CMS 2000; Fretey 2001), an important step was taken four years ago in the Marine Turtle Newsletter (Formia et al. 2003), and this special issue of the MTN – dedicated completely to Africa – is a much-needed advance, thanks to the forethought and efforts of MTN editors Matthew Godfrey and Lisa Campbell, and the invited guest editors Manjula Tiwari, Angela Formia, Sue Ranger, and Jacques Fretey. Papers in this special issue include not only new and interesting information, but some intriguing approaches to the study and conservation of marine turtles that have immediate relevance to other parts of the world.

As expected, there are many and diverse threats to marine turtles in this vast region. Intense exploitation of eggs and turtles is widespread, as is bycatch in various fisheries. In Cote d'Ivoire – which may be typical of much of the western coast of Africa – several nesting beaches have nearly 100% egg take, with intense exploitation on nesting females; and not surprisingly, local residents report a decline in nesting numbers. There are diverse initiatives at public education and building awareness for the need to conserve marine turtles, and most prominent are those that include community development projects, particularly by engaging former turtle hunters as well as other community members in alternative livelihood activities. Help with community shops and the commercialization of copra have been especially effective at encouraging collaboration in turtle conservation (Gómez Peñate et al. 2007).

Bal and collaborators (2007) explain the value of having a full-time presence on nesting beaches in order to reduce intense, uncontrolled egg take and killing of nesting females in the Republic of Congo. They also describe an innovative project in which artisanal fishermen were encouraged to release accidentally captured turtles, and in turn provided with materials to mend their nets. Even though the fishermen received no compensation for lost fishing time, the project resulted in the release of more than 1,300 turtles during the first year. Nonetheless, there are still enormous problems from mechanized trawlers, and particularly fishing activities conducted by Asian companies in this and other countries in western Africa.

Interviews, surveys, and direct observations with fishermen from Benin, Ghana, and Togo confirmed the importance of incidental capture of marine turtles in various types of fishing nets. While there is thought to be no directed take, turtles that are incidentally caught are commonly killed, either by drowning or purposeful slaughter by fishermen who make use of the catch for meat, oil, and shell as other marine resources decline in abundance (Dossa et al. 2007). Elsewhere in western Africa large numbers of turtles are known to strand on vast beaches, for example in southern Gabon and northern Congo. Interactions with fisheries are thought to be a major source of mortality, and cadavers of *Lepidochelys olivacea* have been most common, but *D. coriacea* and *C. mydas* are also recorded (Parnell et al. 2007).

The problem of light pollution and disorientation of turtles is given a new twist with the paper by Deem and collaborators (2007), who studied *D. coriacea* on the world famous Pongara nesting beach, Gabon. Not only are countless thousands of hatchlings disoriented, heading inland from the beach toward artificial lights of the fast-growing resort area at Pointe Denis, some 11 km south of Libreville, but between 2% and 56% of the females nesting on any night may be disoriented and head inland, rather than down the beach to the sea. The immediate effects of light pollution are addressed with all-night guardians who lure post-nesting females to the sea with lights, and a long-term solution is being sought to reduce or eliminate the light disturbance.

Weir (2007) provides a useful account on the issue of seismic airguns and what effect they might have on marine turtles. While her study is focused on the waters of Angola, the information is both globally relevant and timely, for this technology is becoming more common in oil exploration, and there is very little documented about its impacts on marine wildlife, particularly turtles. Given the world situation regarding oil supplies and resources, and especially the increased activity in offshore oil exploration, there have been recurrent concerns about the impacts that these activities may have on marine turtles. It is clear from Weir's study that there is an enormous lack of basic information on the effects of oil exploration on marine turtles, and she provides useful suggestions for future work on this issue. In this context it is important to point out that oil exploration and exploitation has increased dramatically over the past decade in the Gulf of Guinea and as new reserves are discovered in places like Equatorial Guinea, São Tomé and Gabon, there will be ever increasing threats to areas used by marine turtles for nesting, foraging, and migrating.

External tumors may occur on nearly a fifth of the *C. mydas* captured in Corisco Bay, an important feeding ground on the border between Equatorial Guinea and Gabon. Histopathological analysis of tumors from one juvenile confirmed fibropapilomatosis for the first time in western Africa, a disease known to present a serious health problem to *C. mydas* in other parts of the world (Formia et al. 2007).

Fretey and colleagues (2007) provide additional information on the use of marine turtles and their parts in "pharmacopeias" of

western Africa. They list an intriguing variety of turtle parts that are employed, including eggs, meat, heart, liver, penis, oil, blood, skulls, powdered skulls, carapaces, bones, and claws. A remarkable diversity of remedies and beliefs are described, involving uses as cures for diverse ailments, aphrodisiacs, charms and even taboos. In some ethnic groups, marine turtles are to be avoided or even revered and protected. For example, the Adan of Ghana worship marine turtles, and routinely release these animals if caught. The article clearly shows the cultural importance of marine turtles in this vast, diverse geographic region, and emphasizes the need for turtle biologists and conservationists to be well informed about, and sensitive to, local cultures. This message is of critical importance – throughout Africa, and elsewhere.

Information on long distance movements and migrations through tag returns shows that turtles can disperse widely along the Atlantic coast of Africa, and moreover that some individuals in western Africa also live in eastern South America. Not only does *D. coriacea* live on both sides of the south Atlantic and migrate between the southeastern and the southwestern Atlantic (Billes et al. 2006), but these turtles also disperse down the western coast of Africa from the equator to as far as South Africa (Fretey et al., 2007).

No less remarkable are records of *E. imbricata* tagged in Brazil being recaptured off the coast of western Africa. The third case of transatlantic hawksbill migration is also the second record of this species moving from Fernando de Noronha, Brazil, to Corisco Bay (Grossman et al. 2007). Tagged as a juvenile, the female moved more than 4,600 km point-to-point, between release and recapture sites, and this record underscores the fact that various species of marine turtles – including hawksbills – can cross ocean basins. Despite initial impressions, the leatherback and the hawksbill turtles reported in this special issue were not Gabonese or Brazilian; they – like most other marine turtles – were international animals, common property, involving the rights and responsibilities of many societies and governments around the world (Frazier 2004).

The selection of diverse studies in this special issue of the MTN, from the Atlantic and Indian Ocean coasts of Africa shows that there have been recent advances in numerous directions regarding marine turtles. Yet, there is much to do, not only focused on the turtles, but especially on critical activities such as commercial and artisanal fishing, coastal development, and marine and land-based pollution. Moreover, the most complex, but fundamental dilemmas that ultimately impact the status of marine turtles and their habitats over this vast area are questions of governance, security, civil rights, and poverty. Remarkably, work focused on marine turtle research and conservation in Africa is helping to understand and alleviate these immense social problems, and lead the way regionally and globally in the integration of conservation with community development and other human rights issues. Indeed, there will always be something new in Africa!

Acknowledgements: Countless people from many walks of life, from scores of countries, have dedicated enormous efforts to understand and conserve marine turtles and their habitats across the vast African region; A. Formia, D. Margaritoulis & M. Tiwari made useful comments on earlier drafts.

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An Update on Marine Turtles in Côte d'Ivoire, West Africa

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Côte d'Ivoire hosts important sea turtle populations, threatened by human exploitation and habitat disturbances, (Fretey 2001, Formia 2002) however, relatively limited information is available on their abundance, distribution and status. In this paper, we describe the sea turtle monitoring and conservation work undertaken by the local NGO SOS- Forêts since 2001, which included preliminary surveys in 2001-2002 and a more detailed community-based conservation project between 2004 and 2006.

2001-2002. Initial surveys were carried out between February 2001 and February 2002 along the southwestern coast, aimed at providing a preliminary description of the sea turtle populations in the region. Project objectives included: identification of the nesting beaches, the species frequenting the Ivorian coast, the nesting seasons and the feeding areas of adults and juveniles; biological data collection, including carapace measurements, general condition and reproductive data of each species; identification and evaluation of threats; and raising of public awareness on the endangered status of sea turtles in Côte d'Ivoire. Survey methodology consisted of beach surveys on foot, observations of nesting evidence (tracks, nests, depredated nest sites), interviews with local inhabitants to ascertain species occurrence, status and seasonality, and examination of any discarded carapaces or live individuals encountered.

A total of 250 km of beach was surveyed along the southwestern coast, from Fresco (5°06' N 5°35' W) to Bliéron (4°22' N, 7°31' W) (Figure 1) and sea turtles were found to nest at many locations throughout this stretch of coastline. Survey results showed that the most common nesting species at this site are the leatherback (*Dermochelys coriacea)* and olive ridley *(Lepidochelys olivacea),* whereas green turtle (*Chelonia mydas)* nesting is sporadic. The area of highest nest density was a 90 km stretch from Taki (4°42' N, 6°43' W) to Bliéron, where three nesting beaches were selected for monitoring between November 2001 and February 2002: Mani (4°32' N, 7°01' W), Pitiké (4°31' N, 7°10' W) and Soublaké beaches (4°22' N, 7°27' W) (Table 1). All the other beaches between Taki and Bliéron are thought to host approximately similar nesting numbers, based on anecdotal information. The nesting season extends from October to February, with a peak in November for olive ridleys and green turtles, and in January for leatherbacks. No flipper tags were placed or detected. However, several leatherbacks were observed with possible tag scars, suggesting migration from other nesting sites. Immatures of green turtles and hawksbills (*Eretmochelys imbricata)* are thought to occur in near-shore rocky areas throughout the year, and are frequently observed for sale in local ports. One juvenile olive ridley was also captured near-shore.

The main threat identified at these nesting sites was extensive capture of adults and collection of eggs of all species. Interviewees admitted that the turtle population was considerably larger in the past. Egg poaching is widespread all along the coast, often approaching 100% of eggs laid. Three leatherback or four olive ridley eggs can be sold for $0.09. Sixteen nests were protected *in situ* during the study period (hatching data presented elsewhere). Slaughter of sea turtles is also frequent, as shown in Table 1, suggesting that many hundreds are killed each year in Côte d'Ivoire. The price for a leatherback is $25 and for an olive ridley it is $7. Incidental catch in fishing nets of immature greens and hawkbills and of adult leatherbacks and olive ridleys is common. During 4 months of observations, 18 turtles were slaughtered in the Grand Bérébyfishing market: 10 leatherbacks, 5 olive ridleys, 3 green turtles. Legislation prohibiting hunting and poaching is not respected and enforcement by water and forestry agents is virtually absent.

In an attempt to increase public awareness of sea turtle conservation issues, meetings were held with local villagers, the relevant local governors and authorities, as well as hotel-owners. In addition, nine poachers were hired to cooperate in data collection. Three bioscience teachers and two local students were trained in biology, ecology and marine turtle conservation. A film and brochures about the marine turtles of Côte d'Ivoire were produced and distributed.

The recommendations of this first project highlighted the need to support the development of alternative economic activities and involve local communities in the conservation of marine turtles. Improving our knowledge of the biology and ecology of sea turtles in Côte d'Ivoire, including distribution, feeding areas, nesting beaches and migratory routes, was also deemed a priority. Promoting information exchange and cooperation among the countries hosting the same turtle populations are essential. We also recommended the mitigation of human-induced threats, including a reduction of turtle mortality and protection of nests.

	Leatherback		Olive ridley		Green Turtle		TOTAL		Nests/km
	Nests	Killed	Nests	Killed	Nests	Killed	Nests	Killed	
Mani (5 km)	27	9	32	16	2	2	61	27	12
Pitiké (14 km)	121	40	72	24	2	2	195	66	14
Soublaké (8 km)	41	22	50	19	0	0	91	41	11
TOTAL	189	71	154	59	4	4	347	134	

Table 1. Leatherback, olive ridley, and green turtle nests, as well as slaughtered nesting females recorded in Mani, Pitiké, and Soublaké beaches during the 2001-2002 nesting season (non-exhaustive surveys).

Figure 1. Cote d'Ivoire and project sites.

2004-2006. As a consequence of these recommendations, the conservation project of 2004-2006 in the communities of Noumouzou (Jacqueville) and Braffédon (Grand Lahou) (Fig. 1; project sites selected for logistical reasons), placed special emphasis on the development of activities able to generate alternative sources of income for local populations, while at the same time implementing conservation initiatives on the ground (protection of nesting females through beach patrols, establishment of hatcheries, etc.). Two village committees were created for sea turtle conservation composed of ex-poachers, charged with organising beach surveillance and monitoring, as well as daily management of alternative income-generating activities, including two community shops, and the commercialisation of coconuts.

Nest monitoring and protection were similar to those carried out in 2001-2002, with the difference that a fund was created to sustain monitoring activities. In fact, the yearly interests generated by a bank savings account were used to fund turtle patrol expenses, managed by a local board presided by SOS-Forêts. Monitoring consisted of daily/nightly patrols to protect nesting females and eggs and to gather data on number of fresh tracks, species nesting, nest distribution, evidence of poaching and predation (data not presented here). Three hatcheries were built and used to relocate threatened nests, thus ensuring increased hatching success and hatchling survival. The savings fund was in part used to purchase sea turtle nests in need of protection.

The two sea turtle committees installed community shops in the villages of Noumouzou and Braffédon, built with local materials on land donated by each of the two villages. The villages are relatively remote, and have difficulty accessing basic products such as petrol, rice, soap, matches and sugar, all items sold at the community shops. In addition to raising awareness on sea turtle conservation, the community shops generate profits used to provide income to the members of the local protection committee and to support beach monitoring and protection efforts. Previous experience has shown that other income-generators such as small livestock farming are not as successful as the village shops.

Additional initiatives of this project included: building a small hut in Djatéket to host tourists and visitors, training three students of the Biology Faculty of the University of Abidjan who were able to obtain diplomas through their research on sea turtles (Bamba 2002, Karamoko 2002, Djadji 2004). Finally, a coprah (coconut) marketing activity was started in Djatéket by the local sea turtle protection committee. The trade in coprah represents the main economic activity in the region, on which depends the quality of life of the local population. Thanks to this commerce, people can feed and care for their families, send their children to school, etc. Almost everyone in the region owns a coconut plantation, so the benefits of the trade in coprah are extended to a wide number of people.

We believe the outcome of our efforts has been positive, and strongly underscore the value of actively involving the local people in conservation activities. Although people were not initially interested in participating, we found that, when the local sea turtle committees were able to mobilise resources and install community shops, dedicated sea turtle protection was a direct consequence. When neighboring villages heard that the shops were made possible through the sea turtle project, they also decided to protect their marine turtles. Thus, the community shops were highly successful as a source of income for the protection committees and helped to raise awareness and acceptance of the sea turtle projects. These criteria are essential to attain project sustainability.

Hence, for a project to be successful in Cote d'Ivoire, it must take into account the role of the community. People who do not directly benefit from the project, such as traditional local authorities, should also be integrated and made aware of project activities. Finally, project services and benefits should extend to the entire community where they are implemented, and provide a long-term sustainable source of income, beyond the end of the project, and which does not rely on exploitation of non-renewable natural resources.

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An Update on Sea Turtle Conservation Activities in the Republic of Congo

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The coastline of the Republic of Congo extends over 170 km, of which approximately 60 km is included within the Conkouati-Douli National Park (CDNP; Fig. 1). Congolese law does not specifically protect sea turtles. Nevertheless, marine turtles benefit from existing laws that prohibit hunting of wildlife and collection of their products such as eggs between 1 November and 31 April annually, as well as the Park Decree N99-136[bis] that protects the integrity of flora and fauna in the CDNP. In this paper we summarize the nesting activity and various threats (exploitation of turtles and eggs, fisheries bycatch, and pollution) along the Congolese coast during the 2005-06 nesting season.

