Four Years of Marine Turtle Monitoring in the Gamba Complex of Protected Areas Gabon, Central Africa

2002-2006

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and:

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Acronyms

ASF	*Aventures Sans Frontières*
APDN	*Association des Pêcheurs Artisanaux du Département de Ndougou*
BBPP	Bioko Biodiversity Protection Program
CAFPAP	Central African Forest and Poverty Alleviation Programme
CAWFHI	Central African World Forest Heritage Initiative
CBG	*Company du Bois du Gabon*
CENAREST	*Centre National de la Recherche Scientifique et Technologique*
CITES	Convention on International Trade in Endangered Species
CMS	Convention of Migratory Species
CNPN	National Parks Council – *Conseil National des Parcs Nationaux*
CRAP	After Oil Reflection Committee *(Comité de Réflexion Après-Pétrole)*
DFC	Directorate of Wildlife and Hunting – *Direction de la Faune et de la Chasse* (MEFEPCEPN)
EU	European Union
ENEF	*Ecole Nationale des Eaux et Forêts*
IBONGA-ACPE	Association for Understanding and Protection of the Environment – Ibonga - *Association pour la Connaissance et la Protection de l'Environnement*
HSE	Health Security and Environment Department, Shell-Gabon
IOSEA	Indian Ocean and South East Asia
IUCN	World Conservation Union
KUDU	Protection of Marine Turtles in Western Africa
MEF(EPCEPN)	Ministry of Water and Forests – *Ministère de l'Economie Forestière, de la Pêche, du Reboisement charge de l'Environnement et de la Protection de la Nature*
MTCA	Marine Turtle Conservation Act
NGO	Non Governmental Organization
Pont Dick	Name of Research Area
PROTOMAC	*Protection de Turtues Marine d'Afrique Central*
PSVAP	*Programme Sectoriel de Valorisation des Aires Protégées*
SCD	Society for Conservation and Development
SFN	Société Forestière de la Nyanga
SG	Shell Gabon
SI	Smithsonian Institution
SPREP	South Pacific Regional Environment Programme
WIDECAST	Wider Caribbean Sea Turtle Conservation Network
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature
WWF-CARPO	WWF-Central Africa Programme Office
WWF-LAC	WWF-Latin America and the Caribbean
WWF-IOSEA	WWF-Indian Ocean and South East Asia
USFWS	United States Fish and Wildlife Service

Abstract

Gabon holds one of the largest leatherback (*Dermochelys coriacea*) populations in the world, but still little is known about their population dynamics, foraging behaviour, nest ecology and threats. In Total, we find four species of marine turtles nesting on its beaches. The leatherback and the olive ridley are regular nesters and the green turtle and the hawksbill turtle are rare.

Since 2002 WWF and Ibonga have set up a Marine Turtle Monitoring Programme in the Gamba Complex of Protected Areas, in the south-west of Gabon. The main objective of our Marine Turtle Programme is to conserve marine turtles by assisting the Government of Gabon in developing capacity to effectively manage the parks and reserves in the Gamba Complex. Our activities include protection, monitoring, scientific research, building capacity and awareness raising. The main focus of this programme is on leatherbacks because of its predominant presence in the area.

The monitoring Programme is executed on a daily, weekly and quarterly basis. The daily monitored zone is 5,75 km of beach near Gamba. 75 km of beach to the north and south of the daily monitored zone, is monitored on a weekly basis by quad. During the 2005/2006 season, the whole Gabonese coastline was monitored by plane every month between November and March in cooperation with all the partners working on marine turtles in Gabon. Furthermore, the migration of leatherbacks is monitored in the Atlantic Ocean using satellite transmitters, initiated by WWF-LAC.

Over the four years of intensive monitoring (2002-2006) the results show a steady decrease in the leatherback nesting numbers over the first three years, followed by an increase in the fourth season. The population nesting in the Gamba Complex the fourth year is estimated at 2,500 individuals. Human activities in the Complex mostly concern egg poaching, as well as pollution of the beach with trash, light and oil. A permanent presence of MEF and WWF are of great importance to monitor these threats. Thanks to their presence since 1985, human activities are not at a level that endangers the survival of marine turtles today. However a wave of dead turtles was found on the beaches in the south of Gabon between September and October 2005. This might have been caused by one of the many, and still very little monitored, marine threats (fisheries, pollution). The greatest threat to the eggs and the hatchlings on the beach are natural threats; erosion, inundation, destructive roots and predation. The common predators are ghost crabs, monitor lizards and the civet cat. The hatchery showed its effectiveness to protect the eggs from these threats and served at the same time as tool to raise awareness amongst school children and tourists. The nest temperatures were higher in the nests in the hatchery than on the beach which led to shorter incubation periods. Though the temperature was not so high as to cause an impediment for development of the eggs, as the hatching success in the nests in-situ on the beach was not significantly different from that in the nests in the hatchery. The leatherbacks covered at least 100 km during intra-seasonal migrations and inter-seasonal migrations covered the whole Atlantic basin. The latter was proved by the capture of a leatherback near the coast of Argentina in 2005 tagged in Gamba in 2003 (Billes *et al.* 2006). The exact migration routes will be better known thanks to three transmitters deployed during the 2005-2006 season.

The combined efforts of WWF, Ibonga and PSVAP, with financial support from Protomac have resulted in the recruitment and training of 20 people as marine turtle researchers, and a successful tourist package, attracting at least 90 tourists during the fourth season. The collaboration with local and international partners have created a solid foundation for a long term monitoring programme. Only long term monitoring of nesting beaches and migration patterns will lead to a coherent approach for conservation of these highly migratory endangered reptiles.

1 Introduction

1.1 General introduction

There are seven species of marine turtles: leatherback, loggerhead, olive ridley, hawksbill, green, flatback and Kemps ridley. Marine turtles are found in the tropical and temperate waters around the world, except for leatherbacks which are also found in colder waters. All species have been listed in Annex 1 of the CITES (forbidding international trade to and from signatory countries) and Annexes 1 (except the flatback) and 2 of the CMS (strict conservation of the species and necessary agreement on international cooperation). They are all also listed on the IUCN red data list as "Endangered" (*Chelonia mydas, Lepidochelys olivacea, Caretta caretta*) or "Critically endangered" (*Dermochelys coriacea, Lepidochelys kempii, Eretmochelys imbricata)* except for the flatback turtle which is listed as data deficient.

In Gabon all four species nesting in Gabon (leatherback, olive ridley, hawksbill and green turtle) are 'fully protected' by law.

All seven species of marine turtles are threatened by a number of human related issues. Marine turtles have been the victim of direct exploitation for centuries. Human uses of beaches are not necessarily incompatible with successful turtle nesting, but, all too often, development or expansion of coastal leisure complexes occur in the absence of appropriate conservation measures. Other threats are the slaughter of female turtles while onshore, egg collection, incidental catch of turtles by fishermen and pollution (Fretey 2001). Marine turtles are also subject to natural threats such as predation, erosion and inundation. In light of the human-related threats that turtles face, these natural threats have become an issue for conservation.

Recent research suggests that Gabon may host one of the largest leatherback nesting populations in the world. A preliminary study based on three aerial surveys of the coastline carried out in 2003 by WCS estimated that approximately 1,000-1,500 nests are laid on an average night on Gabonese beaches during the peak month of the nesting season (Sounguet et al. in press). PROTOMAC's research estimated that approximately 30,000 nests were laid just along Mayumba's 96.5 km beach during the 1999-2000 nesting season (Billes et al. 2000). For comparison, Hilterman and Goverse (2002) estimated 30,000 nests in Suriname in 2001, 15,000 in French Guyana, and a total of approximately 50,000 in Suriname, French Guyana and Guyana combined. The global leatherback population estimate of 34,500 nesting females (Spotila et al. 1996) significantly underestimated the size of the Gabonese population at 5,000 adult females (calculated from Fretey & Girardin 1988). A rough extrapolation suggests at least 30,000, and perhaps as much as 50,000 leatherback nests per season along Gabon's 850 km coast. Revising the global figures using a conservative Gabonese estimate of 30,000 nests per season, or approximately 15,000 adult females in the population (based on 5 nests per female and a re-nesting interval of 2.5 years), it can be concluded that Gabon's leatherbacks represent as much as 30% of the global population and is therefore critical for the survival of the species.

In Africa, relatively little is known about the nesting behavior and numbers of individuals nesting on the continents beaches. Baseline data is vital for management, to make decisions and take the necessary conservation measures. This study focused mainly on the leatherback turtle because of the high numbers nesting in Gabon and its role as a Global Flagship species.

The aim of this project is to protect the populations of nesting marine turtles and their habitat in Gabon by means of research in order to develop better conservation strategies, education programs, local, national and international partnerships and to raise public awareness and build conservation capacity among the local population and Wildlife Management authorities, as well as to create an attractive ecotourism product.

1.2 Stakeholder mapping

Key stakeholders currently actively involved in turtle protection in Gabon are:

- The Ministry of Water and Forests and National Parks (MEFPCEPN).
- The National Parks Council (*Conseil National des Parcs Nationaux – CNPN)*, composed of representatives from the Primature. The CNPN is responsible for supervising the development of the new National Park Network. A Law on National Parks is currently under preparation which includes the establishment of a semi-autonomous entity responsible for the management of Gabon's network of 13 NPs.
- The Wildlife Conservation Society (WCS), that provised technical and financial support to the local NGO ASF for turtle work in the northern part of Loango NP, in Mayumna BP and in Pongara NP.
- The Protection for Marine Turtles in West Africa (KUDU) is co-coordinating sea turtle research and protection projects in West Africa.
- Protection of Marine Turtles in Central Africa (PROTOMAC) which works under The KUDU program with projects in Cameroon, Sao Tome, Congo and Gabon.
- Ibonga, a local environmental education association - *Association pour la Connaissance et la Protection de l'Environnement* – which hires the local recruits for the research team.
- ASF (Aventures Sans Frontières), a Gabonese Environmental NGO with marine turtle projects in Iguela, Mayumba and Pongara.
- Gabon Environnement, a Gabonese Environmental NGO with marine turtle projects in Mayumba and Pongara
- University of Glasgow.

For the key stakeholders for broader conservation and sustainable development activities in the Gamba Complex, we refer to WWF-Gamba website (www.panda.org/africa/gamba)

1.3 Objectives of the project

General

The main objective of our Marine Turtle Programme is to conserve marine turtles by assisting the Government of Gabon in developing capacity to effectively manage the parks and reserves in the Gamba Complex. Our activities include protection, monitoring, scientific research, building capacity and awareness raising.

Scientific

This study was started in 2002 by Billes (PROTOMAC) and Huijbregts (WWF). After four years, the Marine Turtle Monitoring Programme has developed a solid foundation for long term marine turtle conservation in the area.

The scientific objectives of the study are:

- Monitor the numbers of the four species of marine turtles nesting on 5.75 kilometers of beach in the Gamba Complex;
- Determine the total number of clutches the turtles lay;
- Identify inter-nesting intervals, remigration rates and beach fidelity, by means of tagging programmes;
- Determine nest and hatching success for *in situ* nests and nests in the hatchery;
- Determine nest temperatures and biometry of hatchlings *in situ* and *ex situ* (hatchery)
- Obtain biometric data on nesting turtles;
- Contribute to a genetic fingerprint of the leatherback population nesting in Gabon;
- Investigate nesting habitat quality and the threats faced by adult turtles, hatchlings and eggs;
- Contribute to the mapping of migration of leatherback turtles in the Atlantic Ocean

Social

This project did not solely focus on scientific research. Equally important were capacity building, education, international, national and local collaboration as well as the identification of incentives for the local population for conservation e.g. through ecotourism.

Long term objectives

- Arrive at an institutional exchange mechanism through the joint preparation of an annual "Gabon State of the Marine Turtles Report".
- Insight in migration and foraging behaviour of the leatherback population nesting in Gabon.
- Integrate ecotourism in sustainable conservation of marine turtles.
- Train a national expert to train local research assistants to monitor and manage marine turtle research and conservation.
- Continue and intensify environmental education with the local environmental education NGO Ibonga through environmental education in schools and on beach excursions.
- Acquire additional long term scientific data on habitat quality, predation, hatching success, hatchling sex ratio and pollution.

1.4 Sea turtles in Western/Central Africa

According to Fretey (2001), in Western Africa, the leatherback is widely spread and nesting occurs from Mauritania to Angola. The leatherback nests on the coasts of all countries in Central Africa. Three juveniles (17 to 21 cm) have been observed as far as south of the island of Principe.

Green turtles show the same distribution pattern as the leatherback, from Mauritania to Angola. The nesting of green turtles has been reported on all countries along the Central African coasts with favourite sites on the islands of Bioko and Sao Tome and Principe. Immature turtles often swim in the coastal waters of Cameroon, Equatorial Guinea, Sao Tome and Principe and Gabon. Sea grasses in Corisco Bay on the border between Equatorial Guinea and Gabon constitutes a very important feeding zone for adult green turtles.

The northern limit of distribution of the olive ridley seems to be situated between Mauritania and Cape Verde and the southern limit near Angola. The olive ridley nests in practically every country from Guinea-Bissau to Angola. The olive ridley nests on all Central African beaches, even on islands (Bioko and Sao Tome), which is rather unusual for this species. The Cameroon estuary is thought to be a feeding and growing zone for this species.

The northern limit of the distribution of the hawksbill seems to be situated between Mauritania and Cape Verde and the southern limit near Congo. The hawksbill apparently only occasionally nests on the island beaches of Bijagos, Bioko, Sao Tome and Principe, Equatorial Guinea and in Gabon. Juveniles can be seen in the waters of Equatorial Guinea (island and continental part) in the Sao Tome and Principe Archipelago, Gabon, Cameroon and Congo. Nesting is still to be confirmed in Cameroon and Congo.

The loggerhead is mainly seen in the northern part of West Africa and only sporadically appears south of Cape Verde. The nesting of the loggerhead in Central Africa has not yet been confirmed. Mating has been observed in the Sao Tome waters and fishermen sometimes catch adult loggerheads of both sexes.

The species which is most rarely seen on the Western African coasts is the kemp’s ridley. It has only sporadically been seen in northern waters and has never been seen nesting in the region.

The presence of marine turtles in Gabon was first mentioned by Duméril (1860) in his report on reptiles in Western Africa. However, it was Fretey (1984) who informed the scientific community about the existing nesting sites of the leatherback south of Libreville. Since then, the importance of Gabon’s beaches for nesting marine turtles has been shown on several occasions. This study in the Gamba Complex of the Protected Areas is one of three main ongoing monitoring projects in Gabon, providing a large portion of the research and data on marine turtles enabling the Government to make informed decisions about this important resource.

1.5 Protection

Marine turtles have been exploited by men since prehistoric times. Local extinctions have already taken place in all oceanic basins. Central Africa is no exception, marine turtles are victims of many threats. They are killed for their meat, their eggs are collected and their shell is used in local craft industries. In certain areas, traditional sea turtle fishing exists. Other threats are by-catch and severe habitat alterations or deteriorations caused by industrial fisheries and pollutions, artificial lights preventing the nesting of turtles on certain sites or the running aground of logs barring turtles' way on the beaches, and the possible impacts of oil production. Even though the latter are under-studied in Central Africa and difficult to estimate, it is worth mentioning that laboratory research has shown how sea turtles can be greatly affected by petroleum, for instance oil on the skin can affect respiration and salt gland functions (Lutcavage, 1997).

The four marine turtle species found in Gabon (leatherback, olive ridley, green and the hawksbill) are protected by law, but the lack of law enforcement capacity means that the turtles do not always benefit from the legislation.

1.6 Research area - The Gamba Complex

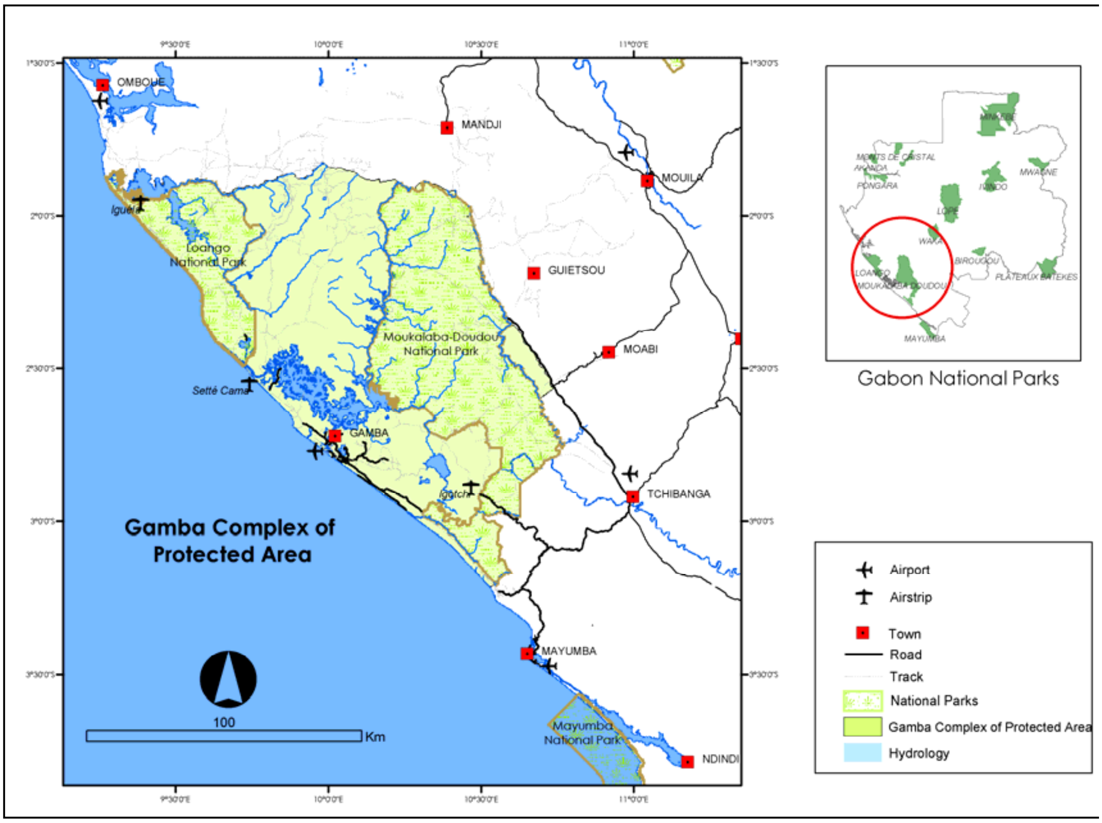


Figure 2: The Gamba Complex of Protected Areas including Loango and Moukalaba Doudou National Park

Gabon's littoral coastline, nearly 950 km in length, has some rocky sections but consists mainly of long sandy beaches. The Gamba Complex of Protected Areas, which is situated in south-western Gabon along the Atlantic coast and extends over a total area of 12,000 km^2, has mostly sandy beach on the coastline. The Complex contains a mosaic of habitats including seashores, mangroves, coastal forest, swamp forest, equatorial rainforest, semi-montane forest, savannas, rivers, lagoons and swamps. Because of strong south-north currents and the obliquity of the swell to the shore, the physical aspects of the beaches changes continuously and the mouths of the lagoons tend to move northwards. The smaller lagoons communicate with the sea through much narrower channels, opening and closing according to the rate of the rivers flowing into them, or the power of the tides and waves. The conservation value of the Complex has been recognized since 1962 through the protection of eight different areas. Two of the 13 recently created National Parks in Gabon are now located in the Complex: Loango National Park (1,500 km^2) in the Northwest, and Moukalaba-Doudou National Park (5,000 km^2) in the eastern part (Fig. 2). The Complex is considered as one of the best-preserved landscapes of its kind in Central Africa. It is now part of the "Gamba-Conkouati" trans-boundary forest landscape selected as one of the 11 key landscapes that form the focus of the Congo Basin Forest Partnership (CBFP) launched during the World Summit on Sustainable Development in September 2002. Its beaches are considered as one of the most important nesting beaches for leatherback turtles in the world.

Some 9,500 people live within the Gamba Complex. About 7,500 people reside in Gamba town, which is located in the heart of the Complex, and their presence is mostly linked to the oil industry. Oil and gas exploration and production concessions are located in the reserves between the two parks and off-shore. A large oil export terminal, operated by Shell Gabon, is located on the coast near Gamba town. Some 30 small villages and settlements with populations ranging from 15 to 350 people are located within and around the Complex. The main towns around the Complex are Tchibanga, Mandji, Moabi, Mayumba and Omboué. The wildlife in the area is abundant and high densities of large mammals such as forest elephant, forest buffalo, red river hog, gorilla and chimpanzee have been recorded. Twelve species of forest antelope are present, and nine species of primates (e.g. white collared mangabeys). The avifauna is represented by many spectacular species such as pelicans, ibises, hornbills, turacos and bee-eaters. A total of 470 bird species have been recorded, of which 80% are breeding residents (reference). The widespread distribution of a variety of aquatic habitats favours the occurrence of all three African crocodile species, a number of fresh water turtles, manatee and hippopotamus. Offshore, marine mammals such as dolphins and whales are regularly sighted, and the coastal waters are a breeding ground for important populations of humpback whales.

1.7 Study site

The chosen study site is a 5.75 km section of beach situated near the airport of Gamba, between the terminal of Shell and a place known as 'Pont Dick'. On the largest part of the site, the beach is quite narrow with a rather steep incline (>10%). At the back of the beach, grassy lands spread onwards 20 to 30 m, with low plants completely covering the substratum. Littoral thickets or low sometimes marshy forests grow before the lagoon areas bordering the shore. The northwestern part of the site (near the oil terminal) is the only area that differs from the rest with a wider stretch of sand which spreads up to the side edge of the lagoon.

This beach area was marked out in 2002 by the WWF team. It was chosen for a number of reasons. First, local people had explained that turtles often went there to nest. Secondly, its closeness to Gamba town made it an easy target for poaching (both eggs and adult female turtles). The presence of a research team might prevent this. The proximity to Gamba town also offers an easy possibility to show sea turtles to tourists, visitors and the local community. Finally, the Shell oil terminal is situated at the northwestern end of the project area allowing the study of the possible impact of the oil activities in the Complex on the turtles.

The Gamba Complex is not only an important site for sea turtles....

2 Project activities

2.1 Research

2.1.1 Population identification

Tag return data are essential to understand the demography and reproductive ecology of marine turtles. Monel tags (style 49) are cheap and easy to apply and can be used on all species of marine turtle. These visible tags make it possible for non-scientists such as fishermen and people at local markets to identify turtles. We also used the Passive Integrated Transponder (PIT) tagging method but exclusively on leatherbacks.

2.1.2 PIT tagging leatherbacks

PIT tagging is essential for any leatherback tagging program in order to allow accurate population size assessments. PIT tags are important because of the high loss rates of Monel flipper tags (McDonald and Dutton 1994 and 1996, Paladino 1999 in Hilterman *et al* 2003). It is believed that PIT tags are a more permanent and reliable way of marking the turtles. Data from Spotila (1998) indicated a tag loss less than 5% for AVID (similar to Trovan which we use) tags. This small loss may be due to inexperienced users and human error or because of cheaper pocket readers that are less reliable for deeper placed tags in leatherbacks (McDonald and Dutton 1996, Paladino 1999 in Hilterman *et al.* 2003). PIT tags are suitable for performing much needed studies such as the delimitation of the leatherback population (in the Guianas) and to estimate population sizes and trends. If tagging is carried out in the long term it produces important information on (changes in) population size, the fraction of first time nesters (recruitment), remigration rates and intervals, mortality at sea, and inter-nesting frequency (McDonald and Dutton 1996, Spotila 1998, Steyermark *et al*. 1996 in Hilterman *et al* 2003). PIT tagging using TROVAN tags was started on a large scale in 1998 in French Guiana (Chevalier and Girondot 1999 in Hilterman *et al.* 2003), but some leatherbacks had already been PIT tagged in French Guiana in 1995/96 (Girondot and Fretey 1996 in Hilterman *et al.* 2003). PIT tags were introduced to Gabon at Pongara beach in 1998, and to Mayumba 1999 (pers. comm. ASF and Billes 2000). Unfortunately funding problems did not allow the use of PIT tags after 1999. In our study in the Gamba Complex, PIT tags have been used since 2003.

2.1.3 Biometric measurements

Marine turtles on nesting beaches were measured to:

- relate body size to reproductive output
- determine minimum size at sexual maturity
- monitor nesting female size for this particular nesting population.

The size-frequency distribution of a population is an important parameter of the population's demographic structure (Bolten 1999, Zug and Parham 1996 in Hilterman 2003). We measured curved carapace length (CCL) and width (CCW) for all nesting marine turtles.