Nesting Activity. Nesting by leatherbacks *(Dermochelys coriacea)*, olive ridleys (*Lepidochelys olivacea)* and to a lesser extent green turtles (*Chelonia mydas)* takes place annually from September to April. The greatest nesting concentration is found inside the CDNP at the border with Gabon in the north, with 220 leatherback and 118 olive ridley emergences recorded on 10 km of beach in 2005-06. During the 2005-06 nesting season, a total of 402 leatherback and 302 olive ridley nests were recorded on 37 km of patrolled beach inside the CDNP (Bitsindou 2006). Beaches located at the southern end of the Park, especially south of the town of Pointe-Noire, are also nesting areas of interest for these species (Bal & Bréheret 2004, 2005, 2006, Fig.1), although no quantitative data are available.

Threats. At the beginning of the 2004-05 and 2005-06 nesting seasons, many strandings of primarily olive ridleys were observed along the Congolese coast. In October 2005, these strandings were concentrated in the north, near the mouth of the Kouilou River (Fig. 1). During one survey 53 strandings were counted on a 3-km stretch (Bal & Bréheret 2006). No obvious causes of mortality were found on any of the individuals, although death could have been caused by the use of explosives, poisonous substances, or pollution. Some threats remain unknown, but the well-known ones are notably exploitation of turtles and their eggs, accidental capture in fishing nets, and pollution. Each of these is discussed in greater detail below.

Exploitation of turtles and eggs. In areas that are not permanently monitored, almost all the nests are collected and every turtle encountered is killed for consumption. To limit this harvest each nesting season, two NGOs set up teams to study and protect sea turtles and their eggs: the Wildlife Conservation Society (WCS) in partnership with the Congolese Ministère de l'Economie Forestière et de l'Environnement (MEFE) inside the CDNP and Rénatura Congo in areas outside the CDNP. The presence of these organizations on the beach as well as important educational and outreach work has produced good results. During the 2005-06 nesting season, exploitation in the areas monitored by Rénatura was 8.2% (Bal & Bréheret 2006) and less than 2% (3 leatherback nests and 10 olive ridley nests out of 712 nests) in the CDNP area where surveillance during the nesting season is intense (Bitsindou 2006).

Fisheries bycatch. Accidental captures in fishing nets represent an important threat to females during the nesting season. These captures take place in trawler nets, artisanal gillnets, or beach seines.

To address the problem, Rénatura established and launched a turtle release program on 17 September 2005, to encourage artisanal fishermen to release accidentally captured turtles. The success of this program led to the adoption of the release program in the CDNP shortly thereafter. As part of this program, fishermen who wish to release a turtle from their nets call the NGOs or report the capture to one of two agents who make daily visits to sites where captures are most numerous. Turtles are released in coastal waters or, in the case of large turtles that cannot be brought aboard the fishing vessel (e.g., leatherbacks), released at sea. Fishermen are provided materials to repair damaged nets, although repair work is left entirely to the fishermen with no compensation given for lost fishing days. Within one year of implementing this program, 1,326 turtles were released by Rénatura agents, primarily in the Bay of Loango (Fig.1). Curved carapace length (CCL) measurements were recorded whenever possible. Of these captures, 48 % (n = 632) were green turtles (mean CCL = 59.1 cm, range = 8 – 130 cm; SD = 10.0, n = 631); 32 % (n = 431) olive ridleys (mean CCL = 65.9 cm, range = 24 – 81 cm; SD = 8.2, n = 429); 13 % (n = 168) hawksbills, *Eretmochelys imbricata*, (mean CCL = 58.6 cm, range = 31.5 – 77 cm; SD = 9.0, n = 167); and 7% (n = 92) leatherbacks (mean CCL = 134.3 cm, range = 89 – 180.3 cm; SD = 20.2, n = 50). Three turtles that were released could not be identified, but color and description suggest that they may have been loggerheads, *Caretta caretta* (Ball & Bréheret 2006).

Given the success of the program initiated outside the Park by Rénatura, WCS implemented the turtle release program in the CDNP with local fishermen along 37 km of their monitored beach. The number of turtles captured in and released from artisanal nets is much lower (less than 20) in the CDNP than the Bay of Loango, largely because fishing inside the Park is much less intense than outside the Park. The Bay of Loango could also possibly be an important foraging and mating habitat. More detailed studies and comparison of project duration and effort are required to reach any conclusions about the difference in the number of captures recorded at the two sites.

This release program does not evaluate capture by commercial trawlers, which should be theoretically fishing beyond 6 nautical miles of the coastline and outside the artisanal fishing zone. Nevertheless, many trawlers are observed to trespass almost daily in the artisanal zone illegally. Some smaller trawlers carry a letter from the Ministry for Fisheries declaring that the boat is a simple improved dugout, thereby legalizing their presence in the zone. These trawlers drag several kilometers of nets in the artisanal fishing zone and utilize fishing methods that include the use of explosives, poisons, etc. Asian industrial fishing companies are sadly most notorious for illegal exploitation in the artisanal fishing zones.

The real impact of these commercial fisheries on sea turtle populations is difficult to evaluate and requires a thorough study.

The CDNP has recently acquired a surveillance boat, making it possible to push back the known trawlers from the protected zone. This very expensive, fuel-consuming technique is very effcient for the protection of CDNP waters but in the event of a technical breakdown of the surveillance boat, the trawlers return immediately to the waters of the CDNP. Additionally, chasing trawlers out of the CDNP waters unfortunately tends to increase trawler presence in the coastal zones outside the Park.

Pollution. The marine and coastal environment is polluted by various industrial chemicals. A recent study detected the presence 27 types of polychlorinated biphenyls (PCBs) and 5 types of polyclinic aromatic hydrocarbons (PAHs) in Congolese beaches (N'Damité 2006). The relationship between the presence of these products on the beaches and hatching success has not yet been addressed. However, the presence of these products in the coastal waters may explain the regular observation of green turtles with tumors and other growths.

Conclusion. The activities implemented by Rénatura and the WCS/ MEFE to reduce the impact of coastal inhabitants and local fshermen have shown satisfactory results. However, these results could be improved and supported by instating decrees that provide complete protection to sea turtles in the country and further reinforcements that prohibit commercial trawlers from accessing artisanal fshing zones.

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Figure 1. Map of the Republic of Congo indicating the limits of the Conkouati-Douli National Park and the nesting beaches surveyed by Rénatura. Thicker bars represent areas with full-time monitoring, thinner bars represent areas with partial monitoring. Map created using Maptool (SEATURTLE.ORG, Inc. http://www.seaturtle.org/maptool/).

Conflicts and Social Dilemmas Associated with the Incidental Capture of Marine Turtles by Artisanal Fishers in Benin

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Along the coast of West Africa, marine turtles are threatened by the large number of industrial and artisanal maritime fsheries. Despite the fact that all species of marine turtle that occur in West Africa waters are classifed as endangered by the IUCN, little work has focused on the threats from fshing gear. In Benin, we developed a research program to look at the problem of incidental capture of marine turtles in coastal fsheries. Specifcally, we sought to: a) identify which species and which kinds of fshing gear often interact; b) investigate the relationship between turtles and fshers; and c) develop potential solutions to the conflict between marine turtles and fshers. We conducted our work in 21 different fshing villages in three coastal sections (Grand-Popo, Agoué and Avloh) that are part of the Grand-Popo Commune of the Mono *département* in the southwest of Benin. The entire area covers 289 km^2 and has a density of 140 inhabitants per km^2.

We used semi-structured individual interviews based on a pre-

determined questionnaire to gather various types of information such as types of fishing gear used in the area, seasonality of use, methods of deployment, and incidental capture of marine turtles in fishing gear. In total, we interviewed 167 maritime fishers, including 24 from Benin, 2 from Togo, and 141 from Ghana. These interviewees were selected randomly from the 21 villages of our study. The interviews were anonymous to ensure that information provided by the fishers would not be used later in law enforcement activities. To effectively gauge the impact of different fisheries on marine turtles, we conducted daily observations of different types of fisheries from November 2004 to February 2005, as they brought their gear and catch back to the villages. In total, we observed 21 groups of fishers at the end of 705 different fishing sets, and noted any captured turtles, both live and dead. The five primary types of fishing gear used were gillnets (*tounga*), shark nets (*gbowlédo*), purse seine nets (*watcha/ouitchi*), beach seine nets (*aguénin /yovodo*), and hook and line. Gillnets, and seine nets were the most commonly used type of gear (Table 1). Gillnets (*tounga)* can be broken down further into subcategories as follows: *agbla* (large mesh gillnets with 40cm stretch mesh), *toungavi* (medium mesh gillnets with 32cm stretch mesh) and *sovi* (small mesh gillnets with 23cm stretch mesh).

During the three months of our observations, we recorded 36 marine turtles incidentally captured and brought to the villages (Table 1), with an overall 5.1% capture rate of the sets. The greatest bycatch was observed in the shark nets (*gbowélédo*), followed by gillnets (*tounga* and *agbla*) There were one observed capture of turtle by hook and line fishers during our observations. The mortality rate was greatest in shark nets (86.2% were dead when observed) while no mortalities were observed in the gillnets. The most commonly captured (91.7%) species was the olive ridley, *Lepidochelys olivacea*. The other two captured species were green turtles, *Chelonia mydas*, (5.6%) and leatherbacks, *Dermochelys coriacea* (2.8%). In addition, we recorded 53 carapaces of olive ridleys, green turtles and hawksbills (*Eretmochelys imbricata*) in fisher villages and also river villages (Fig. 1). This suggests that hawksbills are also incidentally captured, although more rarely than the other species or perhaps at different times of year. It also provides strong evidence that hawksbills do occur in the waters of Benin.

All 36 turtles incidentally captured during our observations were brought back to the fisher villages. We asked fishers to describe what the turtles would be used for. The majority (48%) reported that turtle oil was primary use for the captured turtles. Forty-one percent reported that turtle oil and meat were the primary uses, while 11% stated that only meat of the turtles was to be used. The importance of turtle oil in Grand-Popo is not a surprise, given the variety of uses for the oil in coastal communities, including medicinal uses (see Fretey et al. this issue). Other common products of incidentally capture turtles include meat and shell. The fishers profit from an incidentally captured turtle by using its oil, meat and other products. At the same time, fishing gear is usually damaged when a turtle is incidentally captured. Hence, fishers wish to avoid turtles but when faced with one in their nets, they will try to minimize the negative impacts associated with the capture, either by cutting the turtle out of the net or keeping the turtle for later use.

The information provided by the fishers strongly support the idea that incidental captures in different gear constitute a major threat to marine turtle species in Benin. Although incidentally captured turtles often end up being used by fishers to eat or to sell, we are confident that there is no active turtle fishery per se. This is largely because the fishers do not use gear designed to specifically capture turtles. The large-mesh gillnets commonly used in some Caribbean islands to capture turtles (Fretey 2001) are not in use along the coast of Grand-Popo. In contrast, there are some highly specialized sea turtle fisheries elsewhere in Western Africa. For instance, in the Bay of Corisco, some fishers actively hunt adult green turtles on seagrass pastures using harpoons (Formia 1999; Dossa 2005). In Cameroon, some younger villagers have invented a new technique of using submarine rifes to hunt juvenile hawksbills on coral reefs (Fretey 2001). Nevertheless, as target species of fish and crustaceans become more rare in Benin waters, the pressure to profit from incidentally captured turtles may increase.

The lack of organized fisheries targeting marine turtles in Benin suggests that raising awareness of the conservation status of marine turtles may help condition coastal fishers to actively protect these species while fishing. Of course, the inherent dilemma between the long term conservation needs of marine turtles and short term economic needs of coastal communities makes it challenging to come up with effective means to both preserve turtles and maintain livelihoods. A successful conservation plan should move beyond the simple declaration that fishers play a role in the in incidental capture of marine turtles; indeed, fishers should play an active role in the development of conservation plans and activities. Of course, it is important to remember that "fishers" is not a homogenous group whose members can be expected to want the same things. For instance, in a sea turtle management case from North Carolina, USA, local fishers express interest in enacting changes in fisheries management to reduce bycatch of sea turtles (Santoro 2003). However, in that case individual fishers were more likely to recommend changes to fisheries other than those that they were involved in, rather than recommend self-regulatory measures.

	Fishing gear				
	Gbowélédo Shark nets	*Tounga* Gillnets	*Agbla* Gillnets	*Watcha* Purse seines	Total
Fishing groups	6	10	3	2	21
Fishing sets completed	128	381	113	83	705
% turtles captured	80.6%	13.9%	5.56%	N/A*	100%

*Seine fishers were largely migrant and thus it was difficult to effectively monitor these fisheries throughout the study period.

Table 1. Frequency of fishing gear type used by artisanal fishers and sea turtle interactions in Grand-Popo, Benin

Nevertheless, fishers comprise an important stakeholder in marine conservation. The current conflict in Benin highlights a common dilemma in marine biodiversity conservation: how to meet the needs of both coastal human inhabitants and protected marine species.

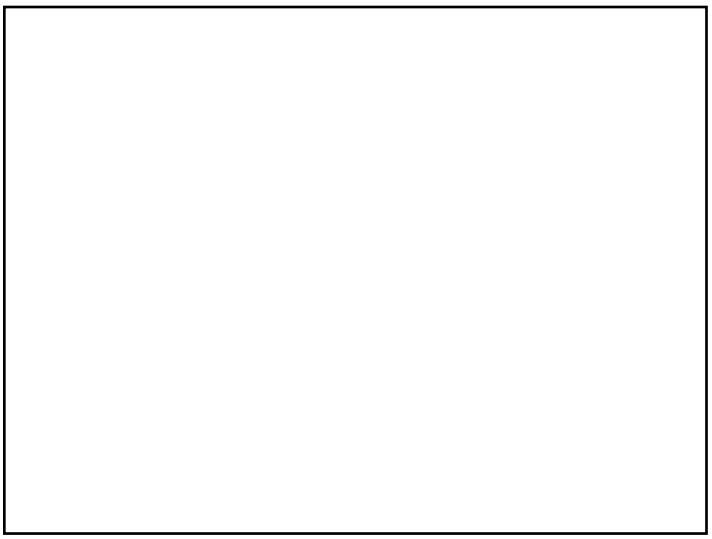

Figure 1. Carapaces of olive ridley, green and hawksbill turtles observed in fishing and river villages in Grand-Popo, Benin. Note carapace of small juvenile hawksbill at the front of the photo.

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Marine Turtle Mortality in Southern Gabon and Northern Congo

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Marine turtle research in Central Africa is relatively new. Only since the mid-nineties has there been a regular research presence on nesting beaches. However, data collected in the intervening years demonstrate the importance of this region for sea turtles, particularly the beaches of Gabon and Congo for nesting leatherbacks (*Dermochelys coriacea)* and olive ridleys (*Lepidochelys olivacea*) (Fretey & Girardin 1988; Fretey 2001). The principal nesting season for olive ridley turtles in the region is October to March (peak in October), and for leatherbacks is November to April (peak in December and January). Monitoring methodologies have varied somewhat, but are characterized by night patrols to measure and tag nesting females, and day patrols to count total nesting and non-nesting crawls. All occurrences of dead turtles on the beaches are recorded. Aerial surveys of beaches have also been used to assess nesting distribution and relative abundance along the Gabonese coastline (Sounguet *et al.* in press).