2.1.4 Leatherback nest ecology and hatchery success

Several aspects of leatherback nest ecology were investigated within the study area. A number of nests were marked and monitored throughout the incubation period to gather baseline information on the nest and hatching success, and to explore several aspects of the intra-nest environment. This information is important for determining the hatchling output of the beach relative to other important nesting areas. An assessment of the level of threat to nests and hatchlings was also made in order to establish how best to manage the beach in terms of conservation.

During the 2004/2005 season, a small data set was collected on the hatching success of in-situ leatherback nests (*n*=23). An open-air hatchery was also created in an attempt to protect nests (*n*=20) from the various threats that exist on the beach: inundation, sand erosion and build up, predation and invading roots. The nests in the hatchery were also assessed in terms of hatching success. The results of the 2004/2005 study showed that the hatching success in the hatchery nests (46%) was significantly lower than in the in-situ nests (83%) (Verhage and Moundjim, 2005). It was suggested that this may have been due to high temperatures in the hatchery and the methods used to translocate the eggs from the beach to the hatchery. Therefore, during the 2005/2006 season, the aim was to try to make improvements to the hatchery and increasing hatchling output. An assessment of the value of relocating nests into the hatchery is made.

Research aims

- To examine nest and hatching success and basic nest parameters in in-situ leatherback nests on the study beach in Gamba
- To identify and assess the threats to leatherback nests
- To compare the nest and hatching success of in-situ nests with nests translocated to the hatchery, and review translocation methods
- To train the local counterparts in nest excavation and translocation techniques to ensure a continuation of data collection for a sustainable project into the future

2.2 Capacity building and (inter)national cooperation

The training of local people to participate in research and conservation activities will always be one of the most important aspects of this programme. Creating highly motivated ecological monitoring teams to “fill the area with conservation eyes and ears” creates local awareness and fascination for nature, controls poaching and thus contributes to the protection of endangered species. Furthermore, conservation related employment serves as an economic incentive to conserve nature. Also, for many young Gabonese who are used to urban life, it helps develops awareness of the biodiversity in general in the area.

Apart from local populations in the direct vicinity of the research area, communication with local partners is crucial to implement national conservation strategies. Stakeholder engagement and exchange of information further provides insight in spatial variation of turtle populations and facilitates coordinated research, protection and even joint fundraising. Therefore stakeholder engagement, data sharing, exchange of data collection techniques and communication on all levels has been an important activity within this programme. In

September 2005, the first national meeting was held between all organisations involved in Marine Turtle conservation, catalysed by US Fish and Wildlife Service.

2.3 (Eco)Tourism

As marine turtles, especially leatherbacks, are easy to approach and impressive to watch, ecotourism has become an important aspect of marine turtle conservation. It serves as a tool to raise international awareness and at the same time creates a local economic incentive for conservation of the species. In cooperation with PSVAP (European Union funded tourism development programme) over the last two years, a successful tourist product has been developed. The tourists arriving in the camp are given a presentation on marine turtles by the local expert. Two teams of beach workers patrol the beach and stay in contact with each other and the camp. In the mean time the tourists are offered a meal and drinks. The tourists can choose to sleep until a turtle is found or they can do a guided walk on the beach to see turtle tracks, nests and other animals, until one of the research teams reports a turtle. While turtles can almost always be sighted during the peak season, even the "unlucky" tourists enjoy a night on the beach, seeing tracks and hearing all about the turtles.

Furthermore a tourist brochure has been developed that will be distributed to the various tour operators, the airport, Shell and other strategic locations. Tourist numbers have increased over the last four years, and are likely to continue to increase in the future.

Also, a webpage within the WWF Gamba website was developed, to allow private donators to adopt a tagged marine turtle, in exchange for a picture and succinct data about the turtle (see www.panda.org/africa/gamba).

2.4 Beach cleanup

Pollution of beaches is a global problem. To show the amount of pollution deposed on the Gamba beach site each year, a clean-up was performed on the 5,75 km study site at the end of each nesting season for the last four years. The materials are recorded and weighed in order to evaluate yearly trash accumulation. In '02-'03 a palmtop was used to categorize the garbage found on the beach (bottles, shoes, needles) before it was weighed.

3 Research Methods

3.1 Monitoring nesting activities

From November till March each year, a group of at least five people were present at the study site. Each night, two teams of two persons patrolled the 5.75 km of beach in search of nesting turtles. The monitoring scheme consisted of two patrols every night; one at 21:30 and one at 03:00. On the second shift the team awaited sunrise at the end of the beach before returning to the camp in daylight counting all the tracks left by the turtles, including the ones missed during the night.

During the '03-'04 season research was conducted in relation to high tide. The teams started their shifts two hours before high tide until two hours after high tide, according to experience gained in Suriname (Hilterman, 2001). However, this strategy appeared ineffective for this research site and so the original method was used in following years.

Every female leatherback encountered was identified and marked by double tagging with Monel tags (style 49) pinned on the skin-fold joining the hind leg to the tail. Hard-shelled turtles (Cheloniids), were identified and marked by a double tagging with the same tags fixed on the forelegs. Leatherback turtles were additionally given a PIT tag (Trovan ID100 and scanner LID500, both EID Aalten B.V., Aalten, The Netherlands).

3.2 Biometric measurements

Biometry was conducted on each marine turtle encountered. For the leatherback, the curved carapace length was measured along the median ridge from the nuchal notch to the tip. For the hard-shelled turtles, the curved carapace length was measured in the middle of the shell from the nuchal, at the junction of the shell and the skin, to the hind notch situated between the two supra-caudal scutes. The curved carapace width was measured at the widest part of the shell, the tape stretching out from one crest to the other for the leatherback.

3.3 Nest ecology (by Suzanne R. Livingstone)

In-situ nests

A total of 35 leatherback nests were marked at the time of deposition and monitored through till hatching. Once hatched, each nest was excavated and the contents of the nest were examined and recorded (see nest profile methods). Other nest parameters were also collected: depth to the top and bottom of the nest chamber, beach zone, position in relation to the high water mark and the backing vegetation and whether the nest had been subject to predation. The incubation period for each hatched nest was recorded. The nests that did not hatch were excavated three days after their due date to determine the cause of hatch failure.

Temperature sensors were placed in 23 of the monitored nests which were set to take a temperature every hour during the incubation period.

In addition to the monitored nests, a random selection of in-situ hatched nests were excavated on the beach. The beach was checked during the early morning for any nests that had hatched the previous night. Nests were identified by an indentation in the sand (approximately 15 cm diameter), usually with hatchling tracks leading from it.

Hatchery nests

A total of 15 leatherback nests were translocated to the open air hatchery. This was done using a technique perfected in Trinidad (Livingstone, 2006), differing from the method used on the Gamba study beach in 2004/2005 season. The technique used in 2004/2005 involved digging up a nest the morning after it had been laid and transporting the eggs in a bucket to the hatchery where they were manually placed in pre-dug holes. The 2005/2006 technique involved collecting the eggs in a thick plastic bag inserted into the empty nest seconds before the start of egg deposition. The sand behind the nest was then dug out to facilitate easy removal of the eggs once the turtle had finished laying. The eggs were then transported immediately and placed in a pre-dug hole in the hatchery. The eggs were never touched with human hands.

The open air hatchery

A temperature sensor was placed in each of the hatchery nests. Each nest was excavated after hatchling emergence, and the data collected as for the in-situ nests.

Nest profile methods

Once excavated, the contents of the nest were counted and the clutch size was recorded. The eggs were then divided up into categories. The eggs were initially categorized by their morphological features, and then by their contents. The egg types were: hatched (empty shell fragments from which a hatchling would have hatched and emerged from the nest), shelled albumin globs (SAGs) referred to in this study as 'inert' eggs (reduced in size with a clear viscous interior) (Bell et al., 2003) and un-hatched (complete full sized eggs)

The unhatched complete eggs were opened, and classified into four further categories: non-fertilized (clear albumen with a clean and separate yolk), dead-in-shell (egg containing an embryo of any size which had died during development), bacterially infected (no clear embryo, with a yellow or pink material with a "cheesy" consistency and a particularly offensive smell), and disintegrated (containing a near fully developed hatchling that has started to disintegrate within the egg).

Each category of egg was calculated as a percentage of the total clutch.

Any live or dead (free from shell) hatchlings were also counted. Live hatchlings found in the nest were usually quite weak, and would not have been able to emerge from the nest on their own. They were allowed to make their way to the sea.

Nest and hatching success

Nest success was defined as the percentage of nests that successfully hatch from the total number of nests laid (using the 35 monitored nests). A nest was classed as hatched if at least one hatchling emerged. The hatching success was defined as the percentage of fertile eggs that developed into hatchlings that fully emerged from the shell. This was calculated as a percentage of the viable eggs (total eggs - inert eggs).

The data from the in-situ nests were compared to those from the hatchery nests. The data from this study was also compared with that collected in 2004/2005. Mann-Whitney U tests were used to analyse the data (non-parametric data).

3.4 Genetic study

From 2004 onwards ASF provided equipment to take genetic samples from nesting leatherbacks: buffer, tubes, knife and datasheets. Samples of 1 cm by 3 mm of skin were taken with a disinfected surgery knife from the hind flipper were the skin was folded. The skin sample was put into a tube with buffer, after which the turtle was identified. The camp coordinator from ENEF was in charge of taking the samples. Genetic samples were stored in the camp until handed over to Guy Phillipe from ASF, for further analyses in the lab.

3.5 Weekly nest counts

During the 2005/2006 season tracks were also systematically counted on a 75 km transect to the north and south of the research site on a weekly basis. Only tracks from the night before were recorded as to be able to correlate the number of nests with the daily patrolled zone. The number of tracks for each species, with and without nests, signs of poaching and carcasses were recorded. This 75 km stretch of beach connects the three coastal villages Mayonami, Gamba and Sette Cama. The weekly surveys were carried out using a quad.

3.6 Additional research

During the beach patrols, the team also collected any other significant data recording occasional strandings, poaching activities and turtle carcasses left on the beach. At night every turtle encountered was additionally examined for fisheries related injuries or other exceptional morphological conditions.

4 Results

4.1 Nest counts and species composition

Four years of research provides a detailed insight in the marine turtle species nesting in the Gamba complex. Leatherbacks and olive ridleys regularly used the beach as a nesting ground whereas the site was only rarely visited by green turtles and hawksbills (Table 4.1). The possible observation of a loggerhead turtle still remains uncertain, due to insufficient morphological data. It is unlikely however, as no previous recordings of loggerheads exist in the Gulf of Guinea.

Comparing data on nest numbers between the four years is based on a data collection between mid November till the end of March every year. In the first season ('02-'03) a total of 576 nesting tracks of leatherbacks nest were counted on the 5.75 km of beach compared to 203 ('03-'04), 128 ('04-'05) and 860 ('05-'06) in the following years. These changes in total nest numbers are due to natural fluctuations in the population size as females only nests every two to three years. For olive ridleys, 58 nesting tracks were found the first year and respectively 51, 50 and 83 nests in the following three seasons which is considered as stable. Olive ridleys start nesting as early as September indicating that these data do not include all the nests laid.

	2002-2003	2003-2004	2004-2005	2005-2006
Dc nests (false crawls)	576 (25)	203 (10)	128 (0)	860 (10)
Lo nests (false crawls)	58 (3)	51(5)	50 (1)	83 (5)
Cm nests (false crawls)	0	5 (3)	2 (0)	0
Ei nests (false crawls)	0	3 (0)	0	0
Dc tagged (PIT)	325	61(38)	55 (45)	291 (286)
Lo tagged	24	9	29	31
Cm tagged	0	2	1	0
Ei tagged	0	1	0	0
Dc recaptures (PIT)	66	16 (4)	20 (8)	67 (67)
Lo recaptures	0	1	1	2
Cm recaptures	0	1	1	0
Ei recaptures	0	1	0	1 †
DC found with tag	3	3	2	5
Lo found with tag	0	0	1	1

Table 4.1 Number of tagged turtles, number of recaptures and nest count per species from 2002 till 2006 on 5.75 km of beach called "Pont Dick" in Gabon. Dc = Dermochelys coriacea; Lo = Lepidochelys olivacea; Cm = Chelonia mydas; Ei = Eretmochelys imbricate; Cc = Caretta Caretta.

The first season ('02-'03) 576 leatherback nests were recorded and 325 leatherbacks were measured, tagged and examined. In total 58 olive ridley nests were recorded and 24 olive ridleys were encountered and tagged. Of the total of 325 tagged leatherbacks during the first season, 43 leatherbacks were seen once again, seven twice and two three times and three turtles had been tagged elsewhere in Gabon by ASF or PROTOMAC teams (see chapter "migration"). No tagged olive ridley was seen again.

During the second season ('03-'04) a total of 203 leatherback nests sighted and 61 leatherbacks were tagged with a Monel tag of which 38 were also given a PIT tag (which arrived end of December after the start of the nesting season due to logistic problems). Fifty one (51) olive ridley nests were recorded and nine individuals were tagged. Of the total of 16 leatherbacks that were recaptured, thirteen of the recaptures were turtles that came nesting a second time and three had been tagged by ASF or PROTOMAC elsewhere (see "migration"). Furthermore, five green turtle nests and three nests made by hawksbills were counted during that season. For both species we succeeded in tagging one individual with Monel tags and both individuals were recaptured.

Within the third season ('04-'05) 128 leatherback nests and 50 olive ridley nests were sighted and 55 leatherbacks and 29 olive ridleys were tagged. Due to technical problems only 45 of the 55 leatherbacks were tagged with a PIT tag (Table 4.1). Of the 55 tagged leatherback individuals, seven leatherbacks came back once, 4 came back twice and one three times. Additionally three tags were found of turtles (one olive ridley and two leatherbacks) already tagged two years before (2002-2003) in Gamba.
In that same season the only tagged green turtle came back once. One possible loggerhead sighting could not be verified due to lack of morphological data.

Within the last season ('05-'06) 860 leatherback nests found and 291 leatherbacks were tagged (of which 286 also with a PIT tag). Eighty three (83) olive ridleys nests were observed and 31 individuals were encountered and tagged. Of the 289 tagged leatherbacks 42 turtles came back once, seven twice and two leatherbacks came back three times to nest on the same 5,75 km stretch of beach. Two leatherbacks were tagged by us in previous seasons and three leatherbacks were originally tagged elsewhere (see chapter 'migration'). One olive ridley was found again on the research beach that was tagged by us two seasons before. One other olive ridley came back nesting once during this season.

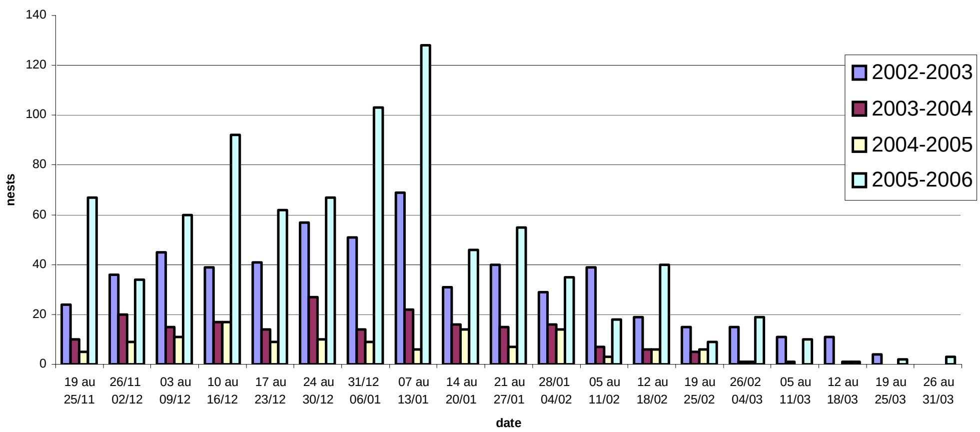


Figure 4.2: Comparison of observed total number of leatherbacks (Dermochelys coriacea) nests per week at Pont Dick, Gabon during seasons 2002-2003, 2003-2004, 2004-2005, 2005-2006.

Figure 4.2 shows the number of leatherback nests in the study site per week during the research period of four years of the study. The numbers shown are the sum of the daily nest counts per week. The occurrence of nests per week throughout the nesting season shows a similar distribution every year. The peak of the nesting effort for leatherbacks is at the end of December and the beginning of January.

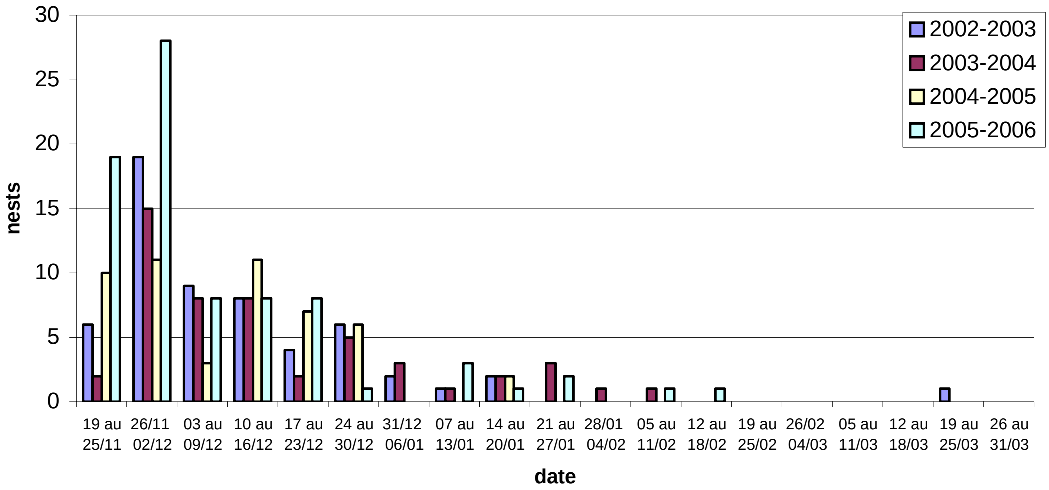


Figure 4.3: Comparison of observed total number of olive ridley (Lepidochelys olivacea) nests per week at Pont Dick, Gabon during seasons 2002-2003, 2003-2004, 2004-2005, and 2005-2006.

Each year, the nesting season of the olive ridley started earlier than that of the leatherback. The highest numbers of nesting olive ridley females were observed in the period between November and December (Fig. 4.3). The nest counts started each year on the 19th of November. Given the fact that the nesting season for olive ridley probably starts as early as September, a significant percentage of the olive ridley nesting season was missed and many females had already visited the beach before the start of this monitoring period.

All five green turtle nests were observed within the last week of December and the first week of February, while the nests of the hawksbill were found in the last week of December and the two first weeks January.

The inter-nesting intervals for tagged and recaptured leatherbacks are shown in Figure 4.4. The distribution of inter-nesting intervals for the 151 leatherbacks recorded show peaks around 10, 20 and 30 days. Often intervals around 10, 20 and 30 days are found, suggesting an nesting interval of around 10 days (Hilterman and Goverse, 2002). The many turtles encountered with longer nesting intervals can be explained by the fact that turtles were not encountered during the intermediate nestings. None of the recaptured leatherbacks were observed more than three times during the last four years season. This can be explained by the enormous stretch of potential nesting sites along the beaches of Gabon, resulting in the fact that many turtles nest outside the research area. The number of 'one-time nesters' over four years was 90 %.

The recaptured olive ridley had an inter-nesting period of 16 days, the hawksbill 17 days and the green turtles 1 and 2 nights. Inter-nesting periods of less than four days are considered to be false crawls (so no eggs were laid the first observation).

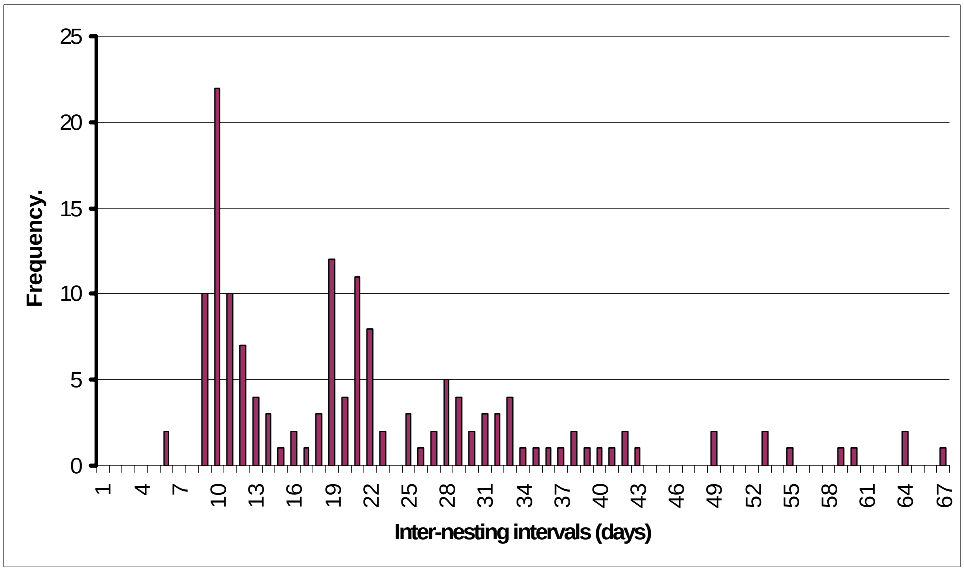


Figure 4.4: Observed internesting (n=151) periods (in days) for tagged leatherbacks at Pont Dick, Gabon 2002-2005.

Spatial distribution of marine turtle nests on the 75 km weekly patrolled zone between Mayonami, Gamba and Sette Cama is shown in figure 4.5.

Data show that certain areas are more important nesting areas than others. For example nest densities are lower in vicinity of villages. Note that the area just north of Gamba could not be accessed due to large outlets of lagoons and rivers. It seems that nest densities are higher between Gamba and Mayonami than north of Gamba. Though is we compare the nestdensities with the daily patrolled zone we find that nest densities are almost equal north and south of the daily studied zone. During the 13 patrols on a quad on the 30 km stretch of beach between Sette Cama and Gamba in total 189 nests were found, compared to 77 in the daily studied zone on the same days. This means that there are 2.5 times (189/77) as many nests as in the daily research. During the 13 patrols on the 30 km between Gamba and Mayonami 334 nests were found compared to 128 nests that were found in the daily studied zone. This means that 2.6 times (334/128) as many nests were found in that area as in the daily zone. This shows that nest densities are quite comparable north and south of Gamba. As the two stretches of beach were not monitored on the same day it appears that by coincidence the days that the Gamba-Mayonami part was monitored more nests were laid over the whole coastline resulting in higher nest densities (see figure 4.5).

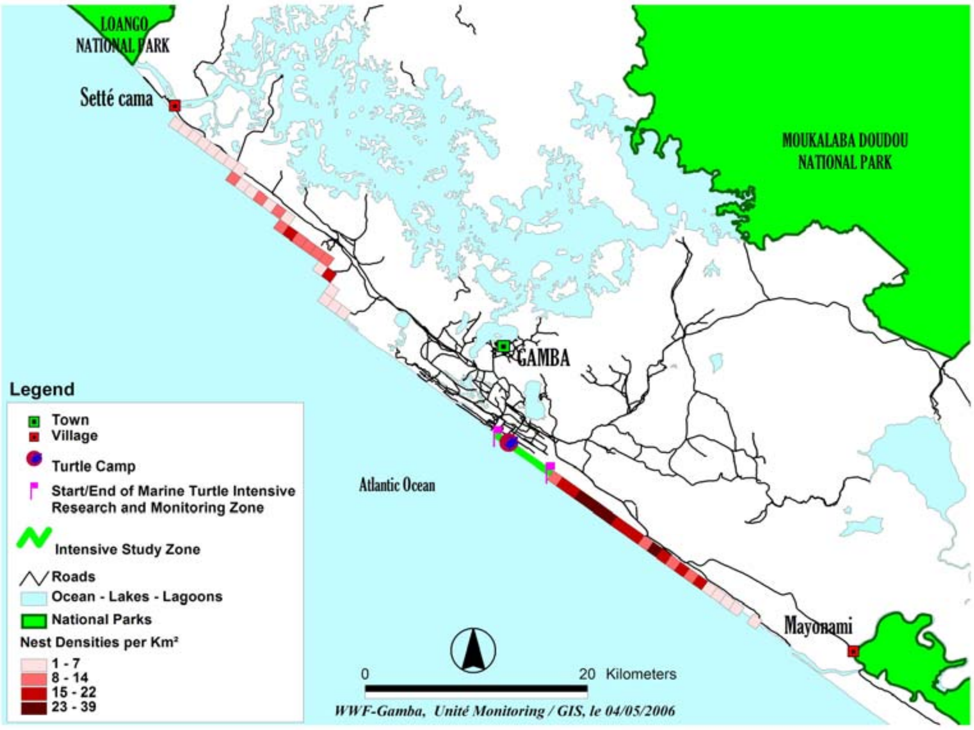


Figure 4.5 Distribution of marine turtle nests on 75 km, between Sette Cama and Mayonami

4.2 Migration

Tag return data are essential to understand the demography and reproductive ecology of marine turtles. Every season turtles have been found already tagged by another research team on another location or by us in the previous seasons.

In the year 2002-2003 three recaptures were recorded. Two of them were leatherbacks tagged in Mayumba (100 km south of Gamba) three months earlier the same nesting season. The origin of the third tag is still unknown.

Season 2002-2003					
Date tagged	Location tagged	Date recaptured in Gamba	Species	Tag left	Tag right
12 Nov 2002	Mayumba (Bame)	21 Jan 2003	DC	ASF 8367	ASF 8366
13 Nov 2002	Mayumba (Bame)	22 Jan 2003	DC	ASF 8404	ASF 8405
Unknown	unknown	11 Feb 2003	DC	ECO 12003 (replaced)	ASF 0272

In the year 2003-2004 three tags from other origin were found. One leatherback was tagged on January 2002 in Mayumba and found in Gamba in December 2003. The other leatherback was found in Gamba in February 2004 one month after it had been tagged in Mayumba. Again this season the origin of one tag could not be retrieved.

Season 2003-2004					
Date tagged	Location tagged	Date recaptured in Gamba	Species	Tag left	Tag right
17-18 Jan 2002	Mayumba (Bame)	2-3 Dec 2003	DC	ASF 6094 lost ECO 12232 (replaced)	ASF6095
Unknown	unknown	25-26 Dec 2003	DC	12648	12649
12 Jan 2004	Mayumba (Bame)	19-20 Feb 2004	DC	ASF 11942	ASF 11943

During the nesting season 2004 -2005 we found three tags placed in Gamba during the '02-'03 nesting season; one olive ridley and two leatherbacks.

Season 2004-2005					
Date tagged	Location tagged	Date recaptured in Gamba	Species	Tag left	Tag right
29 Dec 2002	Gamba	26-27 Nov 2004	DC	ASF 10108	ASF 10107 lost ECO 13664 replaced
27 Dec 2002	Gamba	16-17 Nov 2004	LO	ASF 10262	ASF10263 Lost KUD 10722 replaced
02 Dec 2002	Gamba	29 Dec 2002 & 08-09 Dec 2004	DC	ASF10125 lost ECO 13634 replaced	ECO 10569

In 2005-2006 we found three turtles (one olive ridley and one leatherback) who had been tagged in December 2003 in Mayumba, one leatherback who was tagged in December 2001 in Mayumba and one leatherback who had been tagged in Mayumba in the 2005-2006 season (exact date still unknown) and one tag on a leatherback of which the origin is still unknown.

Season 2005-2006					
Date	Location tagged	Date recaptured in Gamba	Species	Tag left	Tag right
03 Dec 2003	Gamba	21-22 Nov 2005	DC	ECO 12230	ECO 12231 pose ECO 13989 rep
16 Dec 2003	Gamba	10-11 Dec 2005	DC	ECO 12206	ECO 12207
31 Dec 2003	Gamba	23-24 Nov 2005	LO	KUD 10711	KUD 10712
31 Dec 2001	Mayumba Bame	22-23 Dec 2005	DC	ASF2965	KUD04373 rep
08 Dec 2005	Mayumba	08-09 January 2006	DC	KUD01192	KUD00374
Unknown	Unknown	05-06 December 2005	DC	ASF15827	ASF15826

From the 15 recaptured turtles, it is important to note that in eight (8) cases one flipper tag was lost (53 % of all turtles lost a tag) and had to be replaced.

Tag information doesn't only help us to understand migration within the nesting area but also help us to understand trans-oceanic migration. An article published in the Marine Turtle Newsletter 111 on January 2006 (Annex 1) provides evidence of a leatherback that was tagged in Gamba on December 2003 was found by a local fishermen in the coastal waters of Argentina on February 2005.

4.3 Measurements of body size

To measure the body size the Curved Carapace Length (CCL) and Curved Carapace Width (CCW) were measured for all nesting turtles at the study site (Table 4.6). Carapace length was found to be between 130 and 172 cm. Carapace with were between 126 and 144 cm. Figure 4.8 shows the size distribution of the CCL of the leatherback population at Pont Dick. Leatherbacks tend to be smaller in Gabon (151 cm) than in Suriname and the Guiana's (154 cm) (table 4.7)

Species	*CCL*	*SD*	*n*	*min.*	*max.*	*CCW*	*SD*	*n*	*min.*	*max.*
D. coriacea	*150.4*	*7.6*	*819*	*130*	*172*	*108.3*	*6.6*	*819*	*126*	*144*
L. olivacea	*70.7*	*2.7*	*96*	*65*	*78*	*70.7*	*2.7*	*96*	*64*	*77*
C. mydas	*88.8*	*13*	*4*	*77*	*100*	*79*	*7.5*	*4*	*72*	*88*
E. imbricata	*85*	*--*	*1*	*--*	*--*	*74.5*	*--*	*1*	*--*	*--*

Table 4.6: Mean Curved Carapace Length (CCL) and Curved Carapace Width (CCW) with standard deviation (SD) for 4 sea turtle species found at Pont Dick, Gabon 2002-2005 (n = number of measured individuals).

Country	*Beach*	*Source*	*Period*	*CCL*	*n*	*min*	*max*	*CCW*	*n*	*min*	*max*
Gabon	*Pont Dick*	*This report*	*02-06*	*151.4*	*819*	*130*	*172*	*108.3*	*819*	*126*	*144*
Gabon	*Mayumba*	*Billes*	*99-00*	*150.9*	*902*	*130*	*179*	*108.4*	*902*	*86*	*124*
Fr.Guyan	*Yalimapo*	*Fretey*	*1978*	*154.6*	*1341*	*135*	*192*	*87.3*	*1341*	*70*	*120*
Suriname	*Babunsanti*	*Hilterman .G*	*2002*	*154.9*	*1542*	*135*	*177.5*	*113*	*603*	*99.5*	*130*
Suriname	*Babunsanti*	*Hilterman. G*	*2001*	*154.2*	*2307*	*131*	*182.5*	*113*	*876*	*97*	*139*

Table 4.7: Observed mean curved carapace length (CCL) and mean curved carapace width (CCW) of leatherback populations from different countries and sampling periods (n = number of measured individuals).

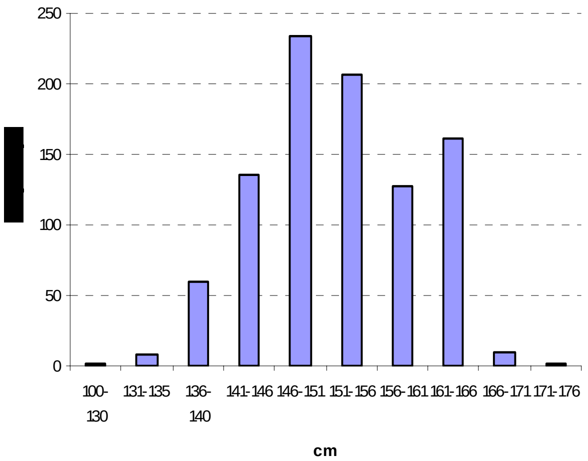


Figure 4.8: Size frequency distribution of tagged leatherbacks of this study. N=819

Photo 4.1 Measuring the Curved Carapace Length (CCL)

4.4 Nest ecology (by Suzanne R. Livingstone)

In-situ nests

A total of 95 in-situ nests were excavated. The excavation allowed the contents to be examined and quantified, and some parameters of the nest environment measured. Only nests that produced at least one hatchling was used for this analysis. Data for completely failed nests were excluded. Figure 4.9 presents the mean percentage of each category of egg within the nests.

The total mean number of viable eggs was 65.9 (*n*=95, *SD*=17.26) (total eggs – inert eggs) and the mean number of inerts was 31.5 (*n*=95, *SD*=14.6).
The mean depth to the top of the nest chamber was 73cm (*n*=95, *SD*=13.6) and the mean depth to the bottom of the nest was 90.7cm (*n*=95, *SD*=14.9).
The mean temperature inside the in-situ nests was 29.07ºC (*n*=11, *SD*=0.26) and the average incubation period was 67.07 days (*n*=12, *SD=2.26*).

Out of the 35 in-situ leatherback nests that were monitored throughout the incubation period, 19 of them produced at least one live hatchling. The nest success was 54%.
The 46% of nests that did not hatch were dug up and the cause determined. 56% of the nests were destroyed by crab predation (*n*=9), 25% of the nests were inundated by the sea (*n*=4) and 19% of the nests were attacked by invading roots at the back of the beach (*n*=3) (figure 4.10). No human poaching was witnessed on the study beach.

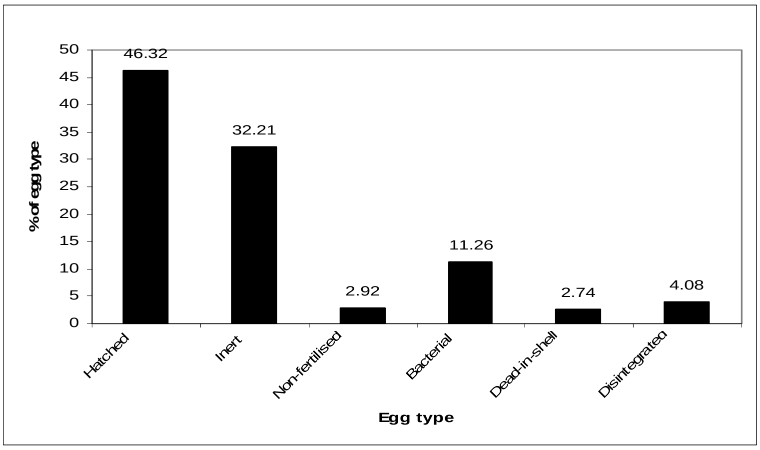


Figure 4.9. The percentage of each type of egg in in-situ leatherback nests

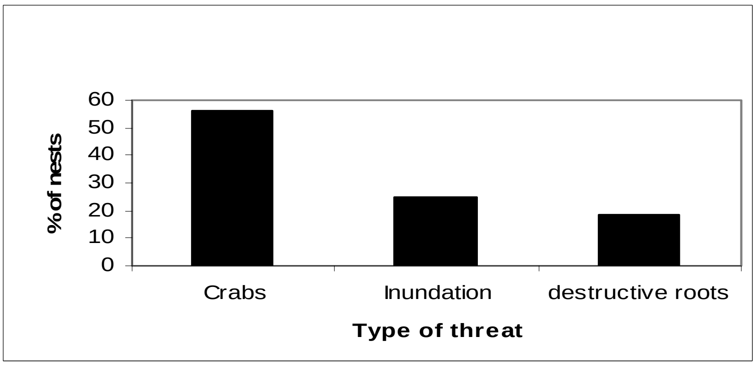


Figure 4.10. Cause of destruction of the unhatched in-situ nests – % of nests destroyed

The hatching success of the monitored nests that did produce hatchlings was 67.0% (*n*=19). The additional nests that were excavated on the beach had a hatching success of 68.7% (*n*=95). There was no significant difference between the hatching success of the monitored nests and the other randomly excavated nests ($U_{95,17}$ = 789, N.S. (Mann Whitney U)).

Hatchery nests
A total of 15 nests were translocated into the hatchery. The nest profile for each is shown in figure 3.

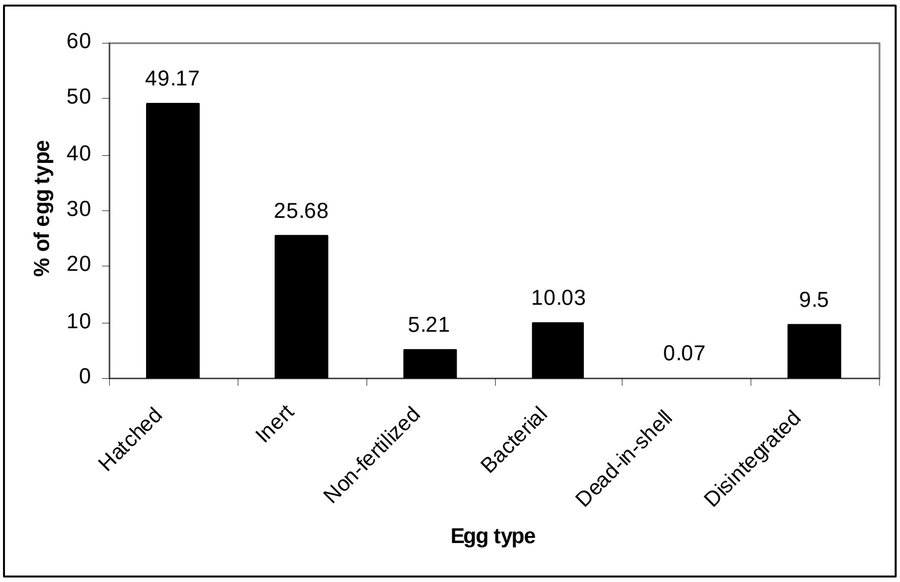


Figure 4.11. The percentage of each type of egg in hatchery leatherback nests

The total mean number of viable eggs was 74.7 (*n*=15, *SD=15.6*) (total eggs – inert eggs) and the mean number of inerts was 25.9 (*n*=26, *SD=11.7*).
The mean depth to the top of the nest chamber was 53.8cm (*n*=15, *SD* =5.6) and the mean depth to the bottom of the nest was 68.2cm (*n*=15, *SD*=5.8*)*.
The mean temperature inside the hatchery nests was 29.6ºC (*n*=15, *SD*=0.31) and the average incubation period was 63.1 days (*n*=15, *SD*=2.21).

Out if the 15 nests that were translocated into the hatchery, all of the nests produced at least one hatchling. The nests success was 100%. There was no predation by any animal or insect in the hatchery nests. The mean hatching success of the hatchery nests was 68.8%.

Comparison with in-situ nests and hatchery nests
The egg profiles for the hatchery nests and the in-situ nests were found to be similar. The only significant differences found were between the numbers of dead-in-shells and the number of disintegrated eggs (table 4.12) ($U_{15,95}$ = 363, p<0.001 and $U_{15,95}$ = 436.5, p<0.013 respectively).
The depths of the hatchery nests and in-situ nests were significantly different from each other (using the bottom depths of the nests) ($U_{15,95}$ = 76.5, p<0.001 (Mann Whitney U).

The mean number of inert eggs found in the two different groups of nests were not significantly different from each other ($U_{15,95}$ = 550.5, N.S. (Mann Whitney U). The number of viable eggs in the hatchery nests and the in-situ nests were significantly different from each other ($U_{15,95}$ = 483.5, p<0.046 (Mann Whitney U).

	Hatched	Inert	Non-fert	Bacterial	DIS	Disint.
Mann-Whitney U	78.0	50.5	64.5	51.0	63.0	36.5
Wilcoxon W	138.0	70.5	224.5	71.0	83.0	996.5
Z	1.172	1.412	.426	1.4	3.3	2.4
Asymp. Sig. (2-tailed)	241	158	670	158	001	013

Table 4.12. – Results of the Mann-Whitney U tests to compare the means of the nest profiles for the hatchery and in-situ nests.

The nest success was significantly different in the in-situ nests and the hatchery nests. There was no significant difference between the hatching success in the hatchery nests and the in-situ nests ($U_{15,17}$ = 126, N.S. (Mann Whitney U).

The temperatures in the in-situ and the hatchery nests were significantly different ($U_{11,15}$ = 10 *p*<0.001 (Mann Whitney U)), as were the incubation periods ($U_{12,15}$ = 22.5, *p*<0.001 (Mann Whitney U)).

Temperature and incubation period

Using the hatched nests from both the in-situ nests and the hatchery nests, the mean nest temperatures were correlated with each other to test for a relationship. These two variables were negatively correlated with each other (*r* = 0.75, $F_{1, 23}$ = 30.1, p<0.001) (fig.4.13), showing that the incubation duration gets shorter as the temperature increases.

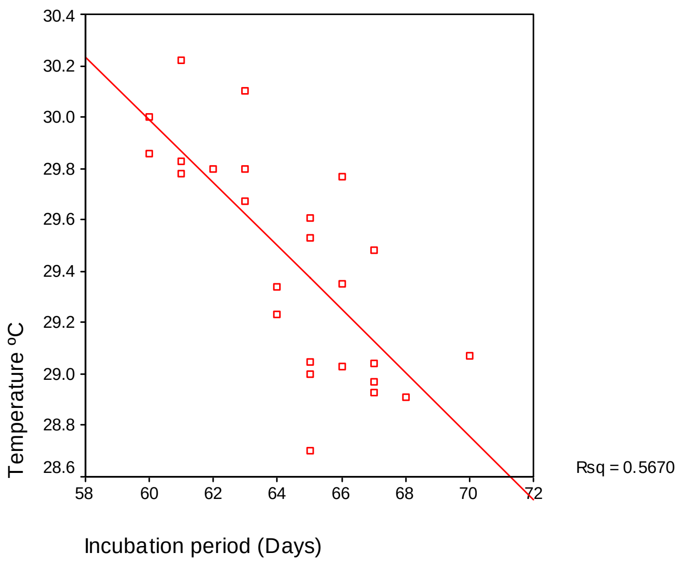


Figure 4.13 Scatter plot showing the relationship between mean nest temperature and the incubation period

4.5 Genetics

Over the study period, 51 genetic samples have been taken from nesting leatherbacks. These samples are being analyzed by Peter Dutton (NMFS – Southwest Fisheries Science Centre, USA) in cooperation with ASF. No results have been made available yet. To ensure a sound outcome of the genetic analysis a larger data set would be desirable so next season more samples will be taken.

4.6 Threats

4.6.1 Natural threats

Both eggs and hatchlings are subject to predation from a number of local animals. Besides the numerous ghost crabs, the mongoose (*Atilax paludinosus*), monitor lizard (*Varanus niloticus)*, civet cat (*Viverra civetta*) and genet (*Genetta tigrina*) are all known predators. Tracks of these animals on the beach and around hatched nests highlighted the presence of predation.

Ghost crabs were found to be an important constant threat to the eggs and the hatchlings. Crabs dig holes in the ground to get to the eggs and eat them. As soon as hatchlings emerge from nests, they are attacked by the crabs on their way down to the sea.

4.6.2 Poaching

Egg poaching (by humans) is a major threat to marine turtle survival all around the world. Although poaching was not recorded in our daily patrolled zone, there was evidence of this activity in the surrounding zones. The zone north of the camp and close to the Shell terminal was visited regularly by poachers. This zone is near the town of Gamba and can be reached by foot by villagers. Due to strong WWF and MINEF presence in town, over the last 15 years eggs are not for sale openly on the market, but several interviews with locals made clear that leatherback eggs can be bought on demand. We were told that four eggs were sold for 200 CFA, or 0.30 Euro.

Photo 4.2 Mortally wounded olive ridley, example of opportunistic poaching

Four marine turtle carcasses were recorded in ’02-‘03. One carcass was of a poached leatherback. The three others were olive ridley turtles of which the cause could not be determined. One poached leatherback was found south of our daily research zone in ’03-‘04 obviously killed for meat. In season ’04-’05 one olive ridley was found mortally wounded and turned on its back by a fisherman (see photo 4.2). This appeared to be an opportunistic poaching event by local fishermen. In comparison to other regions in Gabon and Central Africa, the numbers of slaughtered turtles are relatively low. This can be explained by strong and long-dated WWF and Park and Wildlife Management presence in the area, as well as the low human population densities along the coastal zones.

The southern part of the research zone is littered by dozens of logs, Adolphe is observing a stranded leatherback that died being blocked by a log (left), dead olive ridley trapped between logs (right).

Photo 4.3

4.6.3 Logs

Another cause of turtle mortality is the presence of large numbers of washed up logs on the beaches. These logs are most often lost during transport on the river or sea. In the southern part of our research zone, dozens of logs have accumulated per 100 meter stretch of beach. During the second season dead leatherbacks were found stuck in between logs on the beach on two occasions. Apparently these individuals were not able to find their way back to the sea after laying their eggs, and with their bodies half on the log and their flippers in the air they could not release themselves and died. During the third season one such a case of a dead olive ridley was reported and photographed of north of Sette Cama in Loango National Park (photo 4.3) One female leatherback was reported who broke a foreleg when falling off a log.

During the most recent season ('05-'06) a high number a dead turtles were found throughout the southern part of Gabon. Thanks to improved cooperation between the different conservation partners the following results can be shown:

4.6.4 Industrial threats

Evidence found on the beaches on marine turtles dying at sea represents only a very small part of the marine threats. As these marine reptiles spend 99% of their time at sea (males 100%), marine threats are a very important to quantify before developing a conservation strategy. In the Gamba Complex, fish trawlers are often observed at a distance of less than 5000 meters off the coast, but not many clear fishery related injuries such as fresh cuts from machetes or fishing lines were found on the nesting turtles. Two handicapped leatherbacks were observed during our nightly patrols; one nesting leatherback was observed with only one hind flipper, another individual had a paralysed right hind flipper and was not able to dig a nest pit but there was no indication that this symptom was fishery related.
NOAA has launched a training programme to create a team of qualified observers that will be on board the trawlers for long periods of time to record "by-catch". In this way the influence of trawlers fishing in the coastal waters on the nesting turtles can be assessed.

Apart from fishing, pollution threatens thousands of marine species. Residual oil deposits were found on the hind part of a leatherback which had come to lay eggs. Gabon's oil on-shore and off-shore reserves have attracted oil companies since the late fifties. Both within Mayumba Marine National Park in the South of Gabon, close to the border of Congo Brazzaville, and all along the Gabonese coast off-shore platforms are operational. Oil production in the region started around 1965 from both offshore and onshore fields. Since

A team of Shell Gamba is trying to clean the beach of Pont Dick after pollution with oil. *Photo 4.4*

1998, overall production rates are declining. Within the Gamba Complex, the two large operators (Shell Gabon and Total Gabon) currently work according to clear standards and guidelines limiting overall direct environmental impact.

Shell's operations are certified under ISO 14001. A number of smaller operators are also active and the environmental standards of their operations are not as well known. Offshore pollution in the form of oil on the ocean surface and oil washed up on the beaches occurs occasionally. Investigations into the source of this pollution are generally inconclusive.

On several occasions during this four year campaign, reasonable amounts of oil where found on the beach in our daily patrolled zone. The many activities at sea involved with the oil industry make it likely that these are often occurring events. Furthermore, it is difficult to find the source of the pollution. Possible sources of oil pollution are;

- Dumping of old oil by any type of ship,
- Oil leakage during charging,
- Oil leakage from platform
- Oil leakage due to temporarily non functioning flares

According the department of Health Safety and Environment of Shell Gabon, Shell is able to locate the source of the pollution by fingerprinting the oil. Comparing this component pattern with their own oil it is possible to exclude or confirm any direct relationship. Shell feels responsible for the pollution around their terminal in Gamba so they will try to clean it after every event of pollution, regardless if the oil is theirs (Bos, pers. comm.). In February 2004 a team of Shell cleaned the beach for several days.

Another impact of the oil industry which can be terrestrial or marine is caused by artificial lights. Our research camp is located 2 km south of the onshore Shell Oil terminal from Gamba. Its flare is situated about 400 meters from the beach on shore.
Flares burn important quantities of natural gas, which causes light pollution at night. Artificial lights attract sea turtles at night (Salmon, 2003). Normally hatchlings and adults orient themselves using the clear “whiteness” of the waves of the ocean. Artificial light confuses marine turtles and as a result they crawl towards the light, which is often not in the direction of the sea as the case in this research area.
On one occasion 100% of hatchlings of a nest situated at about 400 meters from the lighted yeti of Shell (apart from the flare this also causes disorientation at marine turtles) were lost. All hatchlings crawled towards this lighted yeti in a route parallel to the sea, unable to find the 'safe' sea. As a result they were all eaten by crabs and other predators such as civets, monitor lizards and mongoose on the beach. Traces in the sand made clear that some hatchlings had been crawling almost 50 m on the beach towards the artificial lights before a predator found them. We observed several adult leatherbacks who could not find a way back

to the ocean after nesting. Attracted by the flare of the terminal, these individuals entered the lagoon behind the beach after crawling on the beach for more than 100 meters.