We present data collected from dead sea turtles discovered on the beaches of southern Gabon and northern Congo during daylight foot and ATV beach patrols in 2005 and 2006. Dead turtles were recorded in both years, particularly olive ridley turtle carcasses. While the cause of death could not be determined with certainty in most cases due to decomposition, of those turtles examined by a veterinarian (n=17), 18% appeared to have sustained trauma of a potentially anthropogenic origin. We suggest that the most likely source of such trauma is interactions with fishing vessels and/or gears.

2005. During September and October 2005, 98 dead turtles were encountered in 145 km of beach from Loango National Park (LNP), the beach between Sette Cama and the town of Gamba, Mayumba NP in Gabon, and Conkouati NP in northern Congo (Table 1 and Figure 1). No dead turtles were reported from Pongara NP in the north of Gabon where an allied research team was operating, using similar methods.

The highest densities of dead turtles were found in Conkouati NP, St. Catherine, and Mayumba NP. Olive ridley turtles were by far the most frequently encountered species, and in Mayumba NP, 55 individuals were discovered during a single patrol in mid-October. No trained veterinary staff was available at this time, so a detailed evaluation of the cause of death could not be undertaken. However, of the two turtles discovered in the Loango South patrol, one had evidence of a puncture wound through the plastron. The patrol team in Mayumba noted that 24 of the 55 olive ridley carcasses showed wounds to the limbs, carapace, or head that could have been sustained pre-mortem. It should be noted, however, that the

advanced state of decomposition in many of these animals, and the action of scavengers (e.g. sharks and/or crabs) may have caused extensive post-mortem damage. One fresh leatherback carcass showed clear signs of extensive damage from shark bites.

During a subsequent patrol of the same area of Mayumba NP in early November 2005, only 4 carcasses were encountered, suggesting that the higher numbers of dead turtles during October was related to a wave of turtles arriving in the area and encountering the same or similar cause of death.

2006. During the 2006-07 nesting season, a count of dead turtles was made in Mayumba NP between the 5 and 8 October 2006. A patrol was undertaken over 83.5 km of beach from Mayumba town southwards to the Congo border. The distance covered included the same 50 km section patrolled during the 2005-06 season.

In total, 10 dead leatherbacks and 32 dead olive ridleys were encountered. By comparison, over the same 50 km stretch patrolled in the previous season, 9 dead leatherbacks and 15 dead olive ridleys were observed. Interestingly, 15 of the 32 olive ridley carcasses in 2006 were discovered in the first 5 kilometers north of the Congo border, whereas in 2005, carcasses were more evenly distributed.

Following the discovery of this wave of dead turtles, a veterinarian was asked to examine the stranded carcasses for possible causes of death. Between the 16 and 24 October 2006, patrols were undertaken in the 40 kilometers immediately south of Mayumba town, stretching into the Mayumba National Park. In total, 17 adult turtle carcasses were encountered during these patrols (Table 2), all but one of which was already desiccated or decomposing.

Of the 17 carcasses, one olive ridley and two leatherbacks showed wounds consistent with fisheries or boat related interactions. The two leatherbacks showed pre-mortem amputations of a fore flipper, while a third leatherback had multiple fractures of the cranium consistent with human induced trauma (e.g., during removal from net). It is possible then that 50% (3) of the leatherbacks evaluated may have died due to fisheries/boat related activity.

Two turtles found in a less decomposed state were given either full and partial necropies. No amputations, wounds, or other significant gross findings were found in either case. All other carcasses were too decomposed for more than visual, external observations (the internal organs having largely liquified).

These findings demonstrate a level of mortality among sea turtles on the coast of central and southern Gabon, and northern Congo. Given the conservation status of sea turtles worldwide, this is of concern, and discovering the cause of death is of considerable importance. Several hypotheses can be proposed to explain some or all of the deaths noted, including, a) poisoning from chemical/hydrocarbon pollutants in water or on land; b) lethal damage caused by offshore oil exploration (seismic surveys); c) natural mortality (viruses, bacteria, other pathogens etc.); d) shark or other predator attack; e) drowning in industrial or artesanal fishing nets (turtles may or may not be subsequently mutilated by fishermen, facilitating their removal from the net).

The advanced state of decomposition of most of the turtles encountered hindered a full study of the cause of death. Thus it was impossible to examine hypotheses 'a', 'b', and 'c'. It should be noted, however, that on 8 October 2005, a moderate slick of crude oil washed up in the Mayumba NP. The slick was swiftly dissipated, and was judged not to be severe in the patrol area. Of course, the oil and the turtles themselves may have collided under more damaging circumstances some distance from the beach where they were later discovered. Indeed, the south to north current may have brought many of the turtles a long way from their point of death to their beaching site. However no significant oiling was noted on any of the carcasses.

During the study period, a seismic exploration vessel was operating in the coastal waters opposite Mayumba NP. Little is known of the effects of seismic exploration on sea turtles (McCauley *et al.* 2000), hindering an examination of this as a potential cause of turtle mortality in West Africa.

Several carcasses showed signs of limb amputation that could have been caused by shark attack. Shark bites may have been sustained by living turtles, leading to death from infection or bloodloss, or sustained post-mortem. However, our examinations suggest that most turtles did not encounter sharks in either state.

The advanced state of decomposition of many of the carcasses also hindered investigation of hypotheses 'd' and 'e'. However, the large number of dead turtles encountered in the south of Gabon in comparison to the lack of carcasses in the north hints at a possible anthropogenic cause of death. The combination of uninjured and mutilated carcasses suggests that in some cases turtles may have died from drowning and/or pre- or post-mortem injury from a sharp object. Fisheries related mortality could explain drownings, as turtles caught in static or trawled nets may be held beneath the surface too long. The observed injuries could have been caused by interactions with fisheries, either through propeller strikes (although we observed none of the characteristic wounds seen in turtles that have been struck by propellers), or through mutilation by fishermen extricating dead or live turtles from their nets. The injuries observed in both seasons were more consistent with the precise use of a knife than with a random mechanical collision. During the 2005-06 season, 5 - 7 industrial trawlers were noted fishing in

Beach	Km	Leatherback		Green		Olive ridley		Total	
		n	n/km	n	n/km	n	n/km	n	n/km
St Catherine (LNP)	5	0	0	0	0	10	2.00	10	2.00
Tassi (LNP)	30	0	0	1	0.03	6	0.20	7	0.23
Loango South (LNP)	5	0	0	0	0	7	1.40	7	1.40
Sette Cama – Gamba	50	0	0	0	0	2	0.04	2	0.04
Mayumba NP	50	1	0.02	2	0.04	55	1.10	58	1.16
Conkouati NP (Congo)	5	1	0.20	0	0	13	2.60	14	2.80
Total	145	2	0.01	3	0.02	93	0.64	98	0.68

Table 1. Numbers of dead turtles encountered in September and October 2005 and number per kilometer of beach. LNP = Loango National Park; NP = National Park

Species	Male	Female	Unknown	Total
Olive ridley	9	0	1	10
Green	1	0	0	1
Leatherback	0	2	4	6
Total	10	2	5	17

Table 2. Dead turtles encountered during veterinarian patrols, October 2006 (sex determined from tail lengths).

and around Mayumba NP. These vessels are also commonplace in the coastal waters around Gamba, Loango south, and St Catherine. Furthermore, in November 2005, park staff reported the illegal presence of 15 small fishing vessels close to the coast within Mayumba NP. These boats deployed nets parallel to the coast from vessel to vessel, less than a kilometer from the shore, thus creating an unbroken net barrier to any turtle approaching the coast to nest. While these vessels were subsequently seized, they are known to have been fishing illegally within the Conkouati-Douli NP on the other side of the Congo/Gabon border during October.

We suggest that the most likely hypothesis to explain the majority of the turtle deaths is incidental capture and subsequent mutilation by fishermen present in the area at exactly the moment of greatest concentration of olive ridley turtles along the coast. The distribution of carcasses northwards from this suggested 'epicenter' is then explained by the carcasses drifting with the prevailing coastal current, with the possibility of further turtles being killed in fisheries interactions closer to their point of discovery.

Whether or not the rate of mortality can be considered as high for this population cannot be judged with confidence. Certainly it was high relative to a patrolled area in the north of the country, but the lack of accurate data on the number of nesting olive ridley turtles in the region is regrettable. An effort to have teams on the beach earlier in the season will be made in the future. In addition, the number of stranded carcasses observed may be a poor indicator of actual mortality levels, due to the local action of sea currents (Epperly *et al.* 1996). It is also possible that sea currents themselves are responsible for creating the impression of a 'strandings hotspot' by concentrating carcasses in time and space that may have died across a much wider area (Hart *et al.* 2006).

In future years, it will be beneficial to have veterinary staff present on the main beaches from the start of October in order to perform full necropsies on fresh carcasses, using strict criteria to distinguish anthropogenic from natural causes of death. Indeed the creation of a 'stranding network' throughout the area, with personnel trained in necropsy and sampling techniques, is recommended. It is hoped that this can be accomplished in part with the assistance of Gabon's new turtle conservation partnership, a loose grouping of NGOs and government agencies, conceived with the aim of standardizing methods, producing a national dataset, and producing a united voice for sea turtle conservation.

Both Conkouati-Douli NP and Mayumba NP now have patrol vessels to guard against illegal fishing, but a strict insistence on sizeable fines for vessels apprehended is of critical importance if enforcement is to be effective in the long-term. Some turtle mortality may also result from interactions with deep-sea fisheries such as the long-line fishery for pelagic predatory fish. On-board observers are the best means to evaluate bycatch impacts and the measures designed to mitigate them. However Gabon is still lacking a full observer program to accurately determine the numbers of turtles captured in either the pelagic or the coastal trawler fishery. As a precautionary measure, Gabon is currently considering the deployment of turtle excluder devices (TEDS) for its shrimp industry, and it is hoped that reductions in bycatch in this sector will lead to the adoption of TEDS throughout the trawler fleet.

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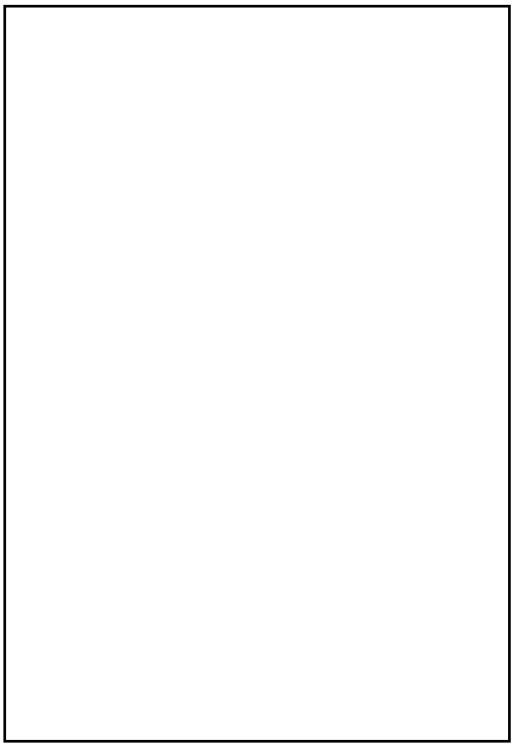

Figure 1. Map of the study areas

Artificial Lights as a Significant Cause of Morbidity of Leatherback Sea Turtles in Pongara National Park, Gabon

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Although leatherback sea turtles (*Dermochelys coriacea*) live in oceans throughout the world, it has recently been confirmed that the coast of Central Africa is home to one of the largest leatherback nesting populations (Fretey & Giradin 1988; Sounguet *et al*. in press). The highest density of nesting female leatherback sea turtles occurs in Gabon, which may host as much as 30% of the global nesting population (Sounguet *et al*. in press). Based on aerial surveys, up to 1,500 nests are laid per night during the peak nesting season along the entire coastline (Sounguet *et al*. in press). In addition to leatherbacks, green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), and olive ridley (*Lepidochelys olivacea*) sea turtles frequent the waters off the coast and have been documented nesting in Gabon (Formia 1999; Fretey 2001; Fretey *et al.* 2002).

One of the primary leatherback nesting beaches in Gabon is located 11 km from the Capital City, Libreville, in the newly established Pongara National Park. The leatherback nesting season in Pongara is October to April with peak nesting occurring in December and January (Aventures Sans Frontières, unpublished data). Approximately 1,800 to 2,000 leatherback nests are laid annually on a 5 km stretch of beach in the northern most area of this Park (00.345441°N, 09.346610°E) (Aventures Sans Frontières, unpublished data).

In addition to the high numbers of nesting leatherback sea turtles in Pongara, the close proximity to Libreville makes it a high priority site for the education of local and international visitors about sea turtle biology, conservation and health. In fact, within walking distance from the nesting beach is Pointe Denis resort area with a growing number of private bungalows and hotels. Artificial light pollution from this resort area has grown significantly during the last five years. In conjunction with development, the potential for sea turtle tours and education for visitors has also increased.

Leatherback sea turtles are listed as critically endangered worldwide (IUCN 2006). Threats to their conservation and health in Pongara National Park and Gabon in general are similar to those in most other regions of the world, and include incidental capture in fisheries, beachfront development, artificial lights, marine and coastal pollution, off-shore oil exploitation, uncontrolled tourism, off-road vehicles, predation, and intentional harvesting (George 1997; Lutcavage *et al*. 1997; Spotila *et al*. 1997; Spotila *et al*. 2000). One unique threat to leatherbacks in the region is the countless logs lost during commercial timber transport, which obstruct the nesting beaches and cause false crawls, nesting below the high tide line and fatal entanglement of females (Laurence *et al*. in press). About 30.5% of the nesting area in Pongara National Park was blocked by logs in the 2002-2004 nesting seasons (Laurence *et al*. in press).

During an initial field season in 2000-2001 to conduct a health assessment of leatherbacks in Gabon (Deem *et al*. 2006), it was noted that lights from Libreville and Pointe Denis appeared to be causing disorientation (turtles crawling on circuitous paths) and misorientation (turtles crawling landward) (Verheijen 1985) in both nesting females and hatchlings in Pongara National Park. During this season, the senior author located one dead adult female leatherback that had walked landward and observed the tracks of thousands of hatchlings that demonstrated both disorientation and misorientation associated with areas of high artificial light pollution. From 2001 to 2005 we recorded an annual mean of 3 deaths of nesting females that wandered into the savanna and an unknown number of hatchlings that succumbed to the effects of artificial lights (Aventures Sans Frontières, unpublished data).

In the 2005-2006 nesting season, we initiated a study to explore the impacts of artificial lights on leatherback sea turtles in Pongara. This initial study was directed at hatchling orientation. Results confirmed that light pollution was playing a role in the misorientation of hatchlings in the Park as 27 of the 41 nests (66%) observed had significant numbers of hatchlings walk in quadrants away from the ocean and towards artificial lights (Bourgeois 2007). This risk of misorientation due to artificial lights was highest in the most open sections of beach (e.g., without logs, erosion and vegetation) and where artificial lights were most evident (Bourgeois 2007).