4.6.4 Observations on at sea mortality

Between the beginning of September and the end of October 2005 extreme high numbers of marine turtles carcasses have been found on the beaches in Gabon. This concerns mostly olive ridley turtles found on the beaches in the southern part of Gabon and Northern Congo, which are all part of the Gamba-Mayumba-Conkouati landscape (see figure 4.14).

The turtle monitoring teams in Pongara National Park in the north of Gabon reported no dead turtle carcasses. For a detailed overview of all marine turtle monitoring beaches in Gabon see chapter "First steps towards a national Sea Turtle Conservation Strategy" below.

The incidents reported by the surveillance teams of WCS, WWF and Ibonga present on the different beaches within the Gamba-Mayumba-Conkouati landscape together form this chapter. The regularly monitored beaches can be found in red on the map.

Going from north to south through the landscape the North of the Loango National Park (see map) will be discussed first:

Loango North National Park
Altogether 17 olive ridley carcasses were reported by the WCS surveillance teams in the North of Loango National Park.

The two dead turtles found on September the 25th at Tassi were recorded with camera and GPS and DNA samples were taken. The turtles were in an advanced state of decay so no external research was executed to determine the cause of death (photos 4.5 and 4.6)

Loango South and the Gamba Complex
Tourist guides regularly visit the beaches in the South of Loango National Park and they reported seven dead marine turtles between September and end October, all identified as olive ridley turtles. Unfortunately the guides are not yet equipped with cameras and GPS.

Olive ridley *Photo Clement M.*
Carapace Length: 63
Carapace Width: 63
GPS : S 2.04807º, E 9.40488º *Photo 4.5*

Green turtle *Photo Clement M.*
Carapace Length: 94
Carapace Width: 83
GPS : 2.04471º, E 9.40126º
Photo 4.6

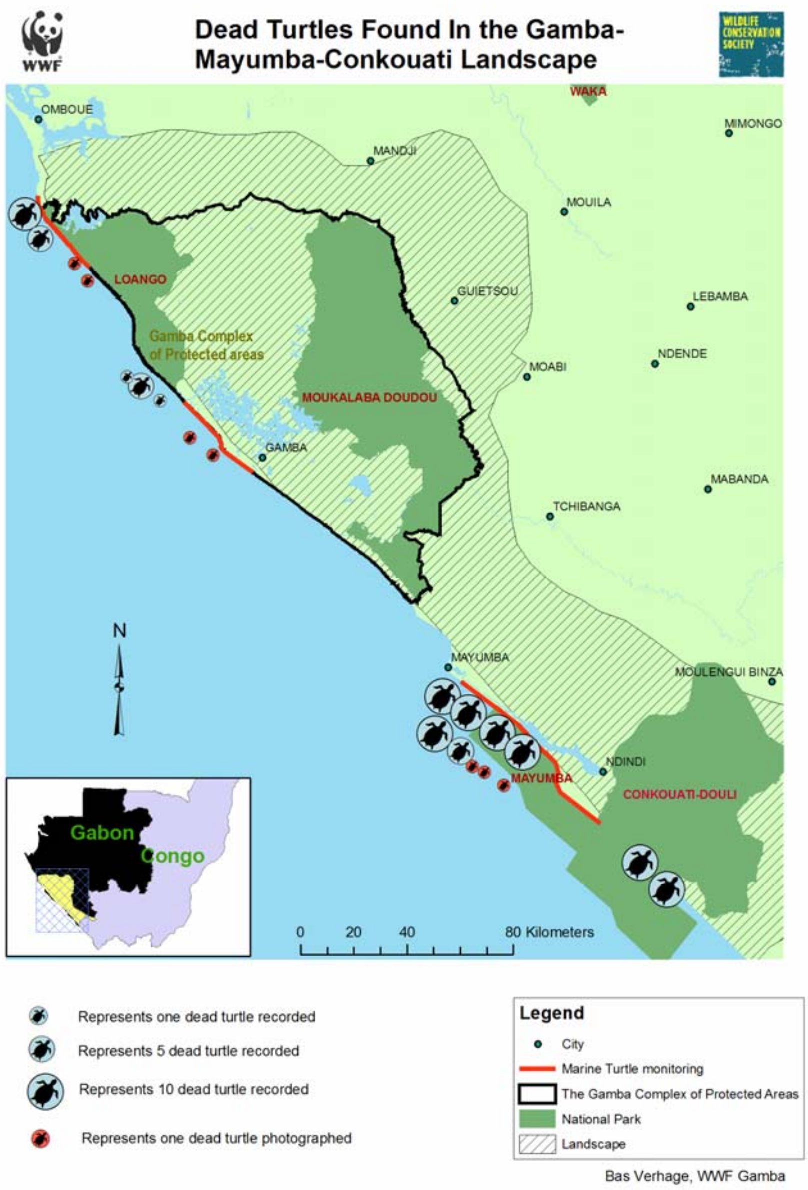


Figure 4.14 Showing dead marine turtles found in the Gamba-Conkouati Landscape

On the 11th of October a surveillance patrol was executed between the outlet of the lagoon in the South of the Loango National park down to the town of Gamba (50 km of beach) and two stranded olive ridley were recorded. Photo's and DNA samples were taken. The GPS unfortunately failed to function. A stab-wound was observed in the plastron of one of the dead animals, indicating that a pointy device had entered the body probably by fisherman or other human interference (photo 4.8). Furthermore one of the hind flippers had been cut. On the second olive ridley found (photo 4.7) head and left front flipper were absent probably due to shark attack.

So in total nine dead olive ridleys were reported between Gamba and the south of Loango National Park.

Olive ridley *Photo Bas Verhage*
Carapace length: 70 cm
Carapace width: 73cm *Photo 4.7*

Olive ridley *Photo Bas Verhage*
Carapace length: 75 cm
Carapace width: 75 cm *Photo 4.8*

Mayumba Marine National Park
In Mayumba National Park a team patrolled the beach on October 11th, 12th and 18th. Turtle carcasses of all states of freshness or decay were counted – from just bones and shell to very recently dead animals.

For each carcass encountered the team recorded the species, the length and width of the carapace, the level of decomposition, and any wounds on the body. Most carcasses were photographed from above and below, and these images are available in Mayumba National Park database.

Fifty-eight olive ridley carcasses were found, plus one leatherback, photographed as suspected shark victim a week earlier (see photo 4.11), and two suspected green turtles.

Olive Ridley carapace morphometrics (n=58)

	Carapace Length	Carapace Width
Mean	74	69
Number	47	47
Max	95	73
Min	67	60

Olive ridley found with hole in head
Photo 4.9

Olive ridley with cut off right front flipper
Photo 4.10

Leatherback with Shark injuries on left front flipper
Photo 4.11

Only 16 turtles were relatively fresh, and most were in an advanced state of decay. The data for this patrol are available by contacting Richard Parnell (WCS Mayumba).

A further patrol of the same area was conducted on the 3rd of November 2005. Only four carcasses were encountered indicating that the previous count may have represented an event causing mass mortality. Either linked to a specific cause of mortality being present at that time, or more likely, a pulse of olive ridley turtles arriving to nest at that time, coinciding with the cause of death.

All carcasses are predated upon by ghost crabs as soon as they wash ashore, hastening their decomposition, enlarging wounds and opening tissues.

Conkouati Douli National Park (Congo)
During a day sensus along a 5 km stretch of beach in Conkouati NP, on 15 October 2005 by the project leader of WCS in Conkouati, 14 dead turtles were found, of which 13 olive ridleys and one leatherback. The numbers of carcasses found there are comparable to those in Mayumba NP during the same period

Possible causes (By Richard Parnell)
This phenomenon was also noted in the 2004-2005 season but seemingly much reduced (systematic data were not taken).

Hypotheses:
H1) Drowning in industrial or artisanal trawl nets (turtles may or may not be subsequently mutilated by fishermen hastening their removal from the net).
H2) Drowning in heavy surf.
H3) Shark or other predator attack.
H4) Poisoning from chemical/hydrocarbon pollutant in water.
H5) Lethal damage caused by geophysical offshore seismic surveys by oil industry.
H6) Virus or other pathogen.
H7) Other cause not yet identified.

The simultaneous presence of an important illegal fishing fleet along the coast in front of the Mayumba and Conkouati nesting beaches and the high numbers of dead olive ridleys found during that time on those beaches, as well as some physical evidence on the carcasses suggests that hypotheses 1 is highly likely, that these turtles were victims of accidental bycatch.

Unfortunately, the necessary research to identify the cause, or most prevalent cause of these deaths has not yet been conducted. In particular, fisheries observers are required to study how many turtles are caught during normal trawling operations during this season (Sept – Nov), and what fate befalls them after capture. Secondly, full necropsies are required on washed up carcasses in order to determine the presence or otherwise of pathogens.

A finding of 'drowning' alone would not permit us to select H1 over H2 (despite the unlikelihood that turtles drown by themselves in such numbers).

A finding of shark attack would not necessarily dismiss other hypotheses, as turtles may be targeted post-mortem.

Lethal damage from seismic shooting may be impossible to detect in all but the very freshest individuals, and even then, the effects of seismic noise on turtles is little studied. Drowning may be a co-variable in this hypothesis as well, and thus, shark attack also.

Observations
As stated before, heavy presence by 5-7 industrial trawlers (Societeé SOCIPEG) was noted in and around Mayumba National park, during the period these turtles were discovered.

In addition, on the 8 October, a slick of heavy black oil washed up on the beaches of the park and at most heavily, at Mayumba.

Finally, during the entire nesting period, the oil company PERENCO had a contracted seismic exploration vessel working in the zone opposite the area where most turtles were found.

4.7 Beach cleanup

A first beach cleanup was organized by employees of Shell five years before the start of this monitoring programme.
During the first season ('03-'04) of our cleanup programme we found 1725 kg of waste on the research beach which equals 300 kilograms per kilometer of beach. On 2 kilometers alone we found 238 syringes, 1796 bottles and 1154 (parts of) shoes and 361 pens.
The second season we found that the same stretch of beach was polluted again with 184 kilogram's of garbage per kilometer of beach, leading to an overall figure of 1034 kilos of polluting materials on the 5.75 km studied stretch of beach per year. During 2005-2006 another 980 kilo's washed up on 5.75 km of beach, confirming a pollution rate of about one ton of waste a year.
Pollution can harm nesting turtles and prevent them from finding an appropriate nesting area.

4.8 Tourism

Tourism numbers in the Gamba area have been increasing over the last four years. It is only during the last season that tourist numbers have been recorded. Sixty-three paying tourists wrote their names in the guestbook of the turtle research camp last year, which means in reality at least 90 people visited the camp to get informed about marine turtles and to get a guided tour on the beach. All income from the tourism went directly to the team members. In light of this, it may be possible to fund part of the research programme through funds generated from tourism in the future.

Ibonga organized a number of visits to the turtle camp for schools. Most of the children had never seen a marine turtle and many of the children had never even visited the beach before.

4.9 Capacity building and (inter) national cooperation

WWF's and Ibonga's joint capacity building efforts, with additional financial and technical support of PROTOMAC, have resulted in the fact that during the last three seasons a total number of 20 local persons have been trained as marine turtle researchers. By recruiting new researchers every year other people get a chance to get acquainted with conservation and past members of the turtle programme have a chance to work in other domains of conservation.

During the ‘04-‘05 and the ‘05-’06 seasons field supervision was executed by a graduate of the ENEF following two years of supervision by Biotopic volunteers. This not only resulted in better national ownership of the research, but also in continuous presence of supervision in the field, good reporting in French, data quality control and a local research team on the ground.

Because of the importance of international cooperation several international meetings were attended. During the WWF Network Species meeting in South Africa from 25 January – 2 February 2005, it was recommended that WWF promotes the production and requirement of annual reports by all governments in countries that do not already produce them. These reports would include all marine turtle research results conducted in the country – including WWF, other NGOs, scientific and government studies’ data. In this way, “ownership” by the government is facilitated, and cooperation is enhanced between NGOs and scientists on data sharing. Models of this reporting already exist through the national reporting scheme of regional agreements such as the IOSEA Memorandum of Understanding (MoU), and the regional reporting of SPREP tagging activities. The first national meeting on marine turtle conservation in Gabon resulted in the following.

4.9.1 First steps towards a national Sea Turtle Conservation Strategy in Gabon

At present Gabon houses three local NGOs (ASF, Gabon Environnement and Ibonga-ACPE), two international NGOs (WCS and WWF), and one regional marine turtle programme (PROTOMAC), involved in marine turtle conservation. *Aventures Sans Frontières* (ASF) and *Gabon Environnement* conduct research in the Mayumba Marine National Park and Pongara National Park (see figure 4.15). The local NGO *Ibonga* operates in the Gamba Complex of Protected Areas. WCS supports ASF and executes weekly monitoring patrols in northern Loango National Park in collaboration with a private tourism investor, *Operation Loango*. PROTOMAC (Protection Tortues Marines Afrique Central) funded through an EU supported Flagship Species project is responsible for the regional coordination of marine turtle work in Central Africa and are giving technical and financial backstopping to *Gabon Environnement* and *Ibonga*. Finally, WWF is supporting marine turtle research in the Gamba Complex by providing *Ibonga* with technical, logistical and financial support and is contributing to the aerial surveys for the total coastline of Gabon (together with WCS and the US Fish and Wildlife Service, see text below).

Although much work has been done by above mentioned partners to protect Gabon’s marine turtles over the last few years, no coordination or exchange of information structures existed. This lack of a coherent approach has been identified by all partners as a serious impediment to first of all a better understanding of the conservation status of marine turtles in Gabon, but also to be able to develop efficient nation-wide protection systems.
During the International Sea Turtle Symposium (ISTS) in Savannah in January 2005, US Fish and Wildlife Service (USFWS) expressed their interest to catalyze the creation of a nation wide coordination structure in Gabon, in the framework of the Marine Turtle Conservation Act (MTCT). Thereto, Angela Formia (marine turtle specialist who worked in Gabon) took on the task of writing a project proposal involving all the different partners to finance the organization of a meeting in Libreville, Gabon, to identify a national coordination structure and to develop a coherent national marine turtle conservation strategy.

Figure 4.15 Gabon's beaches with marine turtle conservation activities (22% of total the total coast) and the organizations involved. All NGO's work together with the Gabonese authorities.

The USFWS accepted the project and from the 7th till the 9th of September 2005 the meeting was held in Libreville involving the different government entities (National Parks Council, Environmental Ministries) national research centres, local and international NGOs and a representative of USFWS (Earl Possardt). Furthermore the Park Warden and WCS project leader of Conkouati National Park (Congo-Brazzaville) and a representative of Equatorial Guinea (INDEFOR: National Institute for the Management of Forests and Protected Areas) were also present to develop trans-boundary coalitions.

Objective of the meeting

The objective of the meeting was to define a coherent nation wide research and conservation strategy and action plan involving all actors implicated in marine turtle conservation in Gabon to be partially funded by USFW through the MTCA.

Outcomes

To ensure a long term national research and conservation program it was considered necessary to consolidate and harmonize current research and conservation focussing on the following set of priorities ;

- standardization of monitoring and nest protection activities across all field sites,
- enhancement of habitat surveillance,
- strengthening of the PIT tagging program,
- standardized training of all field staff,
- standardization of data-collection methodologies and protocols,
- data-sharing in a national database,
- concerted outreach and awareness-raising efforts,
- aerial surveys of the entire coastline,
- coordinated fund raising,
- feasibility study for the removal of logs washed up on the beaches, known to represent serious obstacles for nesting females and hatchlings.

Furthermore it was stated that although several beaches had recorded a drop in leatherback nesting numbers in the last couple of years, it could not be concluded that the population was “declining” because low nesting numbers may reflect a natural cycle. Only long term monitoring can confirm this assumption. To ensure government ownership, coherence with national policies and regulations and law enforcement, it was suggested to incorporate the National Turtle action plan within the 5-year strategic plan for the National Parks of Gabon.

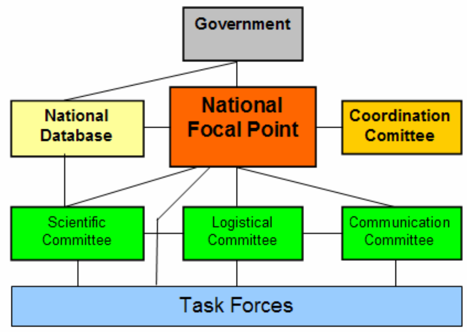
Creation of National Marine Turtle Coordination Structure

In order to coherently address above mentioned priorities on a national level, the participants of the meeting agreed to create a national organization structure grouping government and conservation partners along a national turtle conservation strategy.

Firstly a ‘Turtle Coordination Committee’ (“Cellule Tortues Gabon”) was created, consisting of one representative of each partner. Annual meetings will be held to discuss research protocols, new developments and funding. The ‘conservateur’ (Park Warden) of Mayumba Marine National Park was appointed as national focal point for marine turtles in Gabon.

Secondly, three thematic committees were created;

- The scientific committee's mandate is to produce a yearly national status report and coordinate scientific publications. It will make use of the national database which will be based at the marine department of the National Research Centre (CNDIO) to which all NGO's will provide their data,
- The logistical committee plays the right hand of the National Focal Point and makes sure that data comes in before the deadlines, organises the annual meeting and training courses,
- The communication committee is in charge of the creation of a national website and contacts with the media.



National marine turtle conservation coordination structure in Gabon

To assist the National focal point and the three committees, several cross-cutting task force groups were created, to provide input and advise on specific issues such pathology, commercial fisheries, aerial surveys, oil exploitation, logs, education and outreach, genetics, database quality control, satellite tracking and trans-boundary issues.

Next steps

As a result of the meeting, a 100,000 US$ funding proposal to USFWS has been prepared by the partners covering the period April 2006 to March 2007 and focussing on five main objectives;

- ground surveys/nest protection,
- environmental outreach,
- data management,
- coordination and,
- aerial surveys.

These funds work as co-funding mechanisms for NGO's to assure continued field presence on selected beaches.

Although funding levels are still modest, the outcome of the meeting provided a very important step towards a national marine turtle conservation strategy. The partners agreed that coordination needs to be expanded throughout the Gulf of Guinea, the only way forward to conserve highly migratory species such as marine turtles.

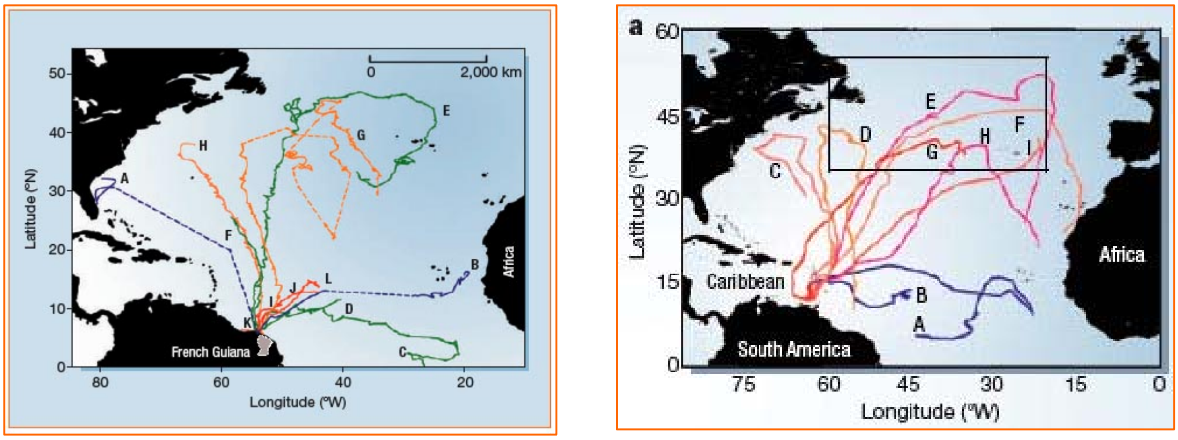
The first steps toward cooperation on a larger scale have already been taken to through an initiative by WWF-LAC to monitor migration activities trough the whole south Atlantic basin, called the Trans Atlantic Migration Programme.

4.9.2 The Trans-Atlantic Leatherback Migration Programme (from proposal by Carlos Drews)

Migration routes and foraging behaviour are still mostly unknown as well as the interaction with fisheries. Leatherback populations in the Atlantic are subject to a great number of threats and sources of mortality. If this rate of mortality continues, these populations will also decline sharply, as happened with the Pacific populations.

WWF´s approach

In a multi-national team effort, this project is the first to document pelagic movements of South-western Atlantic leatherbacks from feeding grounds and/or migratory corridors to their unknown nesting areas using satellite telemetry. Tracks and diving profiles of at least 25 turtles from Panama, French Guiana, Uruguay and Gabon will elucidate their habitat needs in the Central and Southern half of the Atlantic, as well as the degree of coincidence with the fisheries main grounds. The study will shed light on basic biological aspects of the life of leatherbacks in the Atlantic, which are essential to the design and implementation of by-catch reduction measures in this region. WWF and partners will then approach the main fleets of the Atlantic for a basin-wide bycatch reduction strategy that makes a true difference for leatherbacks.



Leatherback females nesting in the Guianas (left) and in the Caribbean (right) disperse along individual routes, rather than distinct travel corridors. Equivalent information is lacking for the Southern Atlantic. Sources: Ferraroli et al. (2004) – left, Hays et al. (2004) – right.

Objectives (2005-2008):

Main Objectives:

1. to set up the platform for the compilation and dissemination of travel route and behaviour information about the trans-oceanic movements of leatherback turtles, for the design of measures to reduce by-catch mortality in Atlantic fisheries.

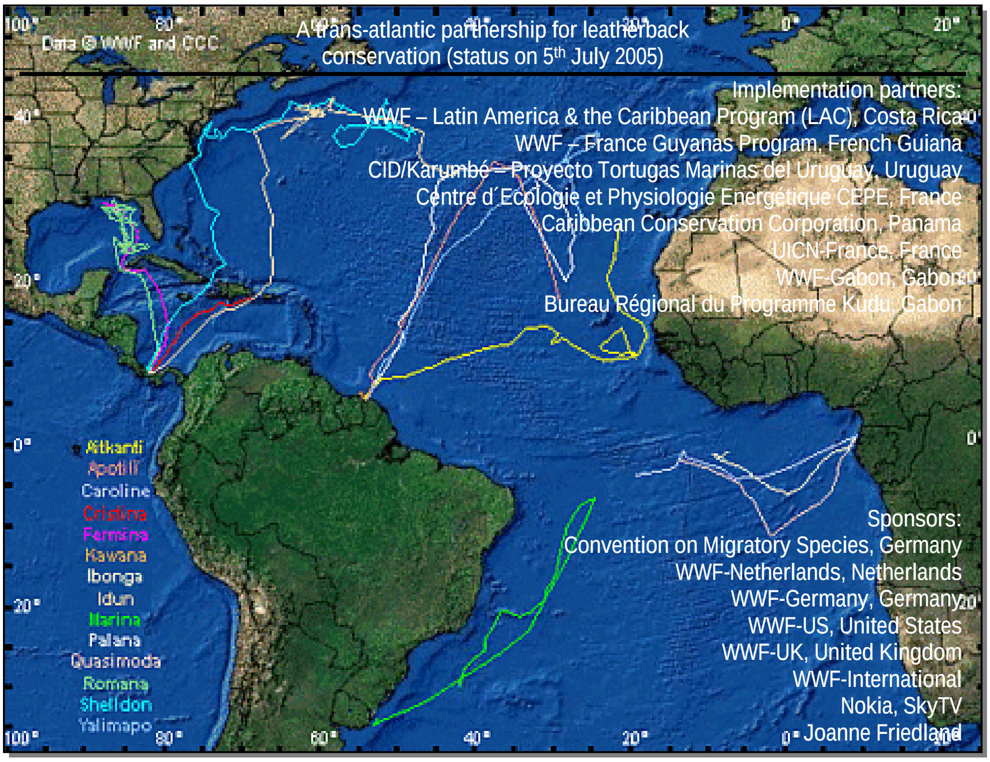
2. to start an international, trans-oceanic cooperation initiative toward bycatch mitigation, based on the study of travel routes and behaviour of leatherbacks, that reaches out to governments, NGO´s and fisheries agencies in the Atlantic basin, for the effective in-water conservation of this highly migratory marine species.

State-of-the-art Satellite Telemetry

To show the migration routes leatherback turtles are equipped with satellite transmitters. Signals sent by each radio-transmitter are captured by a receiver on a satellite, generating data that allow calculation of its geographic coordinates on earth. The satellite tracking service provided by the Argos system (http://www.argosinc.com) is hired for this project. The Argos receivers are carried on-board NOAA series satellites. Argos lets you locate any object equipped with a suitable transmitter, anywhere in the world, to within 150 to 1000 meters (using Doppler effect). The geographic coordinates of the animal's locations are calculated in the Argos processing centre. Scientists in-charge of monitoring the turtles´ movements can retrieve the locations from anywhere in the world by public data networks, often within 20 minutes of transmission.