In the current nesting season, 2006-2007, we have witnessed a growing threat of artificial lights on leatherback nesting females on this 5 km stretch of beach in Pongara National Park. During an 80-day period, we documented 71 misoriented females that walked directly into the savanna and towards the artificial lights of Pointe Denis (Figure 1). Unable to stop these females from walking great distances into the savanna (some up to 500 meters), we moved 68 turtles back to the ocean using ropes, manual labor (Figure 2), and when available, off-road vehicles the following morning. Three turtles (4.2%) died in the savanna before we could locate them. Pathologic findings of these three turtles were suggestive of death due to hyperthermia and dehydration. Additionally, although laboratory diagnostics were not performed, we believe that a large percentage of the turtles we returned to the ocean may not have survived, due to physiologic changes (e.g., dehydration, hypoglycemia, increased cortisol and lactic acid) that made them susceptible to drowning, vehicle strike, and predation.

Based on morning track counts, the percent of nesting females that walked into the savanna following nesting activity was 2-6% on many nights, with a high of 56% on 31 December, which corresponded to increased human activity (e.g., fireworks, increased lights from bungalows and hotels throughout the night) in Pointe Denis. During this 80-day period, we recorded a minimum of 2,024 successful leatherback nests (15 days of track counts are not available; Aventures Sans Frontières, unpublished data). Therefore, 3.6% (71/2024) of leatherback sea turtle nesting events resulted in females that walked into the savanna following nest excavation.

Figure 1. Number of female leatherback turtles that crawled into the savanna, and towards artificial lights, in Pongara National Park, Gabon following nesting activity.

Based on our findings we have taken urgent actions and made recommendations directed at curtailing the immediate impacts of light pollution on leatherback sea turtles on this beach. We obtained emergency funds from the Wildlife Conservation Society, Aventures Sans Frontières, and the American Embassy and currently have two teams of three persons per night patrolling the beach. One person remains with each turtle until it returns to the ocean, ensuring it does not walk into the savanna following nesting activity. We have had great success in moving a number of these females back to the ocean with the "light technique" in which turtles will follow our white light down to the ocean. Additionally, a turtle tarp has been constructed to minimize the tissue damage accrued during transport of females from the savanna to the ocean. Three temporary barriers have also been placed along 250 meters of the beach, at sites with the most tracks indicating hatchlings wandering into the savanna, to minimize loss of hatchlings to the artificial lights.

Although we were forced into a crisis management approach, we emphasise the fundamental need for preventive measures to eliminate or control light impacts at the source. Education programs on light pollution and other threats affecting nesting leatherbacks are underway. We have distributed a brochure on light pollution and turtle-friendly light use to bungalows and hotels at Pointe Denis, and currently have a commercial airing on all local television channels in Gabon which displays leatherback sea turtle conservation in Pongara, highlighting the threat of logs and lights in the region. Finally, we plan to obtain turtle-friendly lights for distribution to home owners and hotels in Pointe Denis. We hope that our conservation actions ensure that we preserve this leatherback sea turtle nesting beach for many years to come. The importance of Pongara National Park for the leatherback females who nest here, the hatchlings that start life here, and the countless people that visit this beach to be inspired and educated on sea turtle biology, health, and conservation is irreplaceable.

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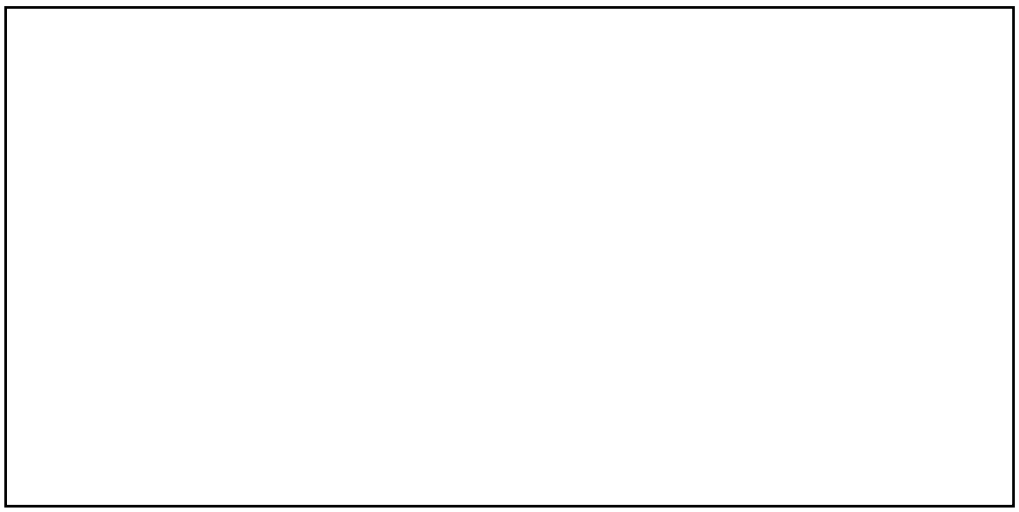

Figure 2. Workers move a female leatherback turtle found in the savanna 400 meters away from the ocean. Photo credit: John Kelson

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Observations of Marine Turtles in Relation to Seismic Airgun Sound off Angola

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The airgun arrays used during geophysical seismic surveys produce sound with source levels in the region of 220–248 dB re. 1 µPa at 1 m, and peak energy in the 10–200 Hz frequency bandwidth (for seismic survey background information see Gulland & Walker 2001). To date, most studies on the impacts of airgun sound on marine fauna have focussed on species deemed acoustically sensitive such as cetaceans (e.g. Gordon et al. 2004) or economically-important such as commercial fish stocks (e.g. Engås et al. 1996). Guidelines have been developed worldwide to mitigate the potential impacts of airgun sound on marine mammals (Weir & Dolman In Press), including the use of dedicated observers to detect animals close to seismic operations and restricted airgun use, and the implementation of a 'soft start' (or 'ramp up') procedure whereby airgun volume is increased gradually over 20 minutes to enable animals to move away.

Despite being listed as endangered or critically endangered by the IUCN, marine turtle species are included only in the Brazilian (IBAMA 2005) and Canadian (DFO 2005) mitigation guidelines and there has been no airgun-related research on free-ranging turtles. Controlled exposure experiments on captive turtles found an increase in swim speed and erratic behaviour indicative of avoidance, at received airgun sound levels of 166–176 dB re 1 µPa (rms) (O'Hara & Wilcox 1990; McCauley et al. 2000). The limited available data on marine turtle hearing suggest highest auditory sensitivity at frequencies of 250–700 Hz, and some sensitivity to frequencies at least as low as 60 Hz (Ridgway et al. 1969; O'Hara & Wilcox, 1990; Moein-Bartol et al. 1999), overlapping with the higher frequencies produced by airguns.

This paper describes observations of marine turtles during a ten-month seismic survey off Angola on the west coast of Africa, with discussion of turtle responses to airgun sound and recommendations for future surveys. The study area and data collection methods are described by Weir et al. (In press). In summary, two consecutive 3D seismic surveys were carried out by BP Exploration (Angola) Ltd and partners over a 288-day period between 1 August 2004 and 15 May 2005 in a deep-water (1000–3000m) area off northern Angola (5–11°S latitude and 9–13°E longitude**)**. Two airgun arrays fired alternately at approximately 10 sec intervals. Each array comprised 24 Bolt airguns of 30–290 cu. in., producing total volume of either 5085 cu. in. or 3147 cu. in. (Table 1).

Concurrently with marine mammal observations, a single observer located on the ship's helideck (18 m eye height) searched for turtles 360° around the vessel with the naked eye and with 10x42 binoculars. A total of 2769 h was spent on-effort during daylight hours, of which 676.4 h occurred in Beaufort sea state ≤2. Effort logs

Parameter	Survey 1	Survey 2
Survey duration	Aug 2004–Jan 2005	Jan–May 2005
Seismic line duration (h)	8–12	1.5–4
Total airgun volume (cu. in.)	5085	3147
Source amplitude (Bar-m, peak to peak)	109	81
Airgun pressure (psi)	2000	2000
Source depth (m)	8	4
Recorded frequency bandwidth (Hz)	5–70	8–120
Minimum intensity within frequency bandwidth (dB re 1µPa per Hz @ 1 m)	208	203
Firing interval (m)	25	18.75

Table 1. Source parameters utilised during each survey.

	Guns-off	Partial-array	Full-array	Total
Total effort (min)	20,340	2,128	18,117	40,585
Turtle sightings	112	5	57	174
Number of turtles	146	5	60	211
Turtles/hour	0.43	0.14	0.20	0.31

Table 2. Survey effort and turtle sighting rate (all species combined) according to airgun status (Beaufort sea state ≤2 only).

(position, water depth and environmental data including Beaufort sea state) were recorded for every watch. Airgun status was defined as full-array, partial-array (soft start or test firing) or guns-off.

Two hundred turtle sightings (240 animals) were recorded, including 33 olive ridley *Lepidochelys olivacea*, three leatherback *Dermochelys coriacea*, four loggerhead *Caretta caretta* and 160 unidentified turtle (hard-shell species) sightings. For each sighting the position, species, number, distance from the airguns (using a range-finding stick based on Heinemann 1981), behaviour, and airgun status were recorded. Behaviour was recorded initially (at the time of first sighting), and subsequently (noting any responses) using descriptive categories including basking (lying motionless at surface with carapace exposed), swimming (surface or subsurface), mating, breathing and diving (normal or 'startle' dive). Where apparent responsive behaviour was observed, it was noted where this occurred in relation to the vessel and towed equipment (i.e. bow, side, stern or astern of the vessel).

The UK marine mammal mitigation guidelines (which do not include turtles) (JNCC 2004) were in use throughout. BP voluntarily included marine turtles in the mitigation measures, such that the airguns were not allowed to start-up for 20 min if a turtle had been observed within 500 m of the airgun array during the 30-min pre-shoot watch.

Turtle data were collected concurrently with marine mammal surveys and were not gathered solely to assess turtle responses to airgun sound. Data were therefore analysed using broad criteria including sighting rate (turtles/h), distance and behaviour, which were compared in different airgun status categories using a combined dataset of all turtle species. Only data collected in Beaufort sea state ≤2 were analysed to ensure a reasonable likelihood of turtle detection. Since detection rate decreases with increasing distance from the vessel, distance categories rather than absolute distances were used for analysis.

Out of 639 airgun uses, airgun start-up was delayed on five instances due to sightings of marine turtles within the 500 m exclusion zone around the airguns. Three occasions involved single sightings of olive ridley turtles and incurred only short delays. However, delays of over one hour were caused by numerous basking turtles encountered on 10 and 11 August 2004. These lengthy delays resulted from a combination of factors including: (1) peak offshore turtle abundance during August (Weir et al. In press); (2) glassy (Beaufort sea state 0) seas from 8–12 August 2004; and (3) time of day. There was a significant difference in the frequency of turtle numbers observed according to Beaufort sea state (X^2=5830.4, d.f.=4, P=<0.001), with significantly more turtles than expected observed in Beaufort sea states 0 and 1, and fewer in sea states 2 to 4. Glassy sea conditions both increased turtle detection and also appeared to trigger the onset of prolonged basking at the surface (further increasing detection) (Figure 1). Most turtles were observed between 10:00 and 14:00 h (UTC) (95% of which were basking) during the hottest part of the day (Figure 2).

The turtle sighting rate during guns-off (0.43 turtles/h) was double that of full-array seismic (0.20/h) (Table 2). Although suggestive of avoidance of airguns by turtles these data should be treated with caution since 118 of the sightings occurred from 8–12 August 2004 during unusually calm conditions. On each of these dates the airguns were inactive between 11:00 to 14:00 h during peak diurnal abundance of turtles (Figure 2), and it is likely that this biased the analysis. Nevertheless, glassy seas also occurred during the midday period on 25 August during full-array seismic, with only seven turtles recorded.

There was indication that turtles occurred closer to the source during guns-off than full-array, with double the sighting rate during guns-off in all distance bands within 1000 m of the array (Figure 3). However, there was no significant difference in the median distance of turtle sightings from the airguns during full-array (mean= 779 m, SD=464, N=57) or guns-off (mean= 743 m, SD=449, N=112) (Mann-Whitney U = 3035, N= 169, P = 0.6). While this result apparently indicates a lack of movement away from active airguns, it is possible that turtles only detect airguns at close range or are not sufficiently mobile to move away from approaching airgun arrays (particularly if basking for metabolic purposes when they may be slow to react).

It was difficult to assess turtle behaviour in the field since animals were usually either distant (61% were ≥500 m away) or seen briefly. Both initial and subsequent behaviour were recorded for 180 turtles. Basking comprised the predominant initial behaviour during both full-array seismic (94%) and guns-off (96%). Although a slightly higher proportion of turtles

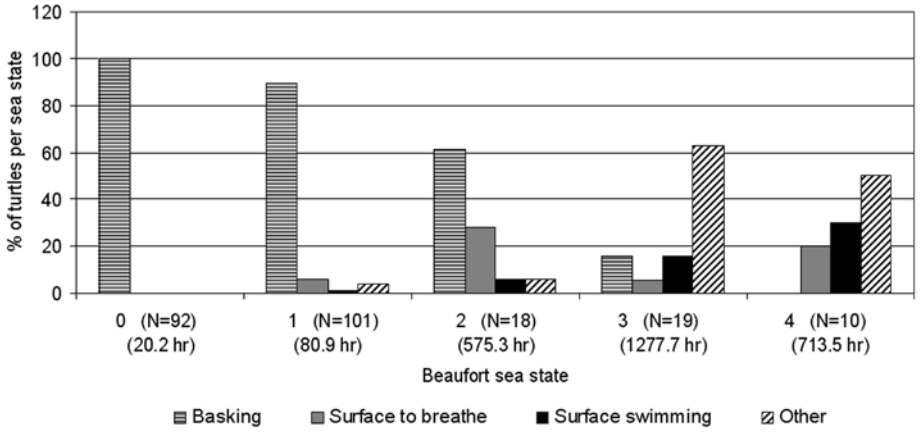

Figure 1. Initial behaviour of turtles according to Beaufort sea state, showing number of turtles and survey effort (hr).

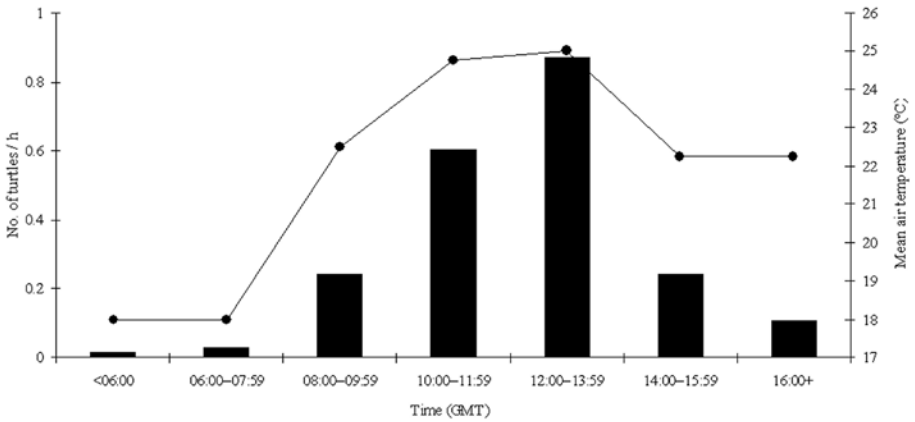

Figure 2. Diurnal trend in turtle relative abundance (Beaufort sea state ≤2) (solid bars), and mean air temperature in Luanda, 8–12 August 2004

dived during full-array seismic (12.5%) than guns-off (11%), in most cases (full-array=77% ; guns-off=83%) turtles continued to bask at the surface as the vessel and towed equipment moved past them and remained visible at the surface well astern of the ship. Apparent responsive dives were noted for 20 turtles, six during full-array seismic and 14 during guns-off. Thirteen turtles dived in apparent response to the vessel, nine of which startle dived at the bow (full-array=2; guns-off=7). Seven turtles startle dived in apparent response to seismic equipment, including six in response to towed surface foats (full-array=1; guns-off=5) and one in apparent response to the inactive airgun array. An assessment of turtle behaviour in relation to seismic status was therefore hindered by apparent reaction of individuals to the ship and towed equipment rather than specifcally to airgun sound. These reactions occurred at close range (usually <10 m) to approaching objects and appeared to be based principally on visual detection.

Collisions between turtles and vessels are clearly not limited to seismic ships, which are slow (survey speed of 4–5 knots) compared with other vessel types. However, the large amount of equipment towed astern of seismic ships does increase the potential for collision. Basking turtles were particularly slow to react; for example one animal was washed away in the bow-wave while others had 'near misses' with towed surface foats. While little can be done to avoid outright collision, turtles can also become entrapped within some seismic equipment leading to suffocation. For example, during seismic surveys off West Africa in 2003, turtles became fatally entrapped within gaps in the tail-buoys (seismic personnel, pers. comms.). Modifying equipment (e.g. with 'turtle guard' bars placed over such gaps to exclude turtles) can prevent these scenarios and should be implemented on all seismic vessels operating in turtle-inhabited areas.

It was not possible to draw conclusions on the impact upon turtles of seismic airgun sound during this study. There was some indication that fewer turtles were seen during full-array seismic, although there was no obvious behavioural avoidance (e.g. swimming away) of the airgun array. However, basking turtles may not be able to move rapidly away from approaching airguns even if motivated to do so, since their responses to approaching objects are slow. The main limitations in assessing the reaction of turtles to airgun sound were: (a) difficulties in detecting animals in Beaufort sea states >1; (b) difficulties in determining at-sea turtle behaviour (notably for subsurface animals); and (c) difficulties in distinguishing responses to airgun sound from responses to the vessel and towed equipment. The data indicate that visual detection of turtles will not be effective in Beaufort sea states >1, with implications for mitigation during seismic surveys. Turtles were only observable at the surface (where received sound levels are lower due to the 'Lloyd mirror' effect (Urick 1983)), and it could not be ascertained whether subsurface turtles reacted to airgun sound. Most responsive dives occurred in clear reaction to the ship or towed equipment rather than airguns, and since the airguns were located at least 300 m astern of the ship's bow, turtles were more likely to initially encounter, and respond to, the ship than the airgun array.

The use of measures to avoid turtle entanglement in seismic apparatus should become mandatory throughout industry. Future surveys should aim to collect detailed turtle behavioural information, and investigate the reaction of different turtle species in varying water depths and with different airgun arrays. Controlled experiments on turtle responses to airgun sound are also required, together with detailed studies of turtle hearing and the acoustic properties of airgun arrays.

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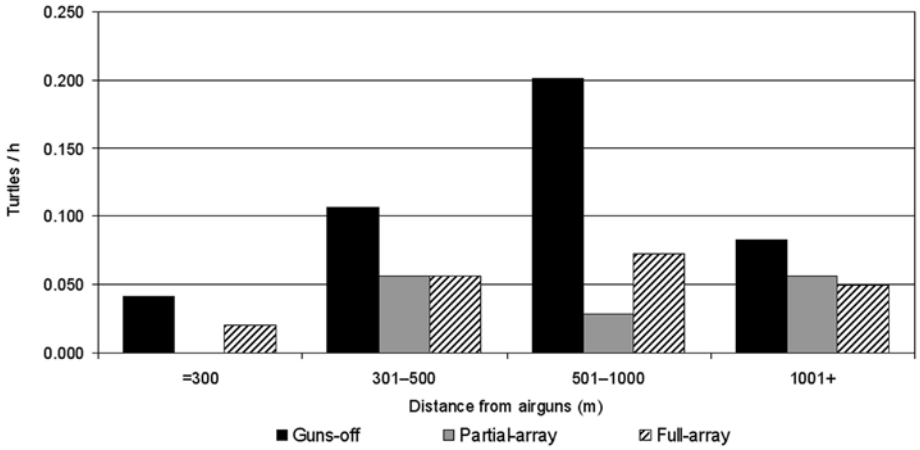

Figure 3. Distance of turtles from the airgun array according to airgun status.

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Fibropapillomatosis confirmed in *Chelonia mydas* in the Gulf of Guinea, West Africa

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Fibropapillomatosis has a global distribution and is the most important health problem affecting free-ranging sea turtles today (Herbst 1994; George 1997). While primarily a disease of immature and young adult green turtles, there is now evidence that fibropapillomatosis occurs in all seven of the extant sea turtle species (Aguirre *et al.* 2002). The underlying etiology is still not fully understood, although there is strong evidence of an underlying viral infection (Herbst *et al.* 1995; Quackenbush *et al.* 1998; Work *et al.* 2001; Work 2005). Tumors appear to manifest more often in stressful habitat conditions, such as regions with poor water quality, under eutrophication and in the presence of contaminants and toxins (Aguirre *et al.* 2002; Ehrhert *et al.* 1996; Adnyana *et al.* 1997). However, a number of documented cases of fibropapillomatosis have been reported in areas considered relatively uncontaminated and studies on the role of environmental contaminants are imperative (Herbst & Klein 1995).

External fibropapillomas sometimes regress if the turtle can maintain its body condition. Treatments include surgical tumor removal and secondary care for debilitation. Mortality rates have yet to be established, but data indicate that the outcome of the disease is highly variable and depends on a number of factors (Work *et al.* 2004; Work & Balazs 1999). When the tumors affect the eyes and mouth, preventing the turtle from foraging effectively, they can lead to death from starvation. Additionally, internal tumors are particularly devastating (Work 2005).

The Gulf of Guinea has recently emerged as critical habitat for sea turtle populations and has been receiving increased attention from the research and conservation community (Fretey 2001; Formia *et al.* 2003). Corisco Bay is home to an important sea turtle foraging ground (Formia 2002). It is located in the Gulf of Guinea, on the border between Equatorial Guinea and Gabon, and comprises approximately 1500 km sq. of warm shallow waters on the west African continental shelf. The most common sea turtles in the Bay are adult and immature green turtles (*Chelonia mydas*). Hawksbills (*Eretmochelys imbricata*), leatherbacks (*Dermochelys coriacea*) and olive ridleys (*Lepidochelys olivacea*) also occur occasionally in the Bay and nest sporadically. The ecology of the area is still largely unknown, but both green turtles and hawksbills feed here throughout the year (Formia *et al.* unpublished data).

Genetic mixed stock analysis of the green turtles in Corisco Bay has shown that potentially contributing rookeries include Ascension Island, Bioko, São Tome, Principe, as well as Suriname, Comores and Mexico (Formia 2002). Local inhabitants have hunted green turtles for generations both for local and commercial consumption in the urban centers of Bata (Equatorial Guinea) and Libreville (Gabon). Research and conservation efforts are underway to halt

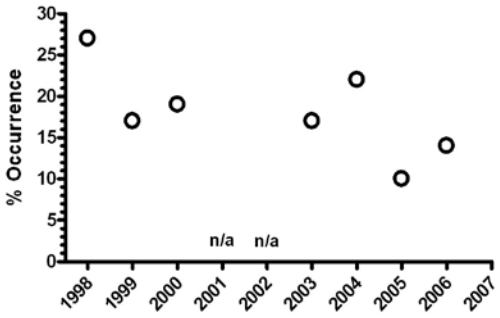

Figure 1. Annual prevalence of fibropapillomatosis in Corisco Bay green turtles (1998 n= 33; 1999 n=151; 2000 n=53; 2003 n=53; 2004 n=54; 2005 n=62; 2006 n=77).

turtle hunting in the Bay and decrease market demand for turtles in the cities.

Before transport and sale, captured turtles are often held in enclosures for several days where close observation by researchers can be carried out. Based on visual assessments, we have documented large abnormal masses of the skin on several individuals. These masses tend to be distributed around the eyes and mouth, neck, tail and the ventral surface of the anterior flippers. Based on the appearance and location of these growths (Balazs & Pooley 1991; Herbst 1994), we hypothesized that fibropapillomatosis was present in the population.

In April 2000, tissue biopsies were collected from an immature green turtle captured in Corisco Bay (near the islet of Mbanye, on the border between Equatorial Guinea and Gabon), West Africa. One skin biopsy was taken from healthy tissue, and seven biopsies from seven different tumors attached to the skin of the neck and inguinal regions. Biopsy sites were pre-treated with topical betadine, tissue samples collected using a 6 mm biopsy punch, and the site again cleaned with betadine at the end of the procedure. The turtle was then measured (67 cm curved carapace length and 62 cm curved carapace width), tagged on the anterior flippers (ECO-813 left, ECO-815 right), and released.

All tumor biopsies were stored in 10% buffered formalin at room temperature, except a single biopsy from the abnormal tissue which was placed in 70% ethanol for parasite evaluation. A healthy skin sample was also collected for mitochondrial DNA analysis and was found to exhibit the common Atlantic haplotype CM-A8 (Formia 2002).

Histopathological analysis of the samples was carried out at the Colorado Veterinary Diagnostic Laboratory (USA). Microscopically, all masses were diagnosed as fibropapillomas based on proliferation of epidermal cells, dermal fibroblasts, or both (Jacobson *et al.* 1989). These tumors were similar to tumors from other regions of the world except there was increased blister formation and/or early microabscess formation within the epidermis. Additionally, there was a slightly increased infiltration of heterophils, both within the tumor and within the epidermis, and increased cellular vacuolation. None of the seven biopsies we evaluated had evidence of regeneration within the tumors. Intranuclear inclusion bodies, although not extremely distinct, were present in three cells of one of the biopsies observed. There were no parasite eggs detected in any of the biopsies.

Data collected over seven years (1998 – 2006) on the green turtle population of Corisco Bay reveal a 17% prevalence of probable fibropapillomatosis in captured turtles (82 out of 483 individuals) we examined. These 82 turtles had an average curved carapace length of 71.5 cm (n=82; SD 10.5 cm; range=49-97 cm), and six of the 82 were morphologically identified as males, the remainder were females or immatures. Sampling effort was not uniform during the seven years of data collection. However, we found no apparent trend in annual fibropapillomatosis prevalence (Figure 1).

In October 2006 we recorded a green turtle live stranded in Mayumba National Park, in southern Gabon, with multiple growths consistent with fibropapillomatosis (Figure 2). In addition, we noted the presence of leeches near one of the tumors (Figure 2). Interestingly, marine leeches have been found to carry high loads of fibropapilloma-associated turtle herpesvirus DNA, implicating them as a possible mechanical vector (Greenblatt *et al.* 2004). Histological evaluation of biopsy samples collected from this turtle is pending.

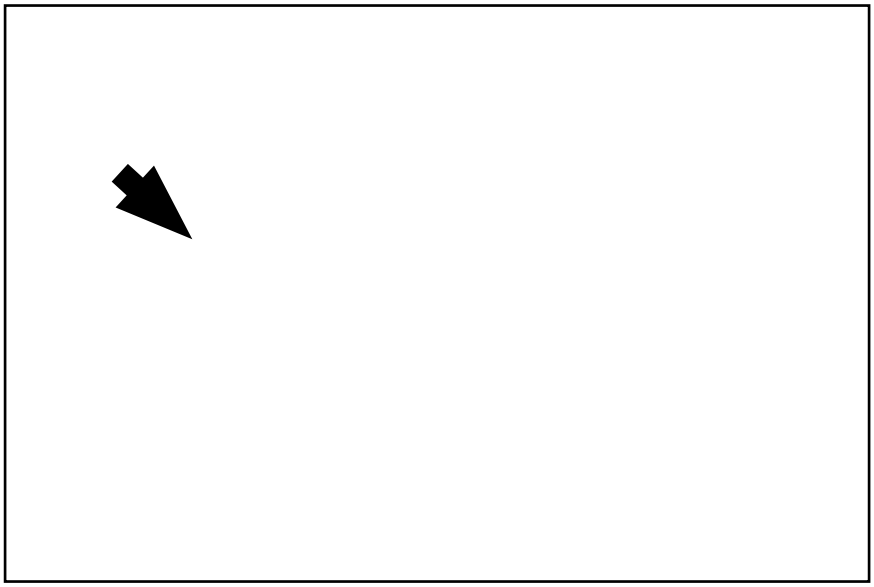

Figure 2. Right anterior flipper of a green turtle stranded in Mayumba National Park, southern Gabon. Note the fibropapilloma with highly rugose structure (black arrow) and presence of leeches (white arrow). Photo credit: Tim Collins.

To the authors' knowledge, described here is the first histopathologically confirmed report of fibropapillomatosis of sea turtles in Central or West Africa. To date, the conditions contributing to the presence of fibropapillomatosis in Corisco Bay are unknown. There are no other cases reported from other sea turtle species in Gabon or Equatorial Guinea (hawksbills, leatherbacks and olive ridleys), or from green turtles elsewhere in the region, despite regular monitoring activities. No apparent fibropapillomatosis has been reported among the nesting females of Bioko Island (Equatorial Guinea; J. Tomas pers. comm.), or the adults and immatures found in continental Equatorial Guinea and in São Tome and Principe (AF, unpublished data).

However, field biologists and technicians in the region are receiving further training

in methods of health assessment based on visual examinations, including assessing the presence or absence of fibropapilloma-like growths, and documenting mortalities throughout the region. Training and data-collection will also be expanded to include necropsies and in-water prevalence studies. Future lines of investigation on this disease in the region should also include testing tumors for herpesvirus DNA. Overall, health monitoring of the sea turtles in the Gulf of Guinea will help us determine the true prevalence of fibropapillomatosis and other disease threats, in this region of such high conservation value.

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Presence of Sea Turtles in Traditional Pharmacopoeia and Beliefs of West Africa

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Traditional medicine has often used plants and animals, including sea turtles, as healing elements or other kinds of treatment (Alves & Rosa 2006). In Africa, medicine, religion, and beliefs are all parts of the same entity according to (Gilli 1987; de Surgy 1993). Healers are often fetishists. Their treatment methods are often well-kept secrets. During our extended work on sea turtle conservation in Western Africa over a number of years, we have collected information on the use of sea turtles in traditional healing or voodoo practices (Fretey *et al*. 2006). Our research on this topic was conducted in Togo, Benin, Guinea, and Cameroon (Fig. 1) with some difficulty and the information collected is still incomplete and fragmentary. We surveyed from 2000 to 2005 the fetish markets, and interviewed fishermen in coastal villages and some traditional doctors. We compiled information on the use of various sea turtle parts by local families and in pharmacopoeia in these countries, and supplemented it with information collected by us in other countries in the sub-region (Fig. 1) as well as with records in the literature.