We are using on the initial deployments the ***Series 7000 Satellite Relayed Data Logger** (SRDL)*, a state-of-the-art transmitter designed and manufactured by the Sea Mammal Research Unit in St. Andrews (see http://www.smru.st-and.ac.uk/Instrumentation F.htm/instrumentation.htm), a non-commercial research body. There are basic transmitters in the order of US$ 3,500 that could be used to obtain location data only, and for a period of seven to 12 months. In addition to temperature and diving depth/activity profiles, the *7000 SRDL* transmitter has the unique feature of allowing a very flexible programming of transmission rates, such that the battery life can be optimized to last for three years. This will allow us to monitor a complete leatherback inter-nesting period: the female will be fitted with the transmitter as she lays her eggs, she will be tracked over several thousand miles as she seeks her distant feeding grounds in the Atlantic and, after two or three years, when she returns back to the nesting beach.
The location data from recently deployed transmitters is made available by partners to WWF on a weekly basis for immediate release on the Internet, as it is received from ARGOS. The generation of tracks on maps as the turtle swims is part of the great power of this initiative for awareness raising, advocacy and buy-in from additional sponsors. There is a central WWF web site with all maps & tracks generated by this project:

http://www.panda.org/about_wwf/where_we_work/latin_america_and_caribbean/our_solutions/marine_turtle_programme/leatherback_tracking_project/



5 Discussion

5.1 Population dynamics

To estimate the number of leatherback nest laid on the 200 kms of beach of the Gamba Complex we can extrapolate the data recorded daily on the 5.75 km combined with the weekly nest counts on 75 km and the aerial surveys. The nest densities north of the research area and south of the research area were very similar. If we compare the weekly counts to Sette Cama with our 5.75 km research zone, we found nest densities about 78 nests per kilometer of beach. To know the number of nest laid we calculated the following: 860 nests were laid on 5.75 km as we know from our daily data. For the other 70 km of beach outside our research area we found nest densities of 78 nests per kilometer which adds up to as many as 5460 nests. In total for the 75.75 kilometer of beach, that would be 5460 plus 860 is 6320 nests.
Looking at the aerial survey data (figure 5.1) of the season 2004-2005 we see that the nest densities of leatherback nests are lower south and north of the patrolled 75km which makes it difficult to extrapolate the data for the whole Complex. Though we could say that if we estimate that nest densities are again half of what we found on our weekly patrolled zone, so 39 nets per kilometer per season for the remaining 125 kilometer. This adds up to (125*39=) 4875 nests on 125 km and makes more than 10,000 (6320+4875) nests in the Gamba Complex alone. To estimate the leatherback population that depends on the Gamba Complex as nesting ground we need the number of nests laid per leatherback turtle and the stretch of beach covered per season per turtle. On 5.75 km of beach we found a remigration

Figure 5.1 Leatherback distribution along the coastline of the Gamba Complex; every colour represent a different aerial survey. Source WCS/ASF.

percentage of 10%. The larger the stretch of beach the higher the percentage will be as turtles distribute their different nests over a larger area. Though as we found that the same leatherback turtles nest in Mayumba as well as in the Gamba Complex during the same season, we cannot presume that the same animals only use the Gamba Complex as nesting ground. So if we estimate that a leatherback lays an average of five nests per individual per nesting season and say 80% is laid within the 200 km of the Gamba Complex (4 nests) than around 2,500 nesting female leatherbacks must have visited the Gamba Complex to nest during the 2005-2006 season. Unfortunately last season's (2005-2006) aerial survey data is not yet made available when publishing this report.

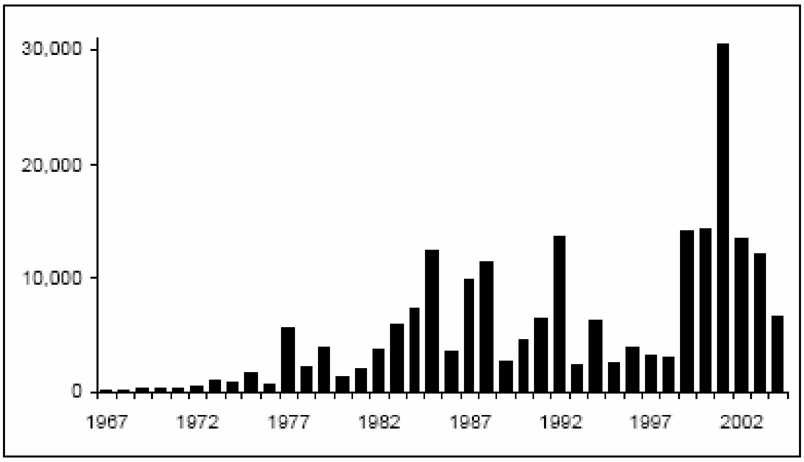


Figure 5.2 Leatherback nest numbers for Suriname (a combination of rough counts, corrected counts, estimates and observations during PIT tagging surveys) in the period 1967-2004 (Hilterman & Goverse, 2004)

In most studied beaches, leatherback nesting numbers vary every year, and we need long term monitoring to confirm any trends. In Suriname for example, 37 years of data (figure 5.2) show that nesting numbers change every year, but an overall increasing trend can be seen over 37 years. In Gabon, and so in the Gamba Complex, monitoring has just begun (figure 5.3) and considered nesting variation have been recorded already. No conclusion in terms of population trend or nesting cycles can though be drawn yet.

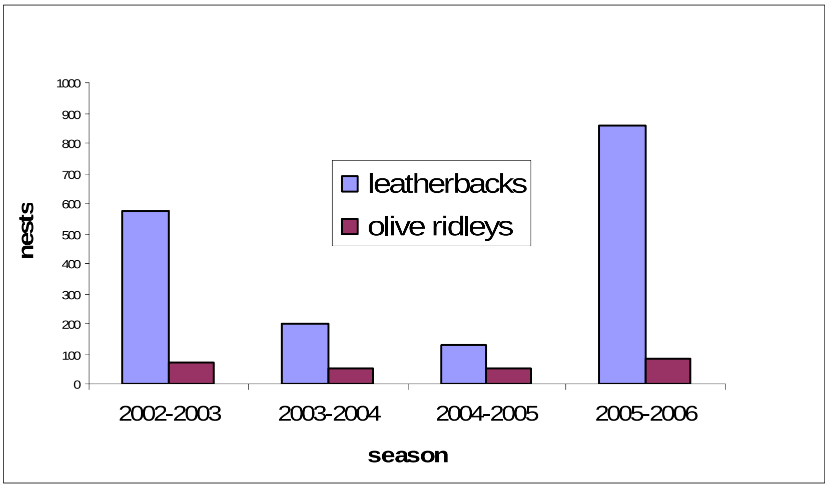


Figure 5.3 Leatherback and olive ridley numbers on the Gamba beach for four seasons (2002 -2006)

In contrast with leatherbacks in Suriname and French Guyana, no correlation was found between nesting behaviour and high tides. This fairly random nesting behaviour became clear when a patrolling schedule used in Suriname, patrolling two hours before till two hours after high tide was adapted and appeared not to be efficient. This can be explained by the river outlet just in front of the beaches in Suriname, which makes it hard for the turtles to access the beaches at low tide because of the current. At our study site no such river exists.

Possible explanations for the variation in nesting numbers could be sought in changing availability of food sources due to changes in the large golf streams (comparable to or related to El Niño effects).

Results from our research and protection program show that continuous presence on the beach linked to larger conservation and development program significantly reduce poaching on monitored beaches. The poaching of leatherback eggs in French Guyana and Suriname is rare and meat from leatherbacks is not eaten by the local population. Maybe because of that the leatherback population in Suriname and French Guyana showed an increase during the past decades. During the nineteen-sixties no more then 200-300 came to nest in Suriname (Schultz 1980) while 30,000 nests were estimated in 2001 (Figure 5.1). Nevertheless, nesting females are a point of concern and discussion for the West African leatherback population. The African turtle population suffered from high egg poaching and turtle killing for consumption activities in the past (CMS/Fretey 2001) and current protection efforts are often insufficient to significantly reduce human pressures.

To determine whether numbers of nesting leatherbacks in Gabon are increasing or declining, ongoing monitoring studies in the upcoming nesting seasons are of high necessity. With increasing fishing activities in the Atlantic Ocean and poaching activities still going on, the leatherback population will be facing many possible threats. While the leatherback population in Suriname increased spectacularly, the olive ridley population has gone almost extinct in Suriname, from 3300 nests in Galibi (one of the several nesting beaches in Suriname) in 1967 (Schultz, 1980), down to at least 109 nests in the total of Suriname's nesting area (Hiltermans, 2000). The olive ridley has been under high egg poaching pressure by the local communities. This example shows how vulnerable and fragile a nesting sea turtle population can be under continuing egg-poaching activities.

5.2 Nest ecology (By Suzanne R. Livingstone)

In-situ nests

The nest profile from the excavated in-situ nests shows that approximately half of the eggs are hatched and a third are inert eggs. Hall (1990) also found that 30 % of the total clutch size of leatherback nests was made up of inert eggs. Approximately 10 % of the eggs were infected by bacteria and showed no signs of embryo. Only a small percentage were found to be un-fertilized, dead-in shell and disintegrated. The mean number of viable eggs in the in-situ nests was 65.9. This is perhaps at the lower end of the range of viable egg numbers found in other leatherback populations; an average of 65 – 80 eggs (Bell et al., 2003); 86 eggs at Tortuguero, Costa Rica (Leslie et al., 1996); 83.1 eggs at Florida beach (Maharaj, 2004).

The mean depth of the of the in-situ leatherback nests was 90 cm to the bottom and 73 cm to the top of the nest chamber. These depths are normal for leatherback nests (Livingstone, 2006). The nests were found to be deeper at the time of excavation then they had been at the time of laying. It is thought that this is due to sand build up on the beach over the nesting season, causing the nests to be deeper at the end of the incubation period.

The temperatures on sea turtle nesting beaches are typically between 24 and 33 °C (Ewert, 1979). Temperature dependent sex determination (TSD) operates to produce male hatchlings at lower temperatures and females at higher temperatures. The pivotal temperature is the temperature at which the sex ratio is 1:1, and varies between 28 to 30 ºC, depending on species and population. The sensitive period for sex determination occurs in the middle third of incubation (Yntema and Mrosovsky, 1982; Mrosovsky, 1994). The pivotal temperature for leatherbacks in the Atlantic is 29.5 °C (Rimblot et al., 1985; Rimblot-Baly et al., 1987). The mean temperature in the leatherback nests on the beach at Gamba was 29.07 °C. Based on this figure, it is likely that the nests laid on the Gamba study beach mostly produce male hatchlings. However, this needs to be investigated in more detail since the overall mean temperatures are based on substantial variability close to the pivotal temperature.

The mean incubation duration in the in-situ nests was 67 days. Nest temperature had a significant negative relationship with the incubation duration (fig.4), as found in other studies (Mrosovsky et al., 1984; Miller, 1985; Marcovaldi et al., 1997; Booth and Astill, 2001). As the nest temperature increases, the incubation period decreases.

The hatching success of individual sea turtle nests is typically high (80 % or more) unless disturbed by external factors such as predation, microbial infection and inundation (Whitmore and Dutton, 1985). The hatching success of leatherback nests has been shown to vary between locations, seasons and individuals (Bell et al., 2003), although researchers generally agree that hatching success is significantly lower for leatherbacks than for other turtle species (Whitmore and Dutton, 1985; Bell et al., 2003; Girondot et al., 1990). Bell et al. (2003) investigated the reasons for lower hatching success in leatherback nests, and concluded that it was due to high hatchling mortality rather than infertility. This was also found to be the case in this study. Lower hatching success may also be due to the higher incidence of inundation as leatherbacks tend to lay their nests closer to the high water mark than other species (Whitmore and Dutton, 1985).

From the 9 recaptured turtles, it is important to note that in five cases one flipper tag was lost (28 % of all tags were lost) and had to be replaced. This emphasises the disadvantage of flipper tags and the need for PIT tag to ensure availability of more remigration data in the future.

The results show that approximately half of the leatherback nests laid on the study beach in Gamba hatch successfully (54%), while the other half are fatally affected by various events (46%). The reasons for the nests not hatching were due to three major threats. Crab predation affected the largest proportion of nests, sometimes completely destroying a nest so that nothing remained (56%). Crabs also predated upon nests that did produce hatchlings, although it is suspected that the hatching success was reduced. 25% of the unhatched nests were affected by inundation by the sea and the 19% by invading roots. Both of these threats are dependent on where on the beach the nest is positioned in relation to the high water mark and the backing vegetation. All the threats present on the beach were natural, with little human interference.

Compared to other regions and populations, the hatching success on the study beach at Gamba is relatively high (68.7%); 64% in the US Virgin Islands (Eckert and Eckert, 1990); 64.1% in Malaysia (Eckert and Eckert, 1996); 73.3 % Trinidad (Livingstone, 2006); 21 % Costa Rica (Bell et al., 2003); 33.5 % in Central and South Brevard County, Florida (Maharaj, 2004), 48.6 % on Playa Grande, Costa Rica (Williams, 1996); 53.2 % in St Croix (Eckert and Eckert, 1985); 72.2 % in Culebra, Puerto Rico (Tucker and Frazer, 1991); 35 % in French Guiana and Suriname (Maros et al., 2003; Girondot et al., 2005).

Hatchery and in-situ comparisons

The nest profile for the hatchery nests were very similar to that in the in-situ nests. The only significant differences were the number of dead-in-shells and in the number of disintegrated eggs. The number of dead-in-shells in the hatchery was lower, and the number of disintegrated was higher. A possible reason for this may be due to the fact that the sand at the bottom of the hatchery was very dark and dirty looking, and possibly contained more bacteria that would breakdown larger embryos faster, making them disintegrated rather than finding them as whole dead-in-shells. It is recommended that, if the hatchery is to be used in the future, that it is dug deeper and filled with clean sand from the beach so that the eggs are not affected by the original sand at the back of the beach where the hatchery is located. It is also recommended that the sand is changed every two years to keep it as fresh and clean as possible. This way the hatching success for the translocated nests can be maximized.

The number of viable eggs in the nests in the hatchery was significantly more than in the in-situ nests. It is thought that this is due to the fact that many of the in-situ nests had been attacked by crabs, and therefore some of the eggs had been removed or totally destroyed, making the number of viable eggs appear less than what was originally laid. There was no significant different between the number of inert eggs in each group of nests. The depth of the nests in the hatchery was significantly shallower than in the in-situ nests. The nests in the hatchery were placed at a mean depth of 70 cm, as this was the average depth of the in-situ nests when they were laid. This again highlights the build up of sand on the beach.

There was a significant different in nest temperatures in the hatchery and in the in-situ nests, with the hatchery nests having a higher temperature. This is possibly to do with the nests being shallower allowing more of the ambient air temperature to affect the nest. In turn, the incubation period was also significantly shorter that in the in-situ nests.

In contrast to the nest success of the monitored in-situ nests, 100% of the nests in the hatchery produced at least one hatchling. This highlights that the hatchery is very effective at keep out predators and keeping the nests safe from the other threats present on the beach. The hatching success measured from the in-situ nests was not significantly different from the nests in the hatchery. This is a very positive result, demonstrating that the hatchery can be a very effective approach to conservation and increasing hatchling production.

Hatchery assessment

This is different from the results of the study in 2004/2005, where the hatching success in the in-situ nests was double that of in the hatchery. The hatching success from the 2004/2005 field season was also higher than in this study (83% compared with 67%). However this may be due to a smaller sample size, and a bias towards digging up nests that had a higher number of hatchlings tracks leading from them, making them easier to identify (Verhage and Moundjim, 2005). The much larger sample size in this study, and the fact that the hatching success in the closely monitored nests was not significantly different to that of the randomly identified nests, shows that the hatching success in this study is a more realistic figure.

It was suggested that the low hatching success in the hatchery in 2004/2005 was possibly due to differing temperatures on the beach and in the hatchery, or translocation technique. The temperatures in the nests was found to be significantly different in the in-situ nests and the hatchery nests. However, there was no significant difference between the hatching success. This suggests that temperature was not the cause of the differing hatching success rates in the 2004/2005 study.

We also used a different translocation technique to move the nests to the hatchery in 2005/2006. The technique used was much less intrusive and involved much less direct handling of the eggs. We feel that this new technique is the reason for the improved hatching success in the hatchery. The local group trained in this technique will be able to use it in future years. Although the differing nest temperatures did not appear to affect the hatching success, it most likely had an affect on the sex ratio of the hatchlings produced. This should be taken into consideration for the hatchery if it is continued in future years.

The hatchery has proved to be very successful in terms of protecting nests and hatchlings, and is much improved from last year. At present the hatchery is on a small scale, able to hold 20 nests. The conservation benefits of this are, of course positive, however to have an impact on the population, it would have to be done on a much larger scale. It is important to maximize hatching success and increase the number of hatchlings that reach the seas (Bell et al., 2003). To do this, hatcheries have been put in practice in a number of places where the mean hatching success is particularly low (Girondot et al., 1990; Mortimer, 1999; Van de Merwe et al., 2005). However, in comparison to other leatherback populations, the nest success and hatching success on the Gamba beach is relatively high, and all the threats are natural. Therefore a full scale hatchery is perhaps not required at this time at Gamba considering the time, effort and manpower it takes to fill and monitor the hatchery. However, the hatchery also proved to be successful in attracting tourists, and also was used for the education and awareness of local school children by the local NGO Ibonga.

Using the new translocation techniques, the hatchery has proved to be a good conservation measure, and not in any way detrimental to the moved leatherback eggs. With this in mind, the small-scale hatchery as it is now is worth continuing for the education benefits alone. Also, the hatchery could be enlarged if the need for more conservation is identified by future decreases in the nesting female population. The hatchery in Gamba can also be used as a model for other leatherback nesting areas.

6 Conclusions

With around 2,500 nesting leatherbacks, the Gamba Complex of Protected Areas can be considered an important site for nesting leatherbacks. After three seasons of continuous decline in nesting numbers the marine turtles have returned to the Gamba beach in greater number than have been recorded before. To verify if this is part of a nesting cycle or just random nesting behaviour, it is of utmost importance to continue monitoring the beaches of the Gamba Complex.

A baseline of data on the nest ecology of the leatherbacks nesting on the beaches of Gabon has been created. With this knowledge, threats to nests can be reduced and improvements have been made to the open air hatchery, increasing hatching success on translocated nests, which in turn increases the hatchling output, including nests which may ordinarily have been destroyed. The training of the local counterparts will ensure effective and analogous data collection into the future, so that changes in nest ecology can be identified, and improvements in the hatchery put into practice. The hatchery will remain as a successful educational tool for tourists and local schools, generating much needed funds, and helping to raise awareness.

Fishing trawlers were sighted at too close and so at Illegal distance from the nesting beaches at Pont Dick at almost daily bases. Although we believe that trawling fisheries in Gabon posses threats to marine turtle populations, even more so after the large numbers of dead turtles found on the beaches in southern Gabon, no evidence exists to confirm this. Further studies are needed to qualify the dangers for turtles by fisheries.

The successful cooperation with Ibonga, ENEF, MINEF, CNPN, PSVAP, PROTOMAC, WWF-LAC is providing a solid base for continuation of the Marine Turtle Monitoring Programme on an elevated level. A local team is now trained to do research autonomously and deliver a successful tourist product at the same time. Thanks to international and national cooperation satellite transmitters have been mounted on three leatherback turtles and a process has been initiated to arrive at an institutional exchange mechanism through the joint preparation of an annual “Gabon State of the Marine Turtles Report”.
National and International platforms are of utmost importance to share knowledge and to protect one of the largest, most migratory and endangered reptiles of the planet.

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Annex 1

First Evidence of Leatherback Movement from Africa to South America

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Descriptions of trans-Atlantic migrations of female leatherbacks focus essentially on movements from the western Atlantic to the eastern Atlantic. Bleakney (1965) speculated that some female leatherbacks from Guyanese nesting sites may migrate across to Europe. In April 1971, a leatherback tagged at Bigisanti Beach, Suriname, in May 1970 was recaptured at Salt Pond in Ghana (Pritchard 1973). Females tagged in French Guiana have been captured at various locations in the northeastern Atlantic (Fretey & Fernandez-Cordeiro 1996; Fretey & Girondot 1996). More recently, satellite telemetry has detailed the routes actually used by leatherbacks from different western Atlantic nesting sites during their migrations across the Atlantic (Eckert 1998; Ferraroli *et al.*2004; Hays *et al*. 2004).Here we present the first evidence of trans-Atlantic migrations by female leatherbacks nesting in the eastern Atlantic, in Gabon, to western Atlantic waters. Gabon supports one of the largest leatherback nesting beaches in the world along with the Guianas and has an annual nesting population between 6,000 to 7,000 females on a 90-km beach in southern Gabon alone (unpublished data). Four leatherbacks flipper-tagged on the beaches of Gabon were recently recovered in the waters of Argentina and Brazil (Fig. 1). Tagging location and recapture location information as well the curved carapace length (CCL) measurement (from nuchal notch to tip of caudal peduncle along the crest of the midline vertebral ridge) at the nesting beach are provided below for each of the four leatherbacks: *Turtle 1*: This leatherback (CCL: 170 cm) was tagged while nesting on Gamba Beach, Gabon (between 2.83°S-10.07°E and 2.79°S- 10.02°E), on 15th December 2003. She was recaptured almost 14 months later on 9th February 2005 in the waters of San Clemente del Tuyú, Buenos Aires Province, (36.37ºS and 56.65ºW; Fig. 1) in Argentina, more than 7,000 km straight-line distance. The turtle was entangled and dead in an artisanal gillnet in San Clemente del Tuyú. *Turtle 2*: This leatherback (CCL: 154.5 cm) was tagged while nesting on Mayumba Beach (between 3.68ºS-10.93ºE and 3.72ºS-10.97 ºE) on 21st November 2002 and was seen nesting again on 20th December 2002, on the same stretch of beach. She was recaptured 2 years and seven months later on 30th July 2005, by a longline vessel in Brazil at 31.22°S and 49.53° W (Fig. 1). The observer put another tag on the female, which was released in good condition, without any hooks or monofilament lines on her. *Turtle 3*: This leatherback (CCL: 147 cm) was tagged while nesting at Mayumba Beach (between 3.68ºS-10.93ºE and 3.72ºS-10.97 ºE) on 22nd December 2003, and was found renesting on 21st January 2004, on the same stretch of beach. Approximately 21 months later, on 9th October 2005, this turtle was found freshly dead in a gill net, in Itacuruça, (23.02°S and 43.93°W; Fig. 1) a city located in Rio de Janeiro State, Brazil. *Turtle 4*: This leatherback (CCL: 144 cm) was tagged on 7th February 2003 at Mayumba Beach (between 3.68ºS -10.93ºE and 3.62ºS -10.87ºE). This animal was found dead on the island of Ilhabela, located on the northern coastline of São Paulo State, Brazil (23.82°S and 45.38°W; Fig. 1) on 26th August 2005. No satisfying explanation has been found to explain trans-Atlantic migrations of leatherbacks. If the presence of foraging grounds in the eastern Atlantic explains the direct west to east migration routes observed in leatherbacks from western populations (Eckert 1998; Ferraroli *et al.* 2004) as well as the 7000-km migration by a leatherback nesting in Tongaland in the Indian Ocean to Namibian waters in the Atlantic (Hughes *et al.* 1998), then further investigations are required to understand why leatherbacks nesting in Gabon would migrate to Argentinean and Brazilian waters. A first hypothesis may be that the 6-month lag between nesting seasons for leatherbacks in the eastern Atlantic (November-January) and the western Atlantic (April-June) may result in different trophic conditions at the onset of their migrations. Satellite telemetry studies are currently underway in Gabon and French Guiana to identify the actual determinants of at sea movements in this endangered species.

Acknowledgements:
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Annex 2

List of Monel used at Pont Dick in the nesting season from November 2002 until March 2003.