This work is certainly incomplete and preliminary. However, it makes us think about the need to define the role and use of sea turtle products, which is illegal according to national legislations, in traditional medical practices. Should these practices be completely prohibited? We do not know if their therapeutic powers are real or have simply a placebo effect. It would be interesting to determine if some of the sea turtle products used are truly effective. If they are effective, what should we do? Should we then profit from the large numbers of sea turtles accidentally killed by industrial trawlers or stockpiles of hawksbills scutes in Sao Tome and Principe by having traditional practitioners officially use them? Can we include these exemptions within conservation projects to respect traditional practices? This paper does not try to answer these questions, but simply does an inventory of African remedies that use turtle products (not always marine turtles) and the pathologies that they address

Traditional practitioners appear to use the fat, the skull, crushed bones, the carapace (bony scutes and scales), the heart, the liver, and the blood for treatment of ailments. Several recipes, whose origin is lost in the past of each ethnic group, appear to be common and used for identical illnesses, all along the coast from Senegal to Cameroon (Fig. 1).

Fat, skull, bone, organs, and blood

Sea turtle fat has numerous uses. Leatherback (*Dermochelys coriacea*) fat is almost exclusively used in preparations and up to forty litres of oil can be extracted from a dead adult turtle exposed to full sunlight. It is used, either pure or mixed with honey, to treat convulsions and malaria (Togo), fever, fainting spells, liver problems and tetanus (Benin), as well as to induce vomiting (Togo, Bénin). In other African countries, sea turtle oil is used to treat traumas caused by shock. In the Loos Islands in Guinea, the fat is used to cure sprains and even to reduce fractures. Not far from there, in Senegal, the Sereer group uses it as a balm for massages that can cure fractures (Sabinot 2003). In the northwest and south of Cameroon, leatherback fat is applied to bruises. In the Neo community of Côte d'Ivoire, leatherback fat is applied to wounds in the mouth and to massage painful articulations (Fretey *et al.* 1999). In Benin, consumption of sea turtle meat is supposed to treat certain diseases like malaria or indigestion (Dossou-Bodjrenou *et al.* 1999).

Powdered skulls and bones are used in Togo against aches. If the fat of a python (*Python sebae*) is added, the skull powder becomes an ointment that helps relieve pains in the chest (Segniagbeto 2004). Carapaces are broken and crushed and mixed with honey, lemon juice, or with Senegal prickly ash (*Fagara zanthoxyloides*), a medicinal plant. These various mixtures are used to cure headaches, asthma and cardiac arrhythmia. According to Togolese coastal villagers, bones of sea turtles are effective for the skeletal and muscular growth of children. Therefore, some mothers add turtle bones daily to the baby's bath water; it is believed that the power of the turtle (especially the leatherback) on the nesting beach, will be transmitted to the child through this practice (Segniagbeto 2004). Similarly, sea turtle bones are also used to treat children affected by rickets. A piece of bone, with a hole drilled through it is tied to the neck or the hip of the child. Sabinot (2003) described a similar practice in the Sereer community in the Palmarin region in Senegal, where hip problems are treated by wearing the last vertebra of the turtle around the waist with a string.

Among the Sereer, the enlarged front flipper claw of a green turtle (*Chelonia mydas*) is placed in the bag of seeds to guarantee a good harvest or used as a charm by soldiers. It is also tied around the ankle of the young child so that he learns to walk more quickly (Sabinot 2003).

In Benin, consumption of sea turtle meat is supposed to treat certain diseases like malaria or indigestion (Dossou-Bodjrenou *et al.* 1999). In the Sereer community (Fretey 1991; Sabinot 2003), fishermen use the heart of green turtles, boiled or grilled, as a remedy for heart diseases; the turtle liver is also used to treat the same diseases. Villiers (1958) reported that in the Lebu community from the peninsula of Cape Verde, people with heart problems wrap a piece of turtle heart in cloth and soak it in their drinking water. The genitalia of the male green turtle is dried in the sun and sometimes left to macerate for 24 hours in water and used as an aphrodisiac drink for men and bulls. Some men tie the dried penis to their waist with a cord for increased sexual power.

We collected information on the use of blood only in Guinea. It is sold in the markets in small bottles and is used to fight rheumatism and anaemia. The fresh blood of green turtles is ingested by asthmatic Sereer people to help with breathing. Fishermen sometimes spread fresh turtle blood at the bottom of their canoe to make their fishing profitable (Sabinot 2003). According to the French explorer Eustache de la Fosse in 1479, leprosy was treated in the Archipelago of Cape Verde by a diet of turtle meat and by rubbing the affected areas with sea turtle blood (Fretey 2001).

Figure 1. Countries in West Africa (dark grey) from where information was compiled on the use of sea turtles in traditional pharmacopoeia and their presence in local beliefs.

Avoidance of turtle products

In the Bijagos Archipelago (Guinea-Bissau), the head of a sea turtle carries great importance. Nobody is allowed to eat the head without authorization of the village chief. Once the head is boiled or cooked on embers, the meat is ripped off with the teeth, the skull is cracked open and the eyes and the brain are eaten. However, in certain ethnic groups along the Slave Coast (Togo, Benin, and western Nigeria), a pregnant woman should not eat the internal organs or the head of a sea turtle because it is believed that the child who is born from this pregnancy would become initially cynical and then sadistic. The villagers fear that such a child would become a criminal, or adopt sea turtles behaviors. It is often said that this child would have a "hard head" (stubborn, obstinate) like turtles. Sabinot (2003) reports similar beliefs among the Sereer groups. Meat ingestion of *ndumar* or green turtle by a woman at the beginning of pregnancy will lead to the birth of a child who has the physical aspect of a turtle, and who will develop aggressive or reprehensible behaviors as he grows up. If a pregnant Sereer woman inadvertently eats the genitals of a turtle, it is believed that the baby will grow up to become permanently highly agitated. These behaviours can be made to disappear through incantations by an elder from the village while the child drinks water in which turtles bones have been soaked, or by bathing him in this water. Water can also be kept in a green turtle carapace at all times to ensure happiness to the person who bathes with this water. In Guinea, in the Soussou community, very thin babies are bathed in a decoction of leaves in the carapace of a green turtle. Thus, in Togo and in Guinea we find the power to cure and ensure well-being associated with water in which turtles bones have been soaked or which has been kept in a carapace.

Myths, beliefs and voodoo

In Ghana, the Adan fishermen have a legend that their ancestors were saved by sea turtles when their dugouts were shipwrecked (Carr & Campbell 1995). Hence, it is taboo among the Adan to kill sea turtles for their meat and instead turtles are worshipped; however, if a leatherback is entangled in a net, it is killed to save the fishing gear. This legend is found with some variation among other ethnic groups in other parts of the Gulf of Guinea (N'Lessi and Dévikinme in Togo, Gbekon in Benin). According to myths of the Godie fishermen of Côte d'Ivoire, sea turtles are considered friends and were formerly worshipped at a shrine dedicated to them. They, obviously, do not eat sea turtle meat except in the Dassioko clan (Fretey *et al*. 1999). The Godie fishermen believe that consumption of turtle meat will cause blindness. On Sémè Beach (Benin), a fisherman's family was said to be struck by misfortune (nets lost in the ocean, dead child, etc.) because they had eaten leatherback meat. Based on interviews with the Sereer fishermen of Senegal, *ndumar* or leatherback meat is not eaten. The turtle is considered to be a totem that holds a big spirit and misfortune befalls the person who kills it. Any fisherman who eats the meat of this species before setting out to sea will have a bad fishing day. In southern Cameroon, in Iyassa, or in the Neo community of Côte d'Ivoire, it is believed that a leatherback emergence on the beach is announced by fashes in the sky or by clouds in the shape of turtles.

In many fishing communities along the coast of Cameroon, Togo, Benin and Ghana, people are afraid to see a leatherback emerging from the sea. At Sémé beach (Benin) an old fisherman told us that when a villager encounters a leatherback on the beach, he has to shout in front of it, to avoid going insane or falling sick. Nevertheless, this belief does not influence the capture of this species. In southern Cameroon, the Batanga are equally afraid of a leatherback emergence during the day because it is supposed to bring misfortunes to their community (Fretey 1999).

In villages along Togolese beaches (Gbetsogbe) it is believed that the female turtle regularly returns to watch over her nest and when it is time for hatching, she sends a mystical message that allows the hatchlings to emerge. This message helps direct the hatchlings towards the sea. They also believe that sea turtle eggs give birth to several other animal species, particularly other reptiles and amphibians. They insist that during hatchling emergence, snakes, toads, and frogs also emerge from the sand.

The carapace enters some animist practices and voodoo, and one can easily buy carapaces in the fetishs markets of Lome-Akodésséwa, in Vogan and Kpalimé (Togo) and Dantokpa, Cotonou (Benin). At the fetish markets of Akodésséwa, small statuettes (fetishes) manufactured with pieces of carapaces were seen. In certain fishing communities in Ghana (Ahlon, Gans) and in Beninese communities at the Nigerian border, hatchlings are used in a voodoo ritual. Sea turtle eggs are used in animist's practices, especially by the followers of Mami-Wata (the Goddess of the sea). According to these beliefs, this goddess uses sea turtles as a vehicle to move from the sea to the ground to be in contact with the human beings. During the ceremonies of the ethnic groups of Dangbe of Ningo in Ghana, the priest in a trance displays the behaviour of a turtle (Segniagbeto, pers. observ.). In some coastal villages of Benin, fetishes representing the souls of ancestors in front of shrines are protected from bad weather by olive ridley (*Lepidochelys olivacea*) carapaces.

In summary, these records of the traditional uses of sea turtles document an important role that sea turtle parts play in cultural practices. As such, sea turtle conservation projects along the Atlantic coast of Africa must take these traditional practices into account within the framework of the Memorandum of Abidjan of the Bonn Convention for the Conservation of Migratory Species (CMS). It is essential that these cultural aspects are respected and traditional practitioners be exempted from laws written to protect sea turtles.

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Discovery of a Gabonese Leatherback in South Africa

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An adult female leatherback (curved carapace length = 149.0 cm; curved carapace width = 113.0 cm) tagged with a monel flipper tag while nesting on February 23, 2005 at Pongara Point in Gabon (a few kilometers from the equator) was found stranded on August 21, 2005 along a rocky beach, approximately 3 km south of De Beers Namaqualand Mines village of Kleinzee (29° 42' 44.4" S, 17° 03' 33.1 E), on the west coast of South Africa. There was evidence of a deep cut just in front of the left rear flipper through which the turtle was partially disembowelled. There was no obvious evidence of scavenging on the carcass, and the cut may have been the result of a boat strike.

Billes et al. (2006) have described transatlantic movements of leatherbacks from nesting beaches in Gabon to South American waters (Argentina and Brazil). Georges *et al.* (in press) report that females nesting in southern Gabon move south towards the beaches of the National Park of Conkouati in the Congo during the inter-nesting period. This stranding is therefore the first evidence of a trans-African migration from a nesting beach near the equator towards the southern end of the continent where leatherbacks nesting on the Indian Ocean coast of South Africa are also some times known to migrate (Hughes 1998; Luschi *et al.* 2006). It should be noted that this movement from Gabon southwards goes against the flow of the cold Benguela current, so it is unlikely that the leatherback carcass drifted passively south with the currents to the South African coast. It is possible that a certain percentage of leatherbacks nesting on Central African beaches migrate towards South Africa to feed whereas others cross the Atlantic to South American waters to forage. More tracking studies are needed to elucidate post-nesting movements to develop appropriate management strategies away from the nesting beach where accidental captures in high seas fisheries (M. Honig & S. Peterson pers. comm., Billes *et al.* unpublished data) pose a major threat to their survival and to determine distinct migratory and foraging strategies within nesting populations.

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Second TAMAR-Tagged Hawksbill Recaptured in Corisco Bay, West Africa

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We report here the second tag recovery demonstrating hawksbill (*Eretmochelys imbricata*) trans-Atlantic migration between Fernando de Noronha (Brazil) and Corisco Bay (on the border between Equatorial Guinea and Gabon). In Brazil, a long-term mark-recapture study by Projeto TAMAR-IBAMA has targeted juvenile hawksbills found foraging and resting in aggregations in the waters of the Fernando de Noronha archipelago and Rocas Atoll. Adult hawksbills are not observed at these sites.

A hawksbill turtle bearing tag number BR19547 was captured off Corisco Island (Equatorial Guinea). This hawksbill was tagged in 1998 in Fernando de Noronha (S 3º 51' 37.98'', W 32º 24' 59.09'') when it was captured in a feeding habitat on 22 November 1998 (Sanches & Bellini 1999). At the time of capture, the turtle had a curved carapace length of 51 cm, a curved carapace width of 44 cm, and a weight of 13.8 kg. It was recaptured on 19 January 2005 by a Corisco fsherman near the islet of Leva (0º 52' 37.98''N, 9º 18' 23.07''E), having travelled a straight-line distance of approximately 4670 km. It was described as being "a large female" and still double-tagged, although only one tag was recovered by researchers. No biometric data or further details were available from this recapture. The recovered tag appeared intact and in good conditions.

The frst record of a similar migratory link documented a hawksbill tagged by TAMAR in November 1994 and recaptured in 1999 also in Corisco Bay, but in Gabonese territorial waters (Bellini *et al.* 2000). To the authors' knowledge there is only one other record of cross-Atlantic hawksbill tag recovery: a turtle tagged by TAMAR in Atol das Rocas and recaptured in Senegal in 1990 (Marcovaldi & Filippini 1991).

Corisco Bay harbours important feeding and nesting habitats for four sea turtles species (*Chelonia mydas*, *E. imbricata*, *Dermochelys coriacea*, *Lepidochelys olivacea*), although it is primarily a green turtle foraging ground. In addition, it is an area of high coral and sponge abundance and juvenile hawksbills are often found here. Since the initial tagging of the migratory hawksbill reported here took place while at a juvenile stage and in a foraging habitat, it is possible that the Corisco region is also a breeding area for hawksbills or located along a route for their reproductive migrations. However, this is still uncon frmed, as the recapture took place at sea and the size or reproductive status of the turtle could not be ascertained. Nevertheless, this recovery con frms that hawksbills can undertake long-range migrations (Bellini *et al.* 2000; Bowen *et al.* 2007). To our knowledge this migration is among the farthest ever recorded for the species.

The Benga tribe communities in Corisco Bay are dedicated turtle hunters, supplying local and urban demand from nearby Libreville (Gabon) and Bata (Equatorial Guinea). Continued exploitation places strong pressure on the local hawksbill population and represents a serious threat to its survival. Conservation efforts are underway throughout the Gulf of Guinea region to address artisanal capture of both greens and hawksbill turtles. These results further highlight the importance of international cooperation in conservation efforts.

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IUCN-SSC Marine Turtle Specialist Group Quarterly Update

Roderic B. Mast[1], Nicolas J. Pilcher[2] & Brian J. Hutchinson[1]

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MTSG Annual General Meeting

The 2007 MTSG Annual General Meeting was held at the 27th Annual Sea Turtle Symposium in South Carolina, USA, on February 24, and 28. The meeting format was modified from previous years to include greater opportunities for member discussions. Two half-day sessions were held; one at the beginning and one at the end of the Symposium.

The first session offered the Co-Chairs and Regional Vice Chairs a chance to make brief presentations on specific themes – Rod Mast provided an overview of the results of the BI:3 Meeting held in August, 2006 and Brian Hutchinson presented the results of a Red List survey undertaken by Jeff Seminoff (who was unable to attend). Regional overviews were provided by Dimitris Margaritoulis and Paolo Casale for the Mediterranean (they were generous enough to halt the concurrent Mediterranean meetings and bring the entire Mediterranean contingent in to participate in the MTSG session), Kartik Shanker for South Asia, Alberto Abreu for the Wider Caribbean (including a fascinating look at the status of hawksbills in the Yucatan), Alejandro Fallabrino for the Southwest Atlantic, Manjula Tiwari for West Africa, and Blair Witherington for the North Atlantic. Their presentations and full meeting minutes are in preparation to be posted online at http://www.iucn-mtsg.org.

The second MTSG session was held on the closing day of the Symposium, and attended by more than 120 members and visitors. The first half of the session was focused on the topic of Red Listing, and specifically a discussion on the re-assessment of the olive ridley. The second half of the session was a discussion on MTSG plans to address the subject of use as it relates to marine turtles.

For the first half, an overview presentation on the olive ridley assessment and challenges was given by Alberto Abreu, the principle assessor, and an active discussion ensued over several issues relating to the assessment. In particular, the question over the application of A1 or A2 categories from the IUCN Red List Guidelines, and the complications posed by the fact that arribada-nesting olive ridleys and solitary-nesting ridleys exhibit strikingly different population trends. The full minutes of this meeting are being posted online at the MTSG website for access by MTSG members.

In the second half of the session, Nick Pilcher spoke on the topic of marine turtle use and led a discussion on the MTSG's role and future directions as they relate to this important theme. The main issues were a lack of responsiveness from potential donors on funding a workshop to bring MTSG people together on this important topic, and a call for someone within MTSG to take the lead in moving the effort address the issue forward. Since that time we are pleased to announce that several MTSG members, including Bill Irwin, Dave Owens and Pat Opay have offered to help drive the topic within the MTSG. Key among the first tasks will be to come up with a list of definitions of use (e.g. consumptive and non-consumptive), and their impacts on marine turtles. Please be on the lookout for more information on this topic.

Asia and Pacific Islands Bycatch Consortium

The inaugural meeting of the Asia and Pacific Bycatch Consortium was held between 15-16 February in Honolulu, USA, hosted by the Western Pacific Regional Fisheries Management Council. The Consortium was developed to foster collaboration among the commercial fishing industry; management authorities; seafood retailer industry; experts in fishing technology, marine ecology and fisheries science; and other interested parties working to promote the efficient direction of resources to solve bycatch problems in Asia and Pacific pelagic fisheries. The IUCN was invited to be part of this new initiative due to its global reach and organizational interest in solving bycatch-related issues, particularly with regard to endangered species. Nicolas Pilcher represented IUCN in his capacity as Co-Chair of the MTSG and also as a member of the SSC Marine Conservation Sub-Committee. The Consortium is envisioned to be a novel regional-level, voluntary, industry-lead approach to solve fishery bycatch problems, and sharing information with fishery management authorities and amongst the fishing and retail industries, and providing an efficient means to support implementation of recommendations and resolutions of the International Fishers Forum series, RFMOs and other international organizations.

The inaugural members first set out to determine the Consortium's initial objectives, namely to support and address specific pelagic longline and purse seine bycatch issues. With regard to longline fisheries (large-scale vessels and smaller vessels < 24 m in length), and at a visionary level, the consortium intends to (i) monitor and reduce bycatch of sea turtles and seabirds; (ii) monitor and promote management measures to ensure that shark catch levels are sustainable; and (iii) encourage practices to maximize post-release survival. For purse seine fisheries, the Consortium will monitor and reduce bycatch of juvenile target and other species. Within this framework, several short and long-term initiatives were then agreed-upon by the inaugural members.

SPREP Marine Turtle Action Plan Review Meeting

Nicolas Pilcher and Milani Chaloupka (Regional Vice-Chair, Pacific Region) recently provided MTSG input at the development of a new 5-year plan for the conservation of marine turtles in the South Pacific, hosted March 12-14 by the South Pacific Regional Environment Programme (SPREP) in Apia, Samoa. Other MTSG members in attendance included Ian Bell, representing the Queensland Parks Service, and Irene Kinan, from the Western Pacific Regional Fisheries Management Council. As a bit of background, in 2003 SPREP members agreed to a Regional Marine Species Programme Framework 2003 which included individual plans for dugongs, whales and dolphins, and marine turtles. These plans, which were developed with the expert advice of Col Limpus and George Balazs, were intended to enable the peoples of the Pacific

to take a primary role in achieving the following vision:

A Pacific Ocean where populations of whales, dolphins, dugongs and marine turtles have recovered to healthy levels of abundance, have recovered their former distribution and continue to meet and sustain the cultural aspirations of Pacific peoples.

The action plans are the collective responsibility of SPREP member states, the SPREP Secretariat, partner non-governmental and intergovernmental organizations, and private sector organizations. Network members agreed that the SPREP Secretariat would take primary responsibility for networking, information management and archiving, and annual reporting. The purpose of the recent meeting was for South Pacifc countries to provide updated information from their work/country/territory regarding implementation of the agreed actions from the previous Marine Species Action Plans, and to develop a new fve year agenda and priority action items for the region with regard to marine turtle conservation.

Milani gave an overview of population status by species, including major rookeries and nesting areas, while Nick made a presentation on threats to marine turtles, broken down by known and quantifable and the unknown, unquantifed threats. Both also provided input to the discussion sessions, and guided deliberations in line with known status and biology of the species in question. We feel it is important for the MTSG to continue to play a role providing the best available scientifc information and skills to regional programmes around the globe, and it was a great pleasure to be invited by the SPREP Secretariat to assist with the recent revisiting of their 5 year conservation plans. Further information can be obtained through the SPREP website at www.sprep.org

SWOT Report II Launched at 27th Sea Turtle Symposium

As a founding partner in the State of the World's Sea Turtles (SWOT) Initiative, the MTSG and its members have played an important role in this increasingly popular effort. This beautiful publication highlights global success stories that demonstrate positive actions that can be taken to conserve sea turtles and their habitats by policy makers, developers, fshers, polluters and coastal communities the world over. The *SWOT Report* is coordinated by CI's Sea Turtle Flagship Program and content is generated by a growing global network of hundreds of volunteers (the "SWOT Team") that provide both the data and the audience for a broad SWOT Initiative. *SWOT Report, Vol. 2's* centerpiece is a compilation of data on loggerhead and leatherback turtle nesting beaches of the world. Over the coming fve years, this dataset will be expanded to include all seven species of sea turtles, and will become a valuable means to visualize trends in sea turtle abundance on a planetary scale. These data can also be accessed online through www.seaturtlestatus.org, where SWOT has recently developed a mapping tool using Google Maps.

Another aspect of SWOT is an Outreach Toolkit that provides user-friendly, multi-lingual documents on "How to run an education/outreach campaign…" with a variety of different audiences from fshers to religious leaders, business interests and policy makers. These documents are available for free in English and Spanish on the internet at www.seaturtlestatus.org

MTSG Laments the Loss of an Old Friend

Sea Turtles and the MTSG have lost one of our greatest advocates, Ms. Frances Velay (1914-2007). An engaged philanthropist and deeply committed to the conservation of turtles, Miss Velay will be greatly missed. She was an ardent supporter of the MTSG and numerous other sea turtle related causes through her Panaphil Foundation. She truly loved turtles, and converted that love into action through her generous and heartfelt support of our work. Co-Chair Roderic Mast was able to speak to her by cell phone from Indonesia just minutes before her passing on January 20, and to thank her one last time for her lifelong love and commitment to turtles.

27th Annual Symposium on Sea Turtle Biology and Conservation: President's Report on the Symposium and ISTS Business

Michael S. Coyne

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The Symposium

Overview: The 27th Annual Symposium on Sea Turtle Biology and Conservation was a huge success. The Symposium returned to South Carolina, the "business" home of the International Sea Turtle Society, for the frst time in 10 years. With about 1000 participants from more than 80 countries, the Symposium's "Migration" theme was clearly evident.

The Kingston Plantation in Myrtle Beach proved to be an excellent location for the meeting. The facilities were such that we were able to keep all Symposium activities within close proximity to one another, and the hotel staff was friendly and extremely helpful. The open bars that we were able to negotiate with the hotel for the nights of the social and auction were huge hits. However, the Symposium would not have been a success without the help and support of all of my turtle friends.

Most notably, the Symposium would not have run as smoothly as it did without the tireless effort of Volunteer Chair Wendy Cluse and all of her excellent volunteers!

More than 400 abstracts were submitted, which provided the Program Chairs (Lisa Campbell and Matthew Godfrey), the Program Coordinators (Kartik Shanker and DuBose Griffn) and their 20-member Program Committee with a tremendous amount of work. Over 370 abstracts were accepted for presentation, and were included in the 296-page Book of Abstracts, made available to participants in PDF format in advance of the Symposium. The latter thanks to the fne work of the four compilers: Mike Frick, Aliki Panagopoulou, ALan Rees and Kris Williams. Symposium proceeding will be forthcoming in the very near future, printed and distributed thanks to Sheryan Epperly and the NOAA Southeast Fisheries Science Center.

On the 22nd-24th February, several regional meetings took place including: the 6th Mediterranean Reunion, the 14th Latin American (RETOMALA) meeting, the Wider Caribbean Sea Turtle Network (WIDECAST) meeting, the Indian Ocean Sea-East Asia (IOSEA) meeting, and the Africa meeting.

The Symposium kicked off on 24th February with a special Carolinas Session and an event open to the public entitled "Sea Turtle Discovery Day". The Carolinas Session was co-hosted by Sally Murphy and Matthew Godfrey and included talks by Jean Beasley, Betsy Brabson, and Sally Murphy. The audience divided up into discussion groups to tackle issues such as dredging, beach nourishment, nest relocation and beach driving.

The regular program followed with concurrent sessions running until the morning of the 28th. In total there were 112 oral and 241 poster presentations, covering the following sessions: Anatomy, Physiology, and Health; Behavior and Movement; Conservation and Management; Ecology and Evolutionary Biology; Education, Outreach and Advocacy; Fisheries; Law and Policy; Population Biology and Monitoring – Beach and In-Water; and Social Sciences.

The regular sessions culminated with a special plenary session on Tracking Marine Vertebrates for Conservation, sponsored by Inter-Research (http://www.int-res.com/) and organized by Brendan Godley of the Marine Turtle Research Group (University of Exeter) and Editor in Chief of *Endangered Species Research* - ESR *(http://www.int-res.com/journals/esr/)*. The program for this mini-symposium was excellent, with an introduction on sea turtles by Brendan followed presentations by Mike Fedak, Molly Lutcavage, Bruce Mate and an outstanding finale by Rory Wilson. These reviews will form the core of a future special themed issue of ESR.

Posters this year were conveniently located near the presentation halls, and adjacent to the coffee breaks and vendor area. Posters were split into two sessions, each with a day-and-a-half viewing time and two "Question & Answer" periods of 1.25 h each. The timely preparation and the smooth running of the program, as well as the efficient arrangement of the posters would not have been possible without the dedication of the Program Officers, the Program Committee, the Session Chairs and the Poster Session Chair, Bill Irwin.

We had hoped to have all posters up throughout the entire Symposium, but the large number of poster submissions made this impossible. This left a very short period of time for attendees to visit all of the posters and presents a continuing problem that the Symposium organizers need to resolve. The organizing committees have been working very hard to ensure that poster presentations are perceived to be of equal value to oral presentations, but this continues to be a struggle. As I see it, there are four potential solutions: 1) extend the symposium so each of the two poster sessions will be longer and there will be time for more oral presentation; 2) reduce the number of posters so that all will fit into one poster session; 3) double the space allotted to posters so that all posters can be displayed at once; or 4) continue as-is. If anyone has any thoughts or suggestions I would be very interested in hearing them.

On 1st March, the Annual Meeting of the SSC/IUCN Marine Turtle Specialist Group convened. See this issue (MTN 116:27-28) for details.

The Archie Carr Best Student Paper Award: Ten awards were given to the best student oral and poster presentations, and runners-up, in the categories of Biology and Conservation. In total, the Judging Committee examined 130 contributions. The award certificates were accompanied by an honorarium, including a subscription to Chelonian Conservation and Biology. Anders Rhodin, through the Chelonian Research Foundation, is a major contributor to the student award fund. And I would like to extend an extra-special thank-you to the co-chairs of the Judges, Lisa Campbell and Jeanette Wyneken, as well as the 20-member Judging Committee for this important task. A formal reporting of the best authors and their presentations will appear in the Symposium Proceedings.

Travel Grants: In total, 189 travel grants were distributed by the Regional Travel Chairs, as cash and "free" rooms, through generous donations from Western Pacific Regional Fishery Management Council, US Fish & Wildlife Service, US National Marine Fisheries Service, Florida Power and Light, Disney's Animal Kingdom, Sirtrack Ltd, and the Marine Conservation Society (MCS). There were also several smaller donors and "room sponsors", too many to be mentioned here. Raising funds in advance of the symposium to support student and international travel is always a challenge. We spent about 75,000 USD on travel grants, including housing for 184 people. Ed Drane, Barbara Schroeder, Sheryan Epperly, Earl Possardt, Sandy MacPherson, Irene Kinan, J Nichols and Elena Finkbeiner provided invaluable assistance in securing funds and in fund-raising efforts. The delicate job of allocating travel grants was once again expertly handled through the efforts of the Travel Committee Chair, Hoyt Peckham, and the Regional Travel Chairs Alan Bolten, Karen Eckert, Alejandro Fallabrino, Angela Formia, Aliki Panagopoulou, Nicolas Pilcher, and Kartik Shanker.

Media: We had a strong showing in the press thanks primarily to the efforts of Heather Crunchie, of Splash Communication, who donated her time to the cause. In total we had more than a dozen press outputs, including stories in local media outlets, a large full page graphic in a local newspaper, and several on-site interviews.

Local Participation: Approximately 300 members of the public attended the previously mentioned Sea Turtle Discover Day, which featured Jersey and Harley, sea turtle patients at the Karen Beasley Sea Turtle Rescue and Rehabilitation Center in Topsail Beach, N.C. Members of the public were also treated to turtle talks by Jean Beasley, Lucy Hawkes, and Charlotte Hope. The Karen Beasley Sea Turtle Rescue and Rehabilitation Center contributed two turtle mascots to interact with the public, along with Gilly the Sharky from Mote Marine Lab, Sharkee from Ripley's Aquarium, the infamous Mr. Leatherback, and two friends from the South Carolina Aquarium. Finally, visitors and Symposium attendees were treated to nearly 200 works of art as part of a global art project, submitted by students from the Carolinas and as far away as Greece and Gabon.

Vendors: Vendor chair Janet Hochella deserves special thanks for organizing a large number of vendors in a very successful effort. Between the public visitors and very generous attendees, many of the vendors sold out before the Symposium was over.

Entertainment: One of the highlights of each Symposium is the Auction. Attendees contributed a large number of wonderful items. These were well arranged and organized by my lovely wife and Auction Chair Lynette Coyne. The live and silent Auctions were a huge success bringing in a record 25,000 USD. A special thanks to Jen Homcy for her invaluable contributions to the auction, Ed Drane and his team from the Hilton Head Island Sea Turtle Protection Project, auctioneer Rod Mast, and all of the attendees that contributed to the auction.