List of abbreviation:

DC	=	*Dermochelys coriaceae*
LO	=	*Lepidochelys olivacea*
CM	=	*Chelonia mydas*
EI	=	*Eretmochelys imbricata*
LHF	=	Left hind flipper
LFF	=	left front flipper
RHF	=	Right hind flipper
RFF	=	Right front flipper
CCL	=	Curved carapace length
CCW	=	Curved carapace width
ICT	=	Head with

DATE	Spec.	Monel tag	Monel tag	Monel Recapture		CCL	CCW
		LHF	RHF	LHF	RHF		
27/12/2002	DC	ASF10101	ASF10102			145,00	105,00
27/12/2002	DC	ASF10104	ASF10103			150,00	108,00
28/12/2002	DC	ASF10105	ASF10106			143,00	108,00
29/12/2002	DC	ASF10108	ASF10107			155,00	110,00
29/12/2002	DC	ASF10109	ASF10110			145,00	100,00
29/12/2002	DC	ASF10111	ASF10112			150,00	104,00
29/12/2002	DC	ASF10113	ASF10114			141,00	106,00
03/01/2003	DC	ASF10115	ASF10116			155,00	110,00
03/01/2003	DC	ASF10117	ASF10118			150,00	108,00
03/01/2003	DC	ASF10119	ASF10120			152,00	110,00
11/12/2002	DC	ASF10121	ECO10646			141,00	102,00
04/01/2003	DC	ASF10121	ECO10646	X	X	142,00	101,00
04/01/2003	DC	ASF10122	ASF10123			148,00	112,00
02/12/2002	DC	ASF10125	ECO10569			153,00	112,00
29/12/2002	DC	ASF10125	ECO10569	X	X	156,00	118,00
31/12/2002	DC	ASF10126	ASF10127			160,00	112,00
04/01/2003	DC	ASF10128	ASF10129			153,00	106,00
04/01/2003	DC	ASF10130	ASF10131			146,00	105,00
05/01/2003	DC	ASF10132	ASF10133			142,00	104,00
07/01/2003	DC	ASF10134	ASF10135			152,00	105,00
07/01/2003	DC	ASF10136	ASF10137			149,00	105,00
19/01/2003	DC	ASF10136	ASF10137	X	X	150,00	110,00
07/01/2003	DC	ASF10138	ASF10139			153,00	110,00
06/01/2003	DC	ASF10140	ASF10141			164,00	113,00
06/01/2003	DC	ASF10142	ASF10143			145,00	100,00
19/01/2003	DC	ASF10142	ASF10143	X	X	145,00	103,00
09/01/2003	DC	ASF10144	0			154,00	103,00
09/01/2003	DC	ASF10145	0			142,00	107,00
09/01/2003	DC	ASF10146	0			155,00	110,00
10/01/2003	DC	ASF10147	0			149,00	108,00

10/01/2003	DC	ASF10148	0			144,00	95,00
09/01/2003	DC	ASF10149	0			147,00	112,00
09/01/2003	DC	ASF10150	0			158,00	108,00
09/01/2003	DC	ASF10151	0			147,00	108,00
09/01/2003	DC	ASF10152	ASF10405			148,00	106,00
18/01/2003	DC	ASF10152	ASF10405	X	X	150,00	105,00
08/01/2003	DC	ASF10153	ASF10154			155,00	105,00
04/01/2003	DC	ASF10155	ASF10274			150,00	106,00
02/01/2003	DC	ASF10156	ASF10157			155,00	110,00
02/01/2003	DC	ASF10159	ASF10158			150,00	106,00
02/01/2003	DC	ASF10160	ASF10161			158,00	112,00
02/01/2003	DC	ASF10162	ASF10163			155,00	110,00
01/01/2003	DC	ASF10164	ASF10165			155,00	108,00
01/01/2003	DC	ASF10166	ASF10167			154,00	110,00
01/01/2003	DC	ASF10168	ASF10169			155,00	110,00
31/12/2002	DC	ASF10170	ASF10171			155,00	110,00
31/12/2002	DC	ASF10172	ASF10173			147,00	100,00
31/12/2002	DC	ASF10174	ASF10175			156,00	110,00
03/01/2003	DC	ASF10176	ASF10177			156,00	112,00
03/01/2003	DC	ASF10178	ASF10179			154,00	110,00
03/01/2003	DC	ASF10180	0			130,00	80,00
03/01/2003	DC	ASF10181	ASF10182			145,00	105,00
13/02/2003	DC	ASF10181	ASF10182	X	X	147,00	105,00
05/01/2003	DC	ASF10183	ASF10184			138,00	103,00
05/01/2003	DC	ASF10185	ASF10186			156,00	103,00
05/01/2003	DC	ASF10187	ASF10188			142,00	100,00
01/02/2003	DC	ASF10187	ASF10188	X	X	142,00	100,00
05/01/2003	DC	ASF10190	ASF10191			155,00	106,00
05/01/2003	DC	ASF10192	ASF10193			139,00	98,00
05/01/2003	DC	ASF10194	ASF10195			151,00	101,00
05/01/2003	DC	ASF10196	ASF10197			145,00	107,00
04/02/2003	DC	ASF10196	ASF10197	X	X	142,00	107,00
08/01/2003	DC	ASF10198	ASF10199			150,00	106,00
09/01/2003	DC	ASF10200	0			142,00	103,00
18/12/2002	DC	ASF10201	ASF10202			157,00	103,00
19/12/2002	DC	ASF10203	ASF10204			153,00	105,00
19/12/2002	DC	ASF10205	ASF10206			165,00	120,00
28/12/2002	DC	ASF10205	ASF10206	X	X	160,00	120,00
26/01/2003	DC	ASF10205	ASF10206	X	X	157,00	118,00
07/02/2003	DC	ASF10205	ASF10206	X	X	157,00	117,00
19/12/2002	DC	ASF10207	ASF10208			145,00	105,00
20/12/2002	DC	ASF10209	ASF10210			148,00	118,00
21/12/2002	DC	ASF10211	ASF10212			152,00	113,00
21/12/2002	DC	ASF10213	ASF10214			145,00	107,00
21/12/2002	DC	ASF10216	ASF10215			158,00	110,00
21/12/2002	DC	ASF10218	ASF10217			147,00	105,00
22/12/2002	DC	ASF10219	ASF10220			145,00	110,00
25/12/2002	DC	ASF10221	ASF10222			155,00	107,00

25/12/2002	DC	ASF10223	ASF10224			162,00	114,00
04/01/2003	DC	ASF10223	ASF10224	X	X	162,00	115,00
13/02/2003	DC	ASF10223	ASF10224	X	X	161,00	112,00
18/12/2002	DC	ASF10226	ASF10227			155,00	110,00
05/01/2003	DC	ASF10226	ASF10227	X	X	155,00	110,00
25/01/2003	DC	ASF10226	ASF10227	X	X	153,00	110,00
18/12/2002	DC	ASF10228	ASF10229			144,00	100,00
27/12/2002	DC	ASF10228	ASF10229	X	X	142,00	101,00
20/12/2002	DC	ASF10230	ASF10231			140,00	100,00
20/12/2002	DC	ASF10232	ASF10233			155,00	110,00
09/01/2003	DC	ASF10232	ASF10233	X	X	150,00	110,00
20/12/2002	DC	ASF10235	ASF10234			154,00	109,00
09/01/2003	DC	ASF10235	ASF10234	X	X	154,00	108,00
21/12/2002	DC	ASF10236	ASF10237			155,00	109,00
21/12/2002	DC	ASF10238	ASF10239			153,00	105,00
21/12/2002	DC	ASF10240	ASF10241			155,00	110,00
21/12/2002	DC	ASF10242	ASF10243			152,00	107,00
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22/12/2002	DC	ASF10248	ASF10249			153,00	110,00
03/01/2003	DC	ASF10248	ASF10249	X	X	155,00	110,00
22/12/2002	DC	ASF10250	ASF10225			149,00	107,00
25/12/2002	DC	ASF10252	ASF10253			151,00	109,00
25/12/2002	DC	ASF10254	ASF10255			150,00	109,00
26/12/2002	DC	ASF10256	ASF10257			148,00	108,00
27/12/2002	DC	ASF10258	ASF10259			155,00	100,00
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28/12/2002	DC	ASF10264	ASF10265			148,00	102,00
28/12/2002	DC	ASF10266	ASF10267			138,00	100,00
29/12/2002	DC	ASF10269	ASF10268			155,00	110,00
31/12/2002	DC	ASF10272	ASF10273			140,00	103,00
09/01/2003	DC	ASF10272	ASF10273	X	X	142,00	101,00
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24/12/2002	DC	ASF10279	ASF10280			150,00	103,00
26/01/2003	DC	ASF10279	ASF10280	X	X	149,00	105,00
24/12/2002	DC	ASF10283	ASF10284			160,00	117,00
24/12/2002	DC	ASF10285	ASF10286			156,00	110,00
24/12/2002	DC	ASF10287	ASF10288			150,00	108,00
25/12/2002	DC	ASF10289	ASF10290			158,00	114,00
26/12/2002	DC	ASF10291	ASF10292			145,00	105,00
26/12/2002	DC	ASF10293	ASF10295			154,00	105,00
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27/12/2002	DC	ASF10298	ASF10299			148,00	103,00
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20/01/2003	DC	ASF10407	ASF10408			151,00	95,00
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20/01/2003	DC	ASF10411	ASF10412			150,00	105,00

21/01/2003	DC	ASF10413	ASF10414			153,00	106,00
21/01/2003	DC	ASF10416	ASF10417			142,00	108,00
21/01/2003	DC	ASF10420	ASF10421			146,00	105,00
20/01/2003	DC	ASF10422	ASF10423			161,00	111,00
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15/01/2003	DC	ASF10426	ASF10427			154,00	113,00
23/01/2003	DC	ASF10426	ASF10427	X	X	155,00	114,00
15/01/2003	DC	ASF10428	ASF10429			147,00	103,00
25/01/2003	DC	ASF10428	ASF10429	X	X	145,00	103,00
16/01/2003	DC	ASF10430	ASF10431			150,00	105,00
17/01/2003	DC	ASF10432	ASF10433			155,00	110,00
17/01/2003	DC	ASF10434	ASF10435			150,00	0,00
18/01/2003	DC	ASF10436	ASF10437			158,00	118,00
20/01/2003	DC	ASF10441	ASF10442			169,00	118,00
22/01/2003	DC	ASF10445	0			158,00	112,00
23/01/2003	DC	ASF10446	ASF10500			159,00	115,00
22/01/2003	DC	ASF10447	ASF10448			165,00	107,00
22/01/2003	DC	ASF10449	ASF10450			162,00	110,00
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07/02/2003	DC	ASF10453	ASF10454	X	X	153,00	106,00
24/01/2003	DC	ASF10455	ASF10456			155,00	110,00
25/01/2003	DC	ASF10457	ASF10458			150,00	108,00
25/01/2003	DC	ASF10459	ASF10460			150,00	102,00
07/02/2003	DC	ASF10459	ASF10460	X	X	150,00	104,00
26/01/2003	DC	ASF10461	ASF10462			152,00	107,00
08/02/2003	DC	ASF10461	ASF10462	X	X	152,00	108,00
26/01/2003	DC	ASF10463	ASF10464			147,00	110,00
27/01/2003	DC	ASF10465	ASF10466			152,00	109,00
27/01/2003	DC	ASF10467	ASF10468			149,00	105,00
29/01/2003	DC	ASF10469	ASF10470			150,00	110,00
29/01/2003	DC	ASF10471	ASF10472			152,00	110,00
30/01/2003	DC	ASF10473	ASF10474			155,00	112,00
30/01/2003	DC	ASF10475	ASF10499			150,00	110,00
23/01/2003	DC	ASF10476	ASF10477			146,00	108,00
03/02/2003	DC	ASF10476	ASF10477	X	X	145,00	103,00
24/01/2003	DC	ASF10479	ASF10478			156,00	112,00
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24/01/2003	DC	ASF10480	ASF10481			150,00	107,00
25/01/2003	DC	ASF10482	0			161,00	108,00
25/01/2003	DC	ASF10483	ASF10484			145,00	109,00
26/01/2003	DC	ASF10485	ASF10486			155,00	108,00
26/01/2003	DC	ASF10487	ASF10488			144,00	116,00
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26/01/2003	DC	ASF10493	ASF10494			144,00	105,00
30/01/2003	DC	ASF10495	ASF10496			149,00	107,00
29/01/2003	DC	ASF10497	ASF10498			149,00	108,00

31/01/2003	DC	ASF11402	ASF11401			152,00	105,00
01/02/2003	DC	ASF11403	ASF11404			153,00	110,00
01/02/2003	DC	ASF11405	ASF11406			150,00	107,00
19/02/2003	DC	ASF11405	ASF11406	X	X	150,00	108,00
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04/02/2003	DC	ASF11409	ASF11410			140,00	101,00
06/02/2003	DC	ASF11411	ASF11412			157,00	110,00
05/02/2003	DC	ASF11413	ASF11414			145,00	100,00
05/02/2003	DC	ASF11415	ASF11416			155,00	112,00
05/02/2003	DC	ASF11417	ASF11418			154,00	110,00
07/02/2003	DC	ASF11419	ASF11420			155,00	110,00
07/02/2003	DC	ASF11421	ASF11422			152,00	108,00
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07/02/2003	DC	ASF11440	ASF11439			149,00	102,00
07/02/2003	DC	ASF11441	ASF11442			155,00	111,00
20/01/2003	DC	ASF11443	ASF10444			160,00	113,00
08/02/2003	DC	ASF11443	ASF11444			159,00	108,00
08/02/2003	DC	ASF11445	ASF11446			160,00	119,00
08/02/2003	DC	ASF11447	ASF11448			150,00	110,00
08/02/2003	DC	ASF11449	ASF11450			148,00	108,00
08/02/2003	DC	ASF11451	ASF11452			155,00	111,00
08/02/2003	DC	ASF11453	ASF11454			142,00	100,00
08/02/2003	DC	ASF11455	ASF11456			157,00	112,00
08/02/2003	DC	ASF11457	ASF11458			155,00	110,00
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09/02/2003	DC	ASF11461	ASF11462			155,00	111,00
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10/02/2003	DC	ASF11465	ASF11466			149,00	110,00
10/02/2003	DC	ASF11467	ASF11468			153,00	110,00
09/02/2003	DC	ASF11470	ASF11469			145,00	100,00
09/02/2003	DC	ASF11471	ASF11472			140,00	100,00
19/02/2003	DC	ASF11471	ASF11472	X	X	140,00	102,00
10/02/2003	DC	ASF11473	ASF11474			160,00	118,00
10/02/2003	DC	ASF11475	ASF11476			145,00	103,00
21/01/2003	DC	ASF8366	ASF8367	X	X	152,00	110,00
22/01/2003	DC	ASF8404	ASF8405	X	X	160,00	115,00
27/12/2002	DC	ASF9938	ASF9939	X	X	143,00	108,00
05/01/2003	DC	ASF9938	ASF9939	X	X	142,00	107,00
11/11/2002	DC	ECO10207	ECO10215			167,00	115,00
21/11/2002	DC	ECO10207	ECO10215	X	X	162,00	110,00
11/11/2002	DC	ECO10208	ECO10205			149,00	110,00

12/11/2002	DC	ECO10219	ECO10224			149,00	100,00
12/11/2002	DC	ECO10220	ECO10221			158,00	115,00
29/11/2002	DC	ECO10225	ECO10526			158,00	110,00
12/11/2002	DC	ECO10504	ECO10502			160,00	110,00
05/01/2003	DC	ECO10504	ECO10502	X	X	158,00	108,00
21/11/2002	DC	ECO10508	ECO10509			154,00	108,00
20/11/2002	DC	ECO10512	ECO10516			150,00	110,00
14/11/2002	DC	ECO10518	ECO10514			167,00	0,00
17/11/2002	DC	ECO10524	ECO10513			149,00	113,00
08/12/2002	DC	ECO10524	ECO10513	X	X	142,00	109,00
14/11/2002	DC	ECO10525	ECO10523			135,00	102,00
24/11/2002	DC	ECO10530	ECO10529			161,00	119,00
20/11/2002	DC	ECO10531	ECO10538			143,00	103,00
20/11/2002	DC	ECO10533	ECO10537			106,00	111,00
28/02/2003	DC	ECO10533	ECO10537	X	X	158,00	113,00
03/03/2003	DC	ECO10533	ECO10537	X	X	157,00	113,00
21/11/2002	DC	ECO10534	ECO10515			154,00	0,00
26/12/2002	DC	ECO10534	ECO10515	X	X	156,00	112,00
04/01/2003	DC	ECO10534	ECO10515	X	X	155,00	116,00
19/11/2002	DC	ECO10540	ECO10535			153,00	110,00
18/11/2002	DC	ECO10542	ECO10522			150,00	110,00
25/11/2002	DC	ECO10543	ECO10544			157,00	110,00
25/11/2002	DC	ECO10545	ECO10541			150,00	105,00
29/11/2002	DC	ECO10546	ECO10547			155,00	110,00
24/11/2002	DC	ECO10549	ECO10550			156,00	117,00
29/11/2002	DC	ECO10549	ECO10548			158,00	116,00
26/11/2002	DC	ECO10551	ECO10552			158,00	110,00
29/11/2002	DC	ECO10557	ECO10562			155,00	110,00
26/11/2002	DC	ECO10558	ECO10559			147,00	110,00
28/12/2002	DC	ECO10558	ECO10559	X	X	145,00	113,00
27/11/2002	DC	ECO10561	ECO10581			158,00	119,00
09/12/2002	DC	ECO10565	ECO10566			150,00	109,00
09/01/2003	DC	ECO10565	ECO10566	X	X	146,00	104,00
03/12/2002	DC	ECO10570	ECO10571			154,00	110,00
03/12/2002	DC	ECO10572	ECO10573			155,00	112,00
03/12/2002	DC	ECO10574	ECO10575			150,00	110,00
01/12/2002	DC	ECO10576	ECO10579			149,00	105,00
28/11/2002	DC	ECO10577	ECO10578			153,00	110,00
19/12/2002	DC	ECO10577	ECO10578	X	X	155,00	110,00
28/12/2002	DC	ECO10577	ECO10578	X	X	150,00	106,00
18/01/2003	DC	ECO10577	ECO10578	X	X	150,00	110,00
01/12/2002	DC	ECO10580	ECO10586			159,00	110,00
01/12/2002	DC	ECO10582	ECO10583			147,00	108,00
01/12/2002	DC	ECO10587	ECO10588			152,00	110,00
02/12/2002	DC	ECO10590	ECO10591			157,00	107,00
28/11/2002	DC	ECO10593	ECO10592			154,00	107,00
07/01/2003	DC	ECO10593	ECO10592	X	X	151,00	115,00
01/12/2002	DC	ECO10594	ECO10595			158,00	112,00

01/12/2002	DC	ECO10596	ECO10589			150,00	110,00
01/12/2002	DC	ECO10598	ECO10599			148,00	108,00
10/12/2002	DC	ECO10600	ECO10601			156,00	110,00
09/12/2002	DC	ECO10602	ECO10603			155,00	105,00
08/12/2002	DC	ECO10605	ECO10604			150,00	100,00
08/12/2002	DC	ECO10608	ECO10609			148,00	97,00
07/12/2002	DC	ECO10610	ECO10611			158,00	114,00
07/12/2002	DC	ECO10612	ECO10613			149,00	100,00
07/12/2002	DC	ECO10614	ECO10615			160,00	110,00
06/12/2002	DC	ECO10617	ECO10616			155,00	110,00
05/12/2002	DC	ECO10618	ASF10189			154,00	111,00
05/01/2003	DC	ECO10618	ASF10189	X	X	155,00	107,00
05/12/2002	DC	ECO10620	ECO10621			153,00	116,00
15/12/2002	DC	ECO10620	ECO10621	X	X	155,00	103,00
23/12/2002	DC	ECO10620	ECO10621	X	X	158,00	103,00
04/12/2002	DC	ECO10622	ECO10623			151,00	110,00
13/12/2002	DC	ECO10622	ECO10623	X	X	157,00	113,00
04/12/2002	DC	ECO10624	ECO10625			147,00	105,00
08/12/2002	DC	ECO10626	ECO10627			158,00	108,00
27/12/2002	DC	ECO10626	ECO10627	X	X	158,00	109,00
05/01/2003	DC	ECO10626	ECO10627	X	X	155,00	108,00
01/02/2003	DC	ECO10626	ECO10627	X	X	155,00	108,00
12/12/2002	DC	ECO10628	ECO10629			157,00	110,00
12/12/2002	DC	ECO10630	ECO10631			147,00	107,00
11/12/2002	DC	ECO10632	ECO10633			150,00	118,00
29/12/2002	DC	ECO10632	ECO10633	X	X	150,00	105,00
03/01/2003	DC	ECO10632	ECO10633	X	X	150,00	110,00
10/12/2002	DC	ECO10637	ECO10636			153,00	109,00
10/12/2002	DC	ECO10640	ECO10641			155,00	110,00
10/12/2002	DC	ECO10642	ECO10643			158,00	113,00
10/12/2002	DC	ECO10644	ECO10645			152,00	110,00
11/12/2002	DC	ECO10648	ECO10649			152,00	107,00
29/12/2002	DC	ECO10648	ECO10649	X	X	153,00	106,00
11/12/2002	DC	ECO10650	ECO10651			163,00	113,00
12/12/2002	DC	ECO10654	ECO10653			148,00	0,00
12/12/2002	DC	ECO10655	ECO10657			147,00	102,00
09/01/2003	DC	ECO10655	ECO10657	X	X	146,00	108,00
12/12/2002	DC	ECO10658	ECO10659			148,00	110,00
12/12/2002	DC	ECO10660	ECO10661			158,00	115,00
03/01/2003	DC	ECO10660	ECO10661	X	X	159,00	115,00
13/12/2002	DC	ECO10664	ECO10665			155,00	110,00
15/12/2002	DC	ECO10666	ECO10667			143,00	107,00
15/12/2002	DC	ECO10668	ECO10670			165,00	115,00
15/12/2002	DC	ECO10669	ECO10671			156,00	110,00
09/01/2003	DC	ECO10669	ECO10671	X	X	152,00	115,00
15/12/2002	DC	ECO10672	ECO10673			148,00	108,00
16/12/2002	DC	ECO10674	ECO10675			148,00	110,00
13/12/2002	DC	ECO10677	ECO10676			148,00	104,00

13/12/2002	DC	ECO10678	ECO10679			158,00	105,00
11/01/2003	DC	ECO10678	ECO10679	X	X	158,00	110,00
13/12/2002	DC	ECO10681	ECO10682			160,00	110,00
13/12/2002	DC	ECO10683	ECO10684			143,00	109,00
03/01/2003	DC	ECO10683	ECO10684	X	X	145,00	112,00
13/12/2002	DC	ECO10685	ECO10686			157,00	107,00
15/12/2002	DC	ECO10687	ECO10688			151,00	106,00
20/01/2003	DC	ECO10687	ECO10688	X	X	150,00	110,00
16/12/2002	DC	ECO10690	ECO10689			155,00	110,00
16/12/2002	DC	ECO10691	ECO10692			158,00	113,00
16/12/2002	DC	ECO10693	ECO10694			158,00	105,00
16/12/2002	DC	ECO10697	ECO10698			157,00	103,00
17/12/2002	DC	ECO10699	0			145,00	108,00
17/12/2002	DC	ECO10700	0			154,00	110,00
11/02/2003	DC	ECO12001	ECO12002			136,00	91,00
11/02/2003	DC	ECO12003	ASF0272	X	X	139,00	98,00
16/02/2003	DC	ECO12004	ECO12005			152,00	110,00
17/02/2003	DC	ECO12006	ECO12007			157,00	112,00
17/02/2003	DC	ECO12008	ECO12009			155,00	111,00
18/02/2003	DC	ECO12010	ECO12011			155,00	111,00
18/02/2003	DC	ECO12012	ECO12013			150,00	110,00
20/02/2003	DC	ECO12014	ECO12015			142,00	105,00
20/02/2003	DC	ECO12016	ECO12017			147,00	106,00
22/02/2003	DC	ECO12018	ECO12019			150,00	110,00
22/02/2003	DC	ECO12020	ECO12021			155,00	111,00
22/02/2003	DC	ECO12022	ECO12023			147,00	100,00
25/02/2003	DC	ECO12024	ECO12025			0	0
13/02/2003	DC	ECO12027	ECO12028			158,00	111,00
15/02/2003	DC	ECO12029	ECO12030			155,00	110,00
15/02/2003	DC	ECO12031	ECO12032			152,00	108,00
16/02/2003	DC	ECO12033	ECO12034			150,00	108,00
17/02/2003	DC	ECO12035	ECO12036			150,00	110,00
18/02/2003	DC	ECO12037	ECO12038			154,00	110,00
18/02/2003	DC	ECO12039	ECO12040			149,00	103,00
21/02/2003	DC	ECO12043	ECO12041			162,00	115,00
23/02/2003	DC	ECO12044	ECO12045			167,00	112,00
23/02/2003	DC	ECO12046	ECO12047			156,00	110,00
25/02/2003	DC	ECO12048	ECO12049			0	0
25/02/2003	DC	ECO12050	ECO12026			0	0
24/02/2003	DC	ECO12051	ECO12052			156,00	111,00
28/02/2003	DC	ECO12053	ECO12054			155,00	111,00
27/02/2003	DC	ECO12055	ECO12056			157,00	112,00
14/03/2003	DC	ECO12055	ECO12056	X	X	157,00	112,00
27/02/2003	DC	ECO12057	ECO12058			147,00	103,00
01/03/2003	DC	ECO12059	ECO12060			140,00	100,00
02/03/2003	DC	ECO12061	ECO12062			155,00	111,00
03/03/2003	DC	ECO12063	ECO12064			150,00	110,00
04/03/2003	DC	ECO12065	ECO12066			150,00	110,00

05/03/2003	DC	ECO12067	ECO12068			155,00	112,00
05/03/2003	DC	ECO12069	ECO12070			155,00	112,00
07/03/2003	DC	ECO12071	ECO12072			147,00	103,00
07/03/2003	DC	ECO12073	ECO12074			152,00	110,00
24/02/2003	DC	ECO12075	ECO12076			150,00	110,00
01/03/2003	DC	ECO12077	ECO12078			156,00	112,00
02/03/2003	DC	ECO12080	ECO12079			157,00	113,00
03/03/2003	DC	ECO12081	ECO12082			157,00	112,00
03/03/2003	DC	ECO12083	ECO12084			150,00	110,00
03/03/2003	DC	ECO12086	ECO12085			148,00	102,00
05/03/2003	DC	ECO12087	ECO12088			140,00	100,00
05/03/2003	DC	ECO12091	ECO12092			150,00	110,00
06/03/2003	DC	ECO12094	ECO12093			155,00	111,00
06/03/2003	DC	ECO12095	ECO12096			153,00	110,00
08/03/2003	DC	ECO12097	ECO12098			154,00	111,00
08/03/2003	DC	ECO12099	ECO12100			155,00	112,00
12/03/2003	DC	ECO12245	ECO12246			155,00	112,00
12/03/2003	DC	ECO12247	ECO12248			152,00	111,00
11/03/2003	DC	ECO12249	ECO12250			152,00	111,00
14/03/2003	DC	ECO12277	0			149,00	110,00
11/03/2003	DC	ECO12279	ECO12280			150,00	110,00
14/03/2003	DC	ECO12282	ECO12283			156,00	112,00
16/03/2003	DC	ECO12284	ECO12285			156,00	107,00
16/03/2003	DC	ECO12286	ECO12287			148,00	105,00
16/03/2003	DC	ECO12288	ECO12289			158,00	108,00
23/03/2003	DC	ECO12291	ECO12292			160,00	112,00
21/03/2003	DC	ECO12295	ECO12294			148,00	106,00
22/03/2003	DC	ECO12296	ECO12297			146,00	103,00
22/03/2003	DC	ECO12298	ECO12299			157,00	105,00

DATE	Spec.	Monel tag	Monel tag	Monel Recapture		CCL	CCW
		LHF	RHF	LHF	RHF		
12/11/2002	LO	ECO10222	ECO10306			73,00	65,00
14/11/2002	LO	ECO10520	0			73,00	72,00
17/11/2002	LO	ECO10519	ECO10510			71,00	74,00
20/11/2002	LO	ECO10511	ECO10521			75,00	75,00
25/11/2002	LO	ECO10527	ECO10528			70,00	70,00
25/11/2002	LO	ECO10532	ECO10309			71,00	71,00
26/11/2002	LO	ECO10501	ECO10503			67,00	68,00
26/11/2002	LO	ECO10554	ECO10553			69,00	70,00
26/11/2002	LO	ECO10555	ECO10556			69,00	70,00
26/11/2002	LO	ECO10564	ECO10563			76,00	77,00
29/11/2002	LO	ECO10536	ECO10539			76,00	76,00
01/12/2002	LO	ECO10560	ECO10597			71,00	72,00
04/12/2002	LO	ECO10584	ECO10585			71,00	72,00
08/12/2002	LO	ECO10607	ECO10606			70,00	69,00

09/12/2002	LO	ECO10638	ECO10639			74,00	70,00
11/12/2002	LO	ECO10634	ECO10635			72,00	70,00
12/12/2002	LO	ECO10662	ECO10663			70,00	70,00
16/12/2002	LO	ECO10695	ECO10696			75,00	77,00
23/12/2002	LO	ASF10275	ASF10276			70,00	69,00
24/12/2002	LO	ASF10281	ASF10282			65,00	65,00
27/12/2002	LO	ASF10260	ASF10261			75,00	72,00
27/12/2002	LO	ASF10262	ASF10263			69,00	69,00
29/12/2002	LO	ASF10270	ASF10271			70,00	70,00
19/01/2003	LO	ASF10439	ASF10440			72,00	74,00

List of Monel and PIT tag codes used at Pont Dick in the nesting season from November 2003 until March 2004.

List of abbreviation:

DC = *Dermochelys coriaceae*
LO = *Lepidochelys olivacea*
CM = *Chelonia mydas*
EI = *Eretmochelys imbricata*
LHF = Left hind flipper
LFF = left front flipper
RHF = Right hind flipper
RFF = Right front flipper
CCL = Curved carapace length
CCW = Curved carapace width
ICT = Head with

DATE	Spec.	Monel tag	Monel tag	Monel Recapture		PIT-code	PIT Recap	CCL	CCW	ICT
		LHF	RHF	LHF	RHF					
25-26 Dec	DC	12648	12649	X	X			152	112	
19-20 Feb	DC	ASF11942	ASF11943	X	X	064D 6DD8		--	--	
7-8 Dec	DC	ECO12201	ECO12202					135	105	
18-19 Feb	DC	ECO12218	ECO12219	X	X	064D 6B23	X	151	110	39
19-20 Jan	DC	ECO13616	ECO13615	X	X	064D BD5O	X	162	114	39
19-20 Jan	DC	ECO13619	ECO13620					155	110	39
21-22 Feb	DC	ECO13619	ECO13620	X	X	064D F2A7		154	110	43
19-20 Jan	DC	ECO13621	ECO13622					148	104	38
12-13 Feb	DC	ECO13649	ECO13650			064D 3267		145	107	40
2-3 Feb	DC	ECO13651	ECO13652			0648 5810		157	114	39
2-3 Feb	DC	ECO13653	ECO13654			064D 8A57		151	119	41
9-10 Feb	DC	ECO13655	ECO13700			064E 08D6		160	114	42
10-11 Feb	DC	ECO13656	ECO13657			064E 048C		155	107	39
17-18 Jan	DC	ECO13678	ECO13679			064D EOC1		146	108	39
19-20 Jan	DC	ECO13681	ECO13682			064E 048D		156	116	40
24-25 Jan	DC	ECO13688	ECO13689			064E OFAO		152	114	
28-29 Jan	DC	ECO13690	ECO13691			064D F57C		148	107	39
1-2 Feb	DC	ECO13692	ECO13693			064D BE4F		140	103	
3-4 Feb	DC	ECO13694	ECO13695			064E 05DF		152	116	39
8-9 Feb	DC	ECO13696	ECO13697			064D FC33		152	113	39

12-13 Dec	DC	ECO12203	ECO12205					145	105	
15-16 Dec	DC	ECO12206	ECO12207					160	110	
2-3 Jan	DC	ECO12206	ECO12207	X	X	064D E1FG		159	117	40
15-16 Dec	DC	ECO12209	ECO12208					157	118	
15-16 Dec	DC	ECO12210	ECO12211					170	120	
21-22 Dec	DC	ECO12213	ECO12212					160	114	32
6-7 Jan	DC	ECO12213	ECO12212	X	X	064E 6943		160	117	42
26-27 Dec	DC	ECO12215	ECO12214					155	110	39
1-2 Jan	DC	ECO12216	ECO12217			064D EF48		163	120	
2-3 Jan	DC	ECO12218	ECO12219			064D 6B23		149	111	41
5-6 Jan	DC	ECO12220	ECO12221					140	110	39
16-17 Jan	DC	ECO12220	ECO12221	X	X	064D 9A6B		140	110	39
7-8 Jan	DC	ECO12222	ECO12223			064E B5FF		147	102	
8-9 Jan	DC	ECO12224	ECO12225			064D BCOC		--	--	
4-5 Dec	DC	ECO12226	ECO12227					145	101	
25-26 Dec	DC	ECO12226	ECO12227	X	X			141	102	39
25-26 Dec	DC	ECO12228	ECO12229					152	108	45
2-3 Dec	DC	ECO12231	ECO12230					164	122	
2-3 Dec	DC	ECO12232	ASF6095		X			155	113	
1-2 Dec	DC	ECO12234	ECO12235					148	100	
30-1 Dec	DC	ECO12236	ECO12242					160	119	
27-28 Jan	DC	ECO12236	ECO12242	X	X	064E 057C		159	118	
24-25 Nov	DC	ECO12240	ECO12239					159	119	
15-16 Dec	DC	ECO12240	ECO12239	X	X			155	119	
20-21 Nov	DC	ECO12241	ECO12244					166	126	
31-1 Jan	DC	ECO12241	ECO12244	X	X			--	--	
1-2 Dec	DC	ECO12251	ECO12252					151	109	
3-4 Dec	DC	ECO12253	ECO12254					162	114	
7-8 Dec	DC	ECO12256	ECO12255					160	117	
7-8 Dec	DC	ECO12257	ECO12258					153	114	
8-9 Dec	DC	ECO12259	ECO12260					150	107	
29-30 Dec	DC	ECO12259	ECO12260	X	X			154	112	39
8-9 Dec	DC	ECO12261	ECO12263					148	108	
17-18 Dec	DC	ECO12264	ECO12265					150	108	39
6-7 Dec	DC	ECO12267	ECO12266					155	105	
5-6 Dec	DC	ECO12268	ECO12269					160	117	
3-4 Dec	DC	ECO12270	ECO12271					146	102	
23-24 Nov	DC	ECO12273	ECO12275					141	106	
19-20 Nov	DC	ECO12290	ECO12293					159	119	
23-24 Nov	DC	ECO12294	ECO12295					159	111	
17-18 Dec	DC	ECO13601	ECO13602					157	120	39
28-29 Dec	DC	ECO13603	ECO13604			064D EAA8		160	116	39
16-17 Jan	DC	ECO13603	ECO13604	X	X	064D EAA8	X	160	116	39
29-30 Dec	DC	ECO13606	ECO13605					160	115	39
7-8 Jan	DC	ECO13605	ECO13606	X	X	064D E9DE		156	115	40
30-31 Dec	DC	ECO13607	ECO13608			064D D7BF		155	110	39
29-30 Dec	DC	ECO13610	ECO13609					157	116	39
1-2 Jan	DC	ECO13611	ECO13612			064D 2257		139	108	
1-2 Jan	DC	ECO13613	ECO13614					--	--	
11-12 Jan	DC	ECO13616	ECO13615			064D BD5O		165	115	39
16-17 Jan	DC	ECO13617	ECO13618			064E OD92		168	118	41
29-30 Jan	DC	ECO13625	ECO13623			064D 9428		140	107	38
17-18 Jan	DC	ECO13676	ECO13677			064D AE96		150	109	39
20-21 Jan	DC	ECO13683	ECO13684			064E ED97		144	108	

20-21 Jan	DC	ECO13683	ECO13684	X	X	064E ED97	X	--	--	
21-22 Jan	DC	ECO13686	---			064D B8D8		146	112	
21-22 Jan	DC	ECO13687	ECO13685			064D E1D8		149	108	
10-11 Jan	DC	ECO13698	ECO13699			064D D9E3		149	106	37

DATE	Species	Monel tag left	Monel tag	Monel Recapture		CCL	CCW	ICT
		LFF	RFF	LFF	RFF			
29-30 Dec	CM	KUD10707	KUD10708			100	83	26
30-31 Dec	CM	KUD10707	KUD10708	X	X	100	88	
27-28 Dec	EI	KUD10781	KUD10782			85	74,5	24
13-14 Jan	EI	KUD10781	KUD10782	X	X			
10-11 Dec	LO	KUD10701	KUD10706			68	70	
21-22 Nov	LO	KUD10702	KUD10703			70	73	
23-24 Nov	LO	KUD10705	KUD10703			65	67	
19-20 Nov	LO	KUD10777	KUD10776			71	72	
12-13 Dec	LO	KUD10778	KUD10779			70	75	
15-16 Jan	LO	KUD10778	KUD10779	X	X	70	75	
29-30 Nov	LO	KUD10796	KUD10795			70	72	
2-3 Dec	LO	KUD10798	KUD10797			69	70	
30-31 Dec	LO	KUD10709	KUD10710			74	70	23
30-31 Dec	LO	KUD10711	KUD10712			74	71	22

List of Monel and PIT tag codes used at Pont Dick in the nesting season from November 2004 until March 2005.

List of abbreviation: DC = *Dermochelys coriaceae*
LO = *Lepidochelys olivacea*
CM = *Chelonia mydas*
EI = *Eretmochelys imbricata*
LHF = Left hind flipper
LFF = left front flipper
RHF = Right hind flipper
RFF = Right front flipper
CCL = Curved carapace length
CCW = Curved carapace width
ICT = Head with

DATE	SPEC	Monel Tag L	Monel Tag R	Reca-pture		PIT-code	DNA	PIT Rec	CCL	CCW	ICT
		LFF	RFF	L	R						
26-27 Nov.	DC	ASF10108	ECO13664	x		064D-F8EA	R63		160	112	40
15-16 Jan	DC	ECO 10649	ECO 10650	x	x	064D-D972	R 509		145	100	38
17-18 Jan	DC	ECO 13301	ECO 13302			064E-OA19	R 519		155	108	40
19-20 Jan	DC	ECO 13304	ECO 13305			064D-DDC7			160	120	39
19-20 Jan	DC	ECO 13306	ECO 13307			064D-6D36			148	111	39
20-21 Jan	DC	ECO 13308	ECO 13309			064D-DA5E			145	102	40
29-30 Jan	DC	ECO 13311	ECO 13312			064D-C783			152	110	40
30-31 Jan	DC	ECO 13313	ECO 13314			064D-7601			150	110	40
1er-02Fev	DC	ECO 13315	ECO 13316			064D-30FC	R 520		165	116	39
02-03 Fev	DC	ECO 13317	ECO 13318			064E-0D26			140	97	38
06:07 Fev	DC	ECO 13319	ECO 13320			064D-9091	R 20		142	100	40
16-17 Jan	DC	ECO 13324	ECO 13325			064D-AC2A			139	103	35
22-23 Jan	DC	ECO 13331	ECO 13332	x	x	064D-98E5	R508	x	145	107	38.5
03-04 Fev	DC	ECO 13341	ECO 13342	x	x	064D-678F	R 502		153	116	42
08-09 Jan	DC	ECO 13343	ECO 13344			064D-F4BE			146	103	39
18-19 Jan	DC	ECO 13343	ECO 13344	x	x	064D-F4BE		x	146	102	39
12-13 Jan	DC	ECO 13346	ECO 13347						157	115	43
10-11 Jan	DC	ECO 13357	ECO 13358			0647D-AD39E	R 507		148	108	40
15-16 Jan	DC	ECO 13361	ECO 13362						157	144	44
21-22 Jan	DC	ECO 13363	ECO 13364			064D-F3EB			140	103	39
01-02Fev	DC	ECO 13367	ECO 13368			064D-E83F			154	113	39
25:26 Jan	DC	ECO 13368	ECO 13369			064D-527C			151	109	39
29-30 Jan	DC	ECO 13370	ECO 13371			064D-61CC	R 512		155	112	40
30-31 Jan	DC	ECO 13372	ECO 13373			064D-B8D2			150	109	35
04-05 Jan	DC	ECO 13630	ECO13631	x	x	064D-C6FF			145	110	36
02-03 Fev	DC	ECO 13645	ECO 13646	x	x	064D-E589			155	110	35
03-04 jan	DC	ECO 13645	ECO 13646	x	x				155	110	35
13-14 Jan	DC	ECO 13645	ECO 13646	x	x				155	110	39
14-15 Fev	DC	ECO 13668	ECO13669	x	x	064d-a55f		x	146	94	40
19-20 Jan	DC	ECO 13672	ECO 13673	x	x				162	120	40
30-31 Jan	DC	ECO 13672	ECO 13673	x	x	064D-A33B			163	122	44
03-04 jan	DC	ECO10649	ECO10650			064D-D972	R 513		140	100	38
15-16 Fev	DC	ECO13321	ECO13322			064d-f821			140	110	40

10-11 Dec	DC	ECO13326	ECO13327	x	x				150	106	38
29-30 Nov	DC	ECO13326	ECO13327			064d-f475			150	108	41
01-02 Dec	DC	ECO13331	ECO13332			064d-98e5			144	107	37
02-03 Dec	DC	ECO13333	ECO13334			064d-b2eb			143	115	35
14-15 Dec	DC	ECO13335	ECO13336			064e-02fb			154	109	40
14-15 Dec	DC	ECO13337	ECO13338			064d-a2ed			156	104	41
03-04 jan	DC	ECO13339	ECO13340			064D-AA03	R 67		155	106	32
17-18 Dec	DC	ECO13341	ECO13342			064d-678f			153	115	43
30-31 Dec	DC	ECO13348	ECO13349			064d-ffa8			143	103	34
25-26 Dec	DC	ECO13351	ECO13352			064D-B526	R13		136	96	30
25-26 Dec	DC	ECO13353	ECO13354			064D-AF36	R500		147	110	33
28-29 Dec	DC	ECO13355	ECO1356						148	101	37
19-20 Nov.	DC	ECO13626	ECO13627						162	114	39
20-21 Nov	DC	ECO13628	ECO13629						167	118	51
17-18 Dec	DC	ECO13630	ECO13631	x	x		R53		144	109	40
29-30 Nov	DC	ECO13630	ECO13631				R50		150	110	39
04-05 Dec	DC	ECO13632	ECO13633				R66		150	110	35
22-23 Dec	DC	ECO13632	ECO13633	x	x	064d-48e9			153	115	40
08-09 Dec	DC	ECO13634	ECO10569		x	064d-3e27	R48		154	115	35
12-13 Dec	DC	ECO13636	ECO13637				R40		150	116	40
12-13 Dec	DC	ECO13638	ECO13639				R31		147	117	40
17-18 Nov	DC	ECO13640	ECO13641						135	113	39
14-15 Dec	DC	ECO13645	ECO13646				R57		157	110	38
17-18 Dec	DC	ECO13647	ECO13648				R58		158	115	37
20-21 Nov	DC	ECO13658	ECO13660			064D-E84B	R65		152	112	40
12-13 Dec	DC	ECO13661	ECO13662	x	x	064d-0f7d			143	100	36
13-14 Dec	DC	ECO13661	ECO13662	x	x	064e-0f7d		x	142	100	35
22-23 Nov.	DC	ECO13661	ECO13662			064E-0F7D	R511		143	106	39
13-14 Dec	DC	ECO13663	ECO13664						157	112	38
28-29 Nov	DC	ECO13666	ECO13667			064d-e9e5	R64		146	108	38
08-09 Dec	DC	ECO13668	ECO13669	x	x	064d-a55f	R35	x	147	108	38
27-28 Nov	DC	ECO13668	ECO13669			064d-a55f			147	108	38
15-16 Nov.	DC	ECO13670	ECO13671						140	102	35
17-18 Nov	DC	ECO13672	ECO13673						163	120	38
16-17 Fev	DC	ECO13926	ECO13927			064d-f6a5			151	114	40
20-21 Fev	DC	ECO13928	ECO13929			064e-04ao	R515		139	115	36
22-23 fev	DC	ECO13930	ECO13931			064d-eg06			157	107	40
24-25 Fev	DC	ECO13932	ECO13933			064d-e789			150	114	42
07-08 Fev	DC	ECO13952	ECO13953						147	113	40
20-21 Fev	DC	ECO13968	ECO13968			064d-fb59			148	105	38
19-20 Fev	DC	ECO13974	ECO13975			064d-fbdb			157	107	40
14-15 Dec	DC	ECO6878	ECO7109	x	x		R25		158	113	38

DATE	Species	Monel tag left	Monel tag right	Monel Recapture		CCL	CCW
		LFF	RFF	LFF	RFF		
22-23 Dec	LO	kud10634	kud10635			66	65
17-18 Nov	LO	kud10713	kud10714			66	68
23-24 Nov.	LO	kud10748	kud10749			67	65
16-17 Nov	LO	kud10720	kud10721			68	67
13-14 Dec	LO	kud10766	kud10767			68	67
18-19 Nov	LO	kud10772	kud10773			68	69
25-26 Dec	LO	kud10628	kud10629			68	73
16-17 Dec	LO	kud10718	kud10789			69	68
20-21 Nov	LO	kud10732	kud10733			69	69
18-19 Nov	LO	kud10775	kud10774			69	70
23-24 Nov.	LO	kud10757	kud10758			70	68
28-29 Nov	LO	kud10746	kud10747			70	68
03-04 Dec	LO	kud10737	kud10738			70	68
06-07 Dec	LO	kud10734	kud10735			70	68
15-16 Jan	LO	kud 10639	kud 10640			70	68
16-17 Nov	LO	asf10262	kud10722	x		70	69
24-25 Dec	LO	kud10743	kud10744			70	69
26-27 Nov.	LO	kud10760	kud10761			70	70
17-18 Nov	LO	kud10724	kud10725			70	71
05-06 Jan	LO	kud 10624	kud 10625			70	74
16-17 Dec	LO	kud10786	kud10787			71	67
10-11 Dec	LO	kud10740	kud10741			71	71
15-16 Nov.	LO	kud10751	kud10752			73	70
19-20 Nov.	LO	kud10768	kud10769			73	70
18-19 Nov	LO	kud10726	kud10727			73	71
27-28 Nov	LO	kud10729	kud10730			73	72
19-20 Nov.	LO	kud10770	kud10771			73	73
18-19 Nov	LO	kud10756	kud10755			74	67
17-18 Nov	LO	kud10753	kud10754			74	72
15-16 Dec	LO	kud10716	kud10717			78	76
18-19 Dec	CM	kud10791	kud10792	x	x	77	72
16-17 Dec	CM	kud10791	kud10792			78	73

List of Monel used at Pont Dick in the nesting season from November 2005 until March 2006.

List of abbreviation:

DC	=	*Dermochelys coriaceae*
LO	=	*Lepidochelys olivacea*
CM	=	*Chelonia mydas*
EI	=	*Eretmochelys imbricata*
LHF	=	Left hind flipper
LFF	=	left front flipper
RHF	=	Right hind flipper
RFF	=	Right front flipper
CCL	=	Curved carapace length
CCW	=	Curved carapace width
ICT	=	Head with

DATE	Species	Monel Tag	Monel Tag	Recapture	Recapture	PIT code	DNA	PIT Recapt	CCL	CCW	ICT
		LHF	RHF	L	R						
16-17/11	DC	ECO13901	ECO13902			064D-D5B2			145	110	40
16-17/11	DC	ECO13903	ECO13904			064D-7252			160	120	43
18-19/11	DC	ECO13905	ECO13906			064D-F3CE			160	110	39
18-19/11	DC	ECO13907	ECO13908			064D-I3257			163	110	40
18-19/11	DC	ECO13912	ECO13911			064D-44D2			145	106	40
18-19/14	DC	ECO13913	ECO13914			064D-654C			152	108	32
19-20/11	DC	ECO13915	ECO13916			064E-ODDB			150	102	30
19-20/11	DC	ECO13917	ECO13918			064D-F66F			156	110	42
19-20/11	DC	ECO13919	ECO13920			064D-C1FA			159	160	38
19-20/11	DC	ECO13376	ECO13377			064D-EA16			142	103	40
20-21/11	DC	ECO13921	ECO13922			064D-D853			150	110	40
20-21/11	DC	ECO13923	ECO13824			064D-A841			165	120	44
20-21/11	DC	ECO13976	ECO13977			064E-040F			145	107	40
20-21/11	DC	ECO13978	ECO13979			O64E-0627			149	105	45
20-21/11	DC	ECO13380	ECO13379			064D-CBB6			148	110	40
21-22/11	DC	ECO13980	ECO13981			064D-C608			142	106	37
21-22/11	DC	ECO13982	ECO13893			064D-FDO3			152	108	42
21-22/11	DC	ECO13984	ECO13985			064D-E1ED			151	105	40
21-22/11	DC	ECO13986	ECO13987			064D-2AD8			140	100	42
21-22/11	DC	ECO12231	ECO13989	X		064D-5B44			165	120	40
21-22/11	DC	ECO13990	ECO13991			064D-F1C3			-	-	-
21-22/11	DC	ECO13383	ECO13384			064D-211F			146	102	39
21-22/11	DC	ECO13400	ECO13389			064E0645			153	109	40
22-23/11	DC	ECO13989	ECO13992			064E-OE35			157	104	40
22-23/11	DC	ECO13381	ECO13882			064D-FA3B	GB1		150	111	45
22-23/11	DC	ECO13385	ECO13386			064D-3E9B	GB3		160	110	45
22-23/11	DC	ECO13387	ECO13388			064D-C342	GB7		145	104	50
22-23/11	DC	ECO13389	ECO13390			064D-FBFD	GB4		148	108	44
23-24/11	DC	ECO13993	ECO13994			064D-DP17			143	100	37
23-24/11	DC	ECO13995	ECO13996			064D-9F0C			148	105	42
23-24/11	DC	ECO13997	ECO13998			064D6A9F			145	106	43
23-24/11	DC	ECO13999	ECO14000			064D-AD15			142	100	40

23-24/11	DC	ECO13391	ECO13392			064D-E717	GB25		137	97	42
23-24/11	DC	ECO13393	ECO13394			064-EA15	GB20		154	108	42
23-24/11	DC	ECO13395	ECO13396			064D-DE89			148	108	45
24-25/11	DC	ECO13801	ECO13802			064E-0890			153	111	35
24-25/11	DC	ECO13387	ECO13388			064D-DD50	GB27		133	100	40
24-25/11	DC	ECO13851	ECO13852			064D-9EAB	GB21		148	100	40
25-26/11	DC	ECO13903	ECO13904			064E-065E 064D-7252	GB15		163	116	47
25-26/11	DC	ECO13853	ECO13854			064E-5F39			157	110	40
25-26/11	DC	ECO13855	ECO13856			064D-9D4C			150	110	40
25-26/11	DC	-	-			064D-5986			156	110	38
25-26/11	DC	-	-			064D-DA47			142	104	42
26-27/11	DC	ECO13860	ECO13861			064D-F58D			147	110	48
27-28/11	DC	ECO13905	ECO13906	X	X	064D-F3CE		X	151	106	45
28-29/11	DC	ECO13907	ECO13908	X	X	O64D-B257	GB30	X	164	111	42
28-29/11	DC	ECO13862	ECO13863			064E-75B7	GB9		143	108	45
29-30/11	DC	ECO13803	ECO13804			064E-C77D			152	106	40
29-30/11	DC	ECO13805	ECO13806			064D-E771			148	115	38
29-30/11	DC	-	-			064D-ODDB					
29-30/11	DC	ECO13864	ECO13865			064D-FB69	GB29		142	100	43
29-30/11	DC	ECO13866	ECO13867			064D-C5AF	GB17		152	110	45
30-1/12	DC	ECO13807	ECO13808			064D-3FB1			152	106	37
1-2/12	DC	ECO13810	ECO13811			064E-0062	GB14		150	114	43
2-3/12	DC	ECO13812	ECO813			064D-E2C3	GB5		163	146	42
3-4/12	DC	ECO13999	ECO13925	X		064D-AD15	GB23	X	141	102	37
4-5/12	DC	ECO13824	ECO13825			064D-CAOD	GB22		159	111	40
4-5/12	DC	ECO13868	ECO13869			064E-6BF2	GB8		142	104	39
4-5/12	DC	ECO13872	ECO13871			064D-E569	GB2		148	108	40
5-6/12	DC	ECO13822	ECO13823			064D-F99D			144	108	38
5-6/12	DC	ECO13815	ECO13816			064E-EDAO			146	100	35
5-6/12	DC	ECO13819	-			-			-	-	-
5-6/12	DC	ECO13817	ECO13818			064E-4CC9			146	115	40
5-6/12	DC	ECO13820	ECO13821			064D-G1C3			131	103	40
5-6/12	DC	ECO13874	ECO13875			064D-EE73	GB19		162	115	44
5-6/12	DC	ECO13726	ECO13727			064D-D8EA	GB31		149	110	40
5-6/12	DC	ECO13728	ECO13729			064DE-630F	GB28		140	108	40
5-6/12	DC	ASF15826	ASF15827	X	X	064D-DGFC	GB32		138	99	38
6-7/12	DC	ECO13701	ECO13702			0647-7986			160	111	40
6-7/12	DC	ECO13703	ECO13704			064D-E4E4			159	108	35
6-7/12	DC	ECO13705	ECO13706			064D-43F3			143	106	40
6-7/12	DC	ECO13707	ECO13708			064D-894F			146	104	38
6-7/12	DC	ECO13730	ECO13731			064D-F070	GB18		146	104	42
6-7/12	DC	ECO13732	ECO13733			064DFABC	GB24		153	110	41
6-7/12	DC	ECO13734	ECO13735			064D-6723	GB26		151	109	42
6-7/12	DC	ECO13736	ECO13737			064D-D644	GB12		151	110	40
8-9/12	DC	ECO13709	ECO13710			064D-BF5C	GB6		146	104	40
9-10/12	DC	ECO13711	ECO13712			064D-F0A5			144	104	40
9-10/12	DC	ECO13806	ECO13805	X	X	064D-E771		X	148	112	45

9-10/12	DC	ECO13713	ECO13714			064D-E739			153	109	41
9-10/12	DC	ECO13715	ECO13716			064D-BE42			139	105	40
9-10/12	DC	ECO13740	ECO13741			064E-0545	GB10		155	105	43
10-11/12	DC	ECO13984	ECO13985	X	X	064D-50E5			152	105	41
10-11/12	DC	ECO13717	ECO13718			064D-D78E			150	110	43
10-11/12	DC	ECO13866	ECO13867	X	X	064D-C5AF		X	132	109	42
10-11/12	DC	ECO13719	ECO13720			064D-55FC			160	110	41
10-11/12	DC	ECO13725	ECO13724			064D-78A8			154	112	40
10-11/12	DC	ECO13826	ECO13827			064D-FCFC			158	110	40
10-11/12	DC	ECO13742	ECO13743			064D-DA06	GB11				
10-11/12	DC	ECO12206	ECO12207	X	X	064D-E1FC	GB16	X	157	120	41
11-12/12	DC	ECO13828	ECO13829			064D-C398			148	113	35
11-12/12	DC	ECO13830	ECO13831			0648-55B8			172	116	42
11-12/12	DC	ECO13832	ECO13833			064D-43CD			158	120	38
11-12/12	DC	ECO13834	ECO13835			064D-B2F6			149	101	38
11-12/12	DC	ECO13744	ECO13745			064E-0114			158	110	42
11-12/12	DC	ECO13746	ECO13747			064D-E791			145	109	40
11-12/12	DC	ECO13748	ECO13749			064D-DD72			153	110	39
12-13/12	DC	ECO13836	ECO13837			064D-9BBB	GB13		158	113	43
12-13/12	DC	ECO13397	ECO13398			064D-DD50			135	100	38
12-13/12	DC	ECO13840	ECO13841			064D-BEE4	GB22		147	109	40
12-13/12	DC	ECO13842	ECO13843			064E-OADB			146	104	40
12-13/12	DC	ECO13844	ECO13845			064D-AE16			152	113	44
12-13/12	DC	ECO13846	ECO13847			0647-82E4			164	113	48
12-13/12	DC	EC013848	ECO13849			064D-BD50			164	114	40
12-13/12	DC	ECO13758	ECO13759			064D-FB45			-	-	-
12-13/12	DC	ECO13755	ECO13756			064D-ED7A			150	106	39
12-13/12	DC	ECO13876	ECO13877			064D-DHFA			138	101	36
12-13/12	DC	ECO13751	ECO13752			064D-F29D			142	103	40
12-13/12	DC	ECO13753	ECO13754			064D-AFD3			148	103	40
12-13/12	DC	ECO13761	ECO13762			064D-B4E8			150	112	50
12-13/12	DC	ECO13766	ECO13763			064D-BC29			152	105	39
13-14/12	DC	ECO13878	ECO13979			064D-D914			147	109	44
13-14/12	DC	ECO13838	ECO13839			064D-B2FF			138	100	38
13-14/12	DC	ECO13767	ECO13768						-	-	-
13-14/12	DC	ECO13769	ECO13768			064D-F377			152	110	41
13-14/12	DC	ECO13776	ECO13775			064D-43B5			140	107	38
13-14/12	DC	ECO13772	ECO13773			064E-OB9E			156	112	50
13-14/12	DC	ECO13777	ECO13778			064D-5F7C			158	114	42
14-15/12	DC	EC013880	ECO13881			064E-78DA			147	105	39
14-15/12	DC	ECO13882	ECO13883			064D-D59C			151	106	40
14-15/12	DC	ECO13885	ECO13886			064D-D45E			147	108	41
14-15/12	DC	ECO13887	ECO13888			064E-171E			148	108	40
14-15/12	DC	ECO13889	ECO13890			064D-5188			148	108	40
14-15/12	DC	ECO13891	ECO13892			064D-48CE			153	108	40
14-15/12	DC	ECO13997	ECO13998	X	X	064D6H9F		X	145	108	40
14-15/12	DC	ECO13824	ECO13825	X	X	064D-CA00		X	160	110	45
14-15/12	DC	ECO13972	ECO13971			064D-E275			150	106	40

14-15/12	DC	ECO13900	ECO13899			064D-FBF9			157	111	42
14-15/12	DC	ECO13966	ECO13967			064D-F6A2			142	105	40
14-15/12	DC	ECO13750	ECO13757						155	111	40
14-15/12	DC	-	ECO13934						144	104	43
14-15/12	DC	ECO13779	ECO13780			064E-F9DO			144	108	45
14-15/12	DC	ECO13874	ECO13875	X	X	064D-EE73		X	162	113	45
14-15/12	DC	ECO13781	ECO13782			064D-F07C			171	118	44
15-16/12	DC	-	ECO13822		X	064D-F990		X	142	105	40
16-17/12	DC	ECO13944	ECO13945			064D-F597			152	100	39
16-17/12	DC	ECO13936	ECO13937			064D-E39A			155	115	45
16-17/12	DC	ECO13946	ECO13947			064D-E42A			152	100	39
16-17/12	DC	ECO13784	ECO13785			064D-ADBF			153	109	40
16-17/12	DC	ECO13786	ECO13787			064D-F32A			150	107	42
17-18/12	DC	ECO13893	ECO13894			064D-F3B0			160	112	43
17-18/12	DC	ECO13788	ECO13789			064D-DC4C			153	112	40
18-19/12	DC	ECO13956	ECO13957			064D-E037			168	100	43
18-19/12	DC	ECO13958	ECO13959			064D-768B			145	100	40
18-19/12	DC	ECO13790	ECO13791			064D-EC5F			145	105	43
18-19/12	DC	ECO13792	ECO13793			064E-ACAC			152	115	40
18-19/12	DC	ECO13794	ECO13795			064D-C371			136	100	37
19-20/12	DC	ECO13949	ECO13950			064D-D687			158	112	44
19-20/12	DC	ECO13959	ECO13958	X	X	064D-768B		X	-	-	-
19-20/12	DC	ECO13866	ECO13867			064D-C5AF			151	111	46
19-20/12	DC	ECO13895	ECO13896			064E-D151			146	102	44
19-20/12	DC	ECO13796	ECO13797			064D-EEEE			140	100	40
19-20/12	DC	ECO13798	ECO13799			064D-9C25			147	103	37
20-21/12	DC	KUD04455	KUD04456			064D-F309			140	105	40
20-21/12	DC	ECO13954	ECO13855			064D-8H36			155	110	44
20-21/12	DC	KUD04466	KUD04467			064D-0355			150	110	42
20-21/12	DC	KUD04482	KUD04483			064D-EEDE			148	94	46
20-21/12	DC	KUD04490	KUD04491			064D-E75C			140	108	45
20-21/12	DC	KUD04487	KUD04488			064D-E00E			150	104	42
20-21/12	DC	KUD04485	KUD04486			064D-E6B2			159	119	44
21-22/12	DC	ECO13964	ECO13965			064D-372F			142	112	44
21-22/12	DC	ECO13962	ECO13963			064D-F12E			158	120	45
21-22/12	DC	KUD04474	KUD04475			064E-039A			160	113	41
21-22/12	DC	ECO13364	ECO13365			064D-CD5E			150	110	42
21-22/12	DC	KUD04472	KUD04473			064D-76B6			150	110	40
21-22/12	DC	ECO13850	ECO13948			064E-5DAF			146	100	40
21-22/12	DC	KUD04449	KUD04450			064D-8D2B			151	110	43
21-22/12	DC	ECO13848	ECO13849	X	X	064D-BD50		X	161	113	42
21-22/12	DC	KUD04447	KUD04448			064D-C885			148	101	40
21-22/12	DC	ECO13826	ECO13827	X	X	064D-FCFC		X	153	116	45
21-22/12	DC	KUD04445	KUD04446			064D-D84F			146	110	43
21-22/12	DC	ECO13917	ECO13918	X	X	064D-FGGF		X	158	112	40
22-23/12	DC	KUD04374	KUD04375			064D-BHDE			162	119	40
22-23/12	DC	ASF2965	KUD04373	X		064E-0912			148	106	42
22-23/12	DC	ECO13995	ECO13996	X	X	064D-9FOC			148	104	40

22-23/12	DC	ECO13754	ECO13755	X	X	064D-AFD3		X	148	109	40
22-23/12	DC	KUD04476	KUD04477			064D-EADF			150	108	43
22-23/12	DC	ECO13859	ECO13768		X	064E-FCBA			136	106	
22-23/12	DC	KUD04478	KUD04479			064D-EF05			138	102	41
22-23/12	DC	ECO13840	ECO13841	X	X	064D-BEE4		X	148	109	45
23-24/12	DC	KUD04468	KUD04469			064D-AB7D 064D-E465			150	105	39
23-24/12	DC	KUD04463	KUD04462			064E-OCBF					
23-24/12	DC	ECO13752	ECOI13753	X	X				140	105	40
26-27/12	DC	ECO13944	ECO13945	X	X				149	107	40
26-27/12	DC	KUD04451	KUD04452			064D-EDE7			149	103	40
27-28/12	DC	KUD04453	KUD04454			064D-D22C			153	107	43
27-28/12	DC	KUD04457	KUD04458			064D-CDDD			151	106	38
27-28/12	DC	KUD04460	KUD04461			064E-6CF8			154	111	43
27-28/12	DC	KUD04326	KUD04327			064E-07F4			147	109	41
27-28/12	DC	KUD04328	KUD04329			064D-4155			151	108	40
27-28/12	DC	KUD04330	KUD04331			064E-07AF			136	102	39
27-28/12	DC	KUD03332	KUD04333			064E-0334			147	101	38
27-28/12	DC	KUD04492	KUD04493			064D-FAO2			142	103	40
27-28/12	DC	KUD04495	KUD04496			064D-AC24			152	108	36
27-28/12	DC	KUD04443	KUD04444			064D-4056			152	106	40
27-28/12	DC	KUD04499	KUD04500			064D-DEF2			152	117	42
27-28/12	DC	KUD04497	KUD04498			064D-119A			149	110	40
27-28/12	DC	KUD04441	KUD04442			064D-DE81			156	106	36
28-29/12	DC	KUD04334	KUD04335			064D-F4C7			146	101	40
28-29/12	DC	KUD04336	KUD04337			064D-F375			142	105	44
28-29/12	DC	KUD04340	KUD04341			064D-EBB0			158	112	42
28-29/12	DC	KUD04338	KUD04339			064D-E552			147	113	40
28-29/12	DC	KUD04342	KUD04343			064E-09A0			152	111	43
28-29/12	DC	KUD04344	KUD04345			064E-0191			155	102	40
28-29/12	DC	KUD04346	KUD04347			064D-ADDA			160	112	40
28-29/12	DC	KUD04348	KUD04549			064D-B72B			150	103	42
29-30/12	DC	KUD04301	KUD04302			064D-EDB8			143	103	36
29-30/12	DC	KUD04438	KUD04439			0648-4C3A			144	105	43
29-30/12	DC	ECO13938	ECO13939			064D-EAB7			149	107	40
29-30/12	DC	KUD04436	KUD04437			064E-F0AE			142	109	38
29-30/12	DC	ECO13940	ECO13941						157	117	46
30-31/12	DC	KUD04351	KUD04352			064E-E38E			151	114	43
30-31/12	DC	KUD04304	KUD04305			064D-D889			147	107	40
30-31/12	DC	ECO13917	ECO13918	X	X	064D-F6GF		X	156	112	42
30-31/12	DC	KUD04306	KUD04307			064D-DFE9			147	103	39
30-31/12	DC	KUD04308	KUD04309			064D-B246			143	115	43
30-31/12	DC	KUD04485	KUD04486	X	X	064D-E6B2		X	160	116	46
30-31/12	DC	KUD04449	KUD04450	X	X	064D-8D2B		X	154	109	46
30-31/12	DC	KUD04310	KUD04311			064D-9E3E			149	106	43
30-31/12	DC	KUD04426	KUD04427			064E-0AE6			147	110	40
30-31/12	DC	KUD04428	KUD04429			064E-F2A6			149	108	40
30-31/12	DC	KUD04430	KUD04431			064D-5F14			142	100	38

30-31/12	DC	KUD04432	KUD04433			064D-D1DD			150	107	40
02-03/01	DC	KUD04312	KUD04313			064D-F2E1			164	112	43
03-04/01	DC	KUD04314	KUD04315			064E-55Z64			158	117	40
03-04/01	DC	ECO13842	ECO13843	X	X	065E-OADB		X	145	105	40
03-04/01	DC	KUD04316	KUD04317			064D-E50D			150	107	39
03-04/01	DC	ECO13899	ECO13900	X	X	064D-FBF9		X	158	116	44
03-04/01	DC	KUD04318	KUD04319			064D-E7B8			144	102	38
03-04/01	DC	ECO13750	ECO13757	X		064D-ACB1		X	154	116	40
03-04/01	DC	KUD04434	KUD04435			064D-F5C2			147	104	42
03-04/01	DC	KUD04480	KUD04481			064D-EC38			148	108	42
03-04/01	DC	KUD01154	KUD01159			064D-EBE9			148	105	39
03-04/01	DC	KUD04376	KUD94377			064D-F664			150	109	44
04-05/01	DC	KUD04320	KUD04321						-	-	-
04-05/01	DC	KUD04322	KUD04323			064D-BA61			150	110	40
04-05/01	DC	KUD04324	KUD04325			064D-C698			145	107	40
04-05/01	DC	KUD04360	KUD04361			064D-C116			156	112	43
04-05/01	DC	KUD04362	KUD04363			064D-F4DC			165	117	41
04-05/01	DC	KUD04364	KUD04365			064D-F55A			150	107	41
04-05/01	DC	ECO13889	ECO13890	X	X	064D-5188		X	153	113	42
04-05/01	DC	KUD04353	KUD04354			064D-E563			140	110	42
04-05/01	DC	KUD04358	KUD04367			064D-C8E7			150	113	40
04-05/01	DC	KUD04355	KUD04356						140	102	40
04-05/01	DC	KUD04378	KUD04379			064D-905A			138	103	40
05-06/01	DC	KUD04369	KUD04370			064E-9AC8			143	103	42
05-06/01	DC	KUD04380	KUD04381			064E-0256			157	110	40
05-06/01	DC	KUD04382	KUD04383			064D-55A6			148	102	38
05-06/01	DC	ECO13729	ECO13728			064E-630F			151	112	39
05-06/01	DC	KUD04384	KUD04385			064D-FBC6			148	104	40
06-07/01	DC	KUD04001	KUD04002			064D-C2B7			150	110	41
06-07/01	DC	KUD04003	KUD04004			064D-FD7F			147	103	39
06-07/01	DC	KUD04005	KUD04006			064E-0A55			155	105	40
06-07/01	DC	ECO13942	ECO13943								
06-07/01	DC	KUD04386	KUD04387			064D-4D99			138	111	38
06-07/01	DC	KUD04388	KUD04389			064D-ED19			150	102	40
06-07/01	DC	ECO13777	ECO13778	X	X	064D-SF7C			158	115	40
06-07/01	DC	KUD04390	KUD04391			064D-B8BC			143	102	37
06-07/01	DC	KUD04392	KUD04393			064D-90BE			148	105	40
06-07/01	DC	KUD04492	KUD04493	X	X	064D-FA02			143	104	43
06-07/01	DC	KUD04394	KUD04385			064D-28A2			152	118	42
06-07/01	DC	ECO13796	ECO13797	X	X	064D-EEEE 064DFE96			137	103	40
06-07/01	DC	KUD04007	KUD04008			064D-FD3F			149	103	40
07-08/01	DC	KUD04009	KUD04010			064D-DDB4			141	105	40
07-08/01	DC	KUD04012	KUD04013			064E-EDE6			156	117	44
07-08/01	DC	ECO13744	ECO13745	X	X	064E-0114		X	151	109	43
07-08/01	DC	KUD04024	KUD04025			064D-4598			145	109	40
07-08/01	DC	ECO13810	ECO13811	X	X	064E-OC62		X	157	114	43
07-08/01	DC	KUD04017	KUD04018			064D-8837			139	101	38

07-08/01	DC	KUD04014	KUD04015			064E-OF87			147	105	41
07-08/01	DC	KUD04396	KUD04397			064E-6160			163	118	45
07-08/01	DC	KUD04398	KUD04399			064D-BE63			160	113	43
07-08/01	DC	KUD04401	KUD04402			064D-C586			152	112	42
07-08/01	DC	KUD04403	KUD04404	X	X	064D-F6EA		X	142	100	40
08-09/01	DC	KUD00374	KUD01192			0674-6F21			140	100	40
08-09/01	DC	KUD04405	KUD04406			064D-D1D4			142	106	41
08-09/01	DC	KUD04407	KUD04408	X	X	064E-040D		X	138	102	38
08-09/01	DC	KUD04439	KUD04438			0648-4C3A			145	102	45
08-09/01	DC	KUD03374	KUD01192	X	X	0674-6F21		X	140	100	40
08-09/01	DC	KUD04405	KUD04406			064D-D1D4			142	106	41
08-09/01	DC	KUD04407	KUD04408			064E-040D			138	102	38
08-09/01	DC	KUD04439	KUD04438			0648-4C3A			145	102	45
10-11/01	DC	KUD04455	KUD04456	X	X	064D-F309		X	142	105	40
10-11/01	DC	ECO13846	ECO13847	X	X	0647-82E4		X	166	115	45
11-12/01	DC	ECO13838	ECO13839	X	X	064D-B2FF		X	142	100	39
11-12/01	DC	KUD04026	KUD04027			064E-06AC			150	110	40
11-12/01	DC	KUD04028	KUD04029			064D-FE19			153	110	40
11-12/01	DC	KUD04030	KUD04031			064E-7854			140	102	40
11-12/01	DC	KUD04032	KUD04033			064D-C71B			154	110	40
11-12/01	DC	KUD04034	KUD04035			064D-F9A8			139	109	39
11-12/01	DC	KUD04036	KUD04037			064E-057D			150	110	40
11-12/01	DC	KUD04409	KUD04410						153	109	40
11-12/01	DC	KUD04411	KUD04412						137	109	39
13-14/01	DC	KUD04020	KUD04021			064D-E444			148	103	38
17-18/01	DC	KUD04022	KUD04023			064D-A247			148	114	42
18-19/01	DC	KUD04076	KUD04077			064D-DA04			138	110	40
19-19/01	DC	KUD04078	KUD04079			064E-09E5			150	105	42
18-19/01	DC	KUD04497	KUD04498	X	X	064E-119H		X	145	107	42
19-19/01	DC	KUD04080	KUD04081			064D-A047			154	111	44
18-19/01	DC	KUD04415	KUD04416			064E-0C3F			147	110	40
19-20/01	DC	KUD04082	KUD04083						139	100	40
19-20/01	DC	KUD040	KUD040						143	105	43
19-20/01	DC	KUD04420	KUD04421			064D-D8B1			140	101	40
19-20/01	DC	KUD04413	KUD04414			064E-7BDD			140	105	40
19-20/01	DC	KUD04423	KUD04424			0647-C1DD			160	120	44
19-20/01	DC	KUD04438	KUD04439	X	X				143	108	40
19-20/01	DC	KUD04417	KUD04418			064D-FA02			158	110	41
20-21/01	DC	ECO13958	ECO13959	X	X				140	103	38
20-21/01	DC	KUD04038	ECO13856		X				150	110	40
20-21/01	DC	KUD04419	KUD04420			064D-CD0C			159	119	40
21-22/01	DC	ECO13754	ECO13753	X	X				149	107	35
21-22/01	DC	KUD04039	KUD04040						153	112	39
21-22/01	DC	KUD