The coffee breaks between sessions provide an excellent opportunity to mingle, compare notes and meet the presenters. The Caribbean Conservation Corporation, CLS America, Inc., Ripley's Aquarium, the South Carolina Aquarium, Turtle Time, Inc., Wildlife Computers, and the Charleston Coffee Roasters, which provided the coffee, generously supported these invaluable events.

I would like to thank all participants, all sponsors and donors, all members of Committees and Task Forces, all of the wonderful volunteers, and all of my friends for helping make this Symposium a great success. Finally, many thanks to Sue Ranger for designing the migration logo and graphics, and Kristy Long for developing the printed program.

ISTS Business

Three major issues were presented at the Annual Plenary Business Meeting in Myrtle Beach: nominations, resolutions, and online voting.

Nominations & Elections: The 5-member Nominating Committee (NC) evaluated each of the nominees for open seats: two on the Board of Directors (BoD) and three on the NC. The NC presented a slate to the BoD, and after some revisions, the BoD presented a final slate of candidates to the membership. Following a secret ballot at the Plenary, the following candidates were elected: Jean Beasley and Marydele Donnelly for the BoD positions, and Felix Moncada Gavilan, Aliki Panagopoulou, and David Owens for the NC. In addition, the NC recommended that the BoD approve the following slate for the Executive Committee: President-Elect Colin Limpus, Treasurer Edwin Drane, Secretary Manjula Tiwari. The BoD accepted this slate and it was approved unanimously by the general membership during the Plenary. I would like to congratulate the new members and also thank the departing BoD members Milani Chaloupka and Jeffrey Seminoff, the past president Roderic Mast, and the NC members Larisa Avens (Chair), Jeanette Wyneken and Angela Formia. For complete details visit the ISTS website (http://www.seaturtle.org/ists/nominations.php).

Resolutions: One resolution was submitted to the Resolutions Committee for the 27th Symposium. After review and editing the resolution was accepted by the Resolutions Committee and the BoD, and subsequently presented to the membership in Myrtle Beach, South Carolina (USA). The following resolution was passed during the Plenary Business Meeting:

Resolution to urge countries to adopt, strengthen, and implement domestic legislation to protect sea turtles from international trade.

The full text of the resolution can be found on the ISTS website (http://www.seaturtle.org/ists/). I would like to thank the Resolutions Chairs, Jeff Seminoff and Nancy FitzSimmons, and their excellent Committee for a very professional job.

Online voting: A motion was passed during the Plenary Business Meeting in Myrtle Beach to try online voting for future ISTS elections. An online voting system will be established this summer and all members of the ISTS will be asked to test the system by voting on a proposal to establish online voting. The results of this vote will dictate whether or not online voting is utilized in advance of the 2008 Symposium in Mexico.

Concerning the ISTS business, I would like to express my sincere thanks to the members of the Executive Committee (Michael Coyne, J Nichols, Dimitris Margaritoulis, Edwin Drane, Manjula Tiwari), the members of the Board of Directors (Clara Padilla, Milani Chaloupka, Jeffrey Seminoff, Hedelvy Guada, Naoki Kamezaki, Donna Shaver, Nancy FitzSimmons, Lisa Campbell, Brendan Godley, Kartik Shanker) and the two past presidents participating at the BoD meetings (Roderic Mast, and Thane Wibbels), for their advice and support.

Finally, I thank Matthew Godfrey, Brendan Godley, and Manjula Tiwari, for their comments while I was drafting this report.

NEWS AND LEGAL BRIEFS

This section is compiled by Kelly Samek. You can submit news items at any time online at <http://www.seaturtle.org/news/>, via e-mail to news@seaturtle.org, or by regular mail to Kelly Samek, 127 E 7th Avenue, Havana, Florida 32333, USA. Many of these news items and more can be found at http://www.seaturtle.org/news/, where you can also sign up for news updates by E-mail. Note that News Items are taken directly from various media sources and do not necessarily reflect the views or opinions of the editorial members of the MTN.

GLOBAL

Global Warming Places Some Turtles at Risk

A British-led study has determined North American marine turtles are at risk if global warming occurs at predicted levels. University of Exeter scientists say an increase in temperature of 1 degree Celsius could eliminate the birth of male turtles from some beaches. A rise of 3 degrees Celsius would lead to extreme levels of infant mortality and declines in nesting beaches across the United States. The researchers analyzed 26 years of loggerhead turtle nesting and climate data and compared the findings with models for future temperatures. The research, conducted in partnership with the Bald Head Island Conservancy and the North Carolina Wildlife Resources, appears in the journal Global Change Biology. Source: *UPI*, 20 February 2007.

AFRICA

Marine Turtle Nestings on the Rise in South Africa

Loggerhead nestings have reached record levels in South Africa, a positive sign for the endangered marine turtle. According to monitoring conducted by WWF-South Africa over the 2005-06 season, more than 2,000 loggerhead nestings were recorded along a 56km stretch of the northern KwaZulu Natal coastline. Populations of the more critically endangered leatherback turtle are also thriving here, with an average of 70–80 nestings per season. One of the main contributing factors to the stability of South Africa's marine turtle populations is that they breed almost entirely within the Greater St Lucia Wetland Park, which is a designated marine protected area and World Heritage site. Elsewhere, populations are in decline due to the consumption of turtle meat and eggs in poverty-stricken coastal

areas, and as a result of fsheries bycatch and abandoned drift nets. Source: *WWF press release*, 19 February 2007.

Lobby Groups Raise Concerns Over Threat to Turtle Habitats

Marine conservationists have raised fresh concern over the alarming number of turtle deaths along the Kenyan coast. Over the last two years, many dead sea turtles have been swept ashore on the Kenyan coastline. Conservationists attribute the deaths to bad fshing methods. Project coordinator of the local Ocean Trust/Watamu Turtle Watch Steve Trott said the biggest threat was posed by trawling in shallow waters. The use of gill nets, jariffe nets and industrial long line fshing is also to blame. Mr. Trott said the death toll for Watamu only could be as high as 400 annually and was a very small fraction of cases along the entire Kenyan coastline. Most of the dead turtles, the conservationists say, have their fippers cut off at the shoulder and severe lacerations around the neck, which are caused by large fshing nets. The Kenya Sea Turtle Conservation Committee, the organisation that looks into the welfare of sea creatures, says 85 per cent of the causes of deaths and threats to turtles are due to human activities. Source: *The Daily Nation*, 9 April 2007.

THE AMERICAS

Turtle Numbers Cause Concern

The loss of almost 40 percent of loggerhead turtle nests on Florida beaches between 1998 and 2005 has prompted a vigorous lobbying effort for legislation to protect sea turtle populations and their habitats. Joined by the University of Florida's Archie Carr Center for Sea Turtle Research and the Florida Fish & Wildlife Commission, turtle conservationists worldwide have been emphasizing the critical role turtles play in the health and fertility of ecosystems through which they travel. Loggerhead strandings in 2004 and 2005 were the highest since 1989, the frst year records were kept by the commission. Some 800 loggerhead carcasses were washed up on Florida's shores in 2005. But that may be just a fraction of the true count, because they sink to the bottom after being caught by fshermen. Shrimp lines and longlines used to catch tuna, sharks and sword fsh in deep waters off the coast of Southwest Florida kill most turtles. Source: *Venice Gondolier*, 14 January 2007

Male Turtle Populations Crashing in the Heat

The gender of marine turtle offspring is determined by the temperature at which the eggs are incubated: high temperatures lead to a higher proportion of females. In Florida, 90% of offspring are females, while in North Carolina, female turtles make up a more balanced 58% of the population. Male loggerhead turtles could entirely disappear from the beaches of Florida if the temperatures there rise by 2°C, according to a new study. This gender imbalance means female turtles in Florida will be increasingly reliant on male turtles migrating from North Carolina, hundreds of miles up the Atlantic coast, in order to breed. And as the coast warms, the northern male turtle population will fnd it harder to meet such breeding demands, the researchers fear. Researchers believe that some males may already be travelling south from North Carolina to reproduce, bolstering the populations there. Source: *New Scientist*, 21 February 2007.

Authorities Check Fishing Vessels in Suriname

Under the auspices of the US Food and Drugs Administration (FDA), Suriname's Ministry of Agriculture, Animal Husbandry and Fisheries has conducted inspections on fshing trawlers. The vessels were scrutinised as to whether installed turtle excluder devices (TED) were functioning properly. Offcials inspected the trawlers of the state-owned Suriname American Industries Ltd, Suriname Japan Fisheries and Guiana Seafoods. So far, only one fshing net was found not in accordance with the guidelines. The offcials also traveled to sea with several of the boats to watch their operations. In July 1999 Suriname was certifed by the US State Department stating that the country was adhering to the acceptable fshing practices regarding the conservation of sea turtles. With this certifcation fshing companies were allowed to continue shrimp exports to the US market. Source: *Caribbean Net News*, 27 February 2007.

Mexican Wrestler Campaigns to Stop the Enemies of the Sea

Mexico's famous professional wrestler "Hijo del Santo," or "Son of the Saint" broadened his battle arena to encompass the Pacifc Ocean's eastern coastline, where overfshing, turtle egg hunting, and pollution are threatening marine resources. In addition to performing acrobatic duels in the ring with opponents dressed as evil characters, the silver-masked "Hijo del Santo" pledged to devote the greater part of this year helping to raise consciousness about how human actions are threatening the ocean. The wrestler will aid the nongovernmental, U.S.-based organization WildCoast with its campaign to stop sea turtle consumption in Mexico, defend protected areas on California's coast, and promote saving the gray whales in Baja California. To raise consciousness, El Hijo will visit various coastal communities in northern Mexico, where he will distribute educational comics featuring his character confronting threats to the ocean. Source: *Surfline.com*, 13 March 2007.

ASIA

Turtle-friendly Fishing Hooks to be Introduced Here

London's Marine Conservation Society (MCS) has joined hands with Young's Sea Food and fshermen in Sri Lanka to introduce a turtle friendly fshing hook that would save the island's endangered sea turtles. It is estimated that thousands of Sri Lanka's sea turtles are accidentally snagged by longline fshing hooks every year. More than 30,000 circular turtle friendly hooks are being implemented by a feet of seven longline fshing vessels, the MCS said. The new circular fshing hooks will replace the traditional 'J' shaped ones. The traditional hooks could snag turtles or can be swallowed by them leading to suffocation or internal bleeding caused by injuries. It is expected that the new kind of fshing hooks will reduce the deaths of 90% turtles caught in the longline fsheries. But the 30,000 hooks distributed will be only fraction of the total number of hooks necessary in Sri Lanka. If the experiment is successful, the retail chain will work with the supplier, Young's Sea Food to distribute the turtle friendly hooks with the rest of the fshermen who use J shaped hooks. Source: *The Daily News* (Sri Lanka), 5 March 2007.

Taiwan Sets Up Turtle Reserve on Disputed Island

A green turtle reserve has been established on a disputed South China Sea island where fshing boats from surrounding nations hunt

the endangered species, a local official said. The Marine Bureau of Kaohsiung, a south Taiwan port city, has declared the ocean around Taiping Island a protected area for at least two subspecies of green turtle that frequent the area and are listed internationally as endangered. Brunei, China, Malaysia, Vietnam and the Philippines also claim the 51 Spratly islands and reefs, of which Taiping is the largest at 489,500 square meters and least prone to sand or mud erosion that hurts turtles, said Cheng Yi-chun, a professor at Taiwan National Ocean University. Source: *Reuters*, 12 March 2007.

OCEANIA

Turtles May Fall Victim to Australian Gas Project

Environmentalists say that Barrow's fatbacks may be among the victims of a plan by the oil giant Chevron to use Barrow Island for a roughly $8.6 billion project meant to supply natural gas to Japan and other energy-hungry nations. Chevron and its minority partners in the venture, Exxon Mobil and Shell, say that Barrow is the only commercially viable location for the plant, which will liquefy gas piped from the Greater Gorgon gas fields 70 kilometers, or 43 miles, out to sea before it is then poured into enormous tankers. Environmentalists dispute the partners' contention that only Barrow will do, and say that not even their best efforts can prevent such a large project from causing irreversible damage to the island's unique environment. In June, the state of Western Australia's own Environmental Protection Authority agreed, rejecting the project. Chevron appealed, and in December the state's environment minister overruled the EPA, approving the project subject to new conditions that are still being determined. Gorgon's partners now need only the approval of the Australian federal government. A spokesman for Malcolm Turnbull, the Australian minister for environment and heritage, said that the government was still assessing the project. Source: *International Herald Tribune*, 6 March 2007.

RECENT PUBLICATIONS

This section is compiled by the Archie Carr Center for Sea Turtle Research (ACCSTR), University of Florida. The ACCSTR maintains the Sea Turtle On-line Bibliography: (http://accstr.uf.edu/biblio.html). It is requested that a copy of all publications (including technical reports and non-refereed journal articles) be sent to both:

1) The ACCSTR for inclusion in both the on-line bibliography and the MTN. Address: Archie Carr Center for Sea Turtle Research, University of Florida, PO Box 118525, Gainesville, FL 32611, USA.

2) The editors of the Marine Turtle Newsletter to facilitate the transmission of information to colleagues submitting articles who may not have access to on-line literature reviewing services.

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The remit of the *Marine Turtle Newsletter (MTN)* is to provide current information on marine turtle research, biology, conservation and status. A wide range of material will be considered for publication including editorials, articles, notes, letters and announcements. The aim of the *MTN* is to provide a forum for the exchange of ideas with a fast turn around to ensure that urgent matters are promptly brought to the attention of turtle biologists and conservationists world-wide. The *MTN* will be published quarterly in January, April, July, and October of each year. Articles, notes and editorials will be peer-reviewed. Announcements may be edited but will be included in the forthcoming issue if submitted prior to the 15th of February, May, August and November respectively. All submissions should be sent to the editors and not the members of the editorial board. A contact address should be given for all authors together with an e-mail or fax number for correspondence regarding the article.

Text

To ensure a swift turnaround of articles, we ask that, where possible, all submissions be in electronic format either as an attached file in e-mail or on compact disc in Word for Windows or saved as a text file in another word-processing package. Should these formats not be suitable, authors should contact the editors to seek alternative arrangements. If internet access or compatible computer facilities are not available, hard copies of the article can be sent to the editors by mail or fax.

Scientific names should be italicised and given in full in their first appearance. Citations in the text should be in **alphabetical** order and take the form of: (Carr *et al.* 1974; Hailman & Elowson 1992; Lagueux 1997). **Please keep the number of references to a minimum.**

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For a book:

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For an article in an edited volume;

GELDIAY, R., T. KORAY & S. BALIK. 1982. Status of sea turtle populations (*Caretta caretta* and *Chelonia mydas*) in the northern Mediterranean Sea, Turkey. In: K.A. Bjorndal (Ed.). Biology and Conservation of Sea Turtles. Smithsonian Institute Press, Washington D.C. pp. 425-434.

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BJORNDAL, K.A., A.B. BOLTEN, C.J. LAGUEUX & A. CHAVES. 1996. Probability of tag loss in green turtles nesting at Tortuguero, Costa Rica. Journal of Herpetology 30:567-571.

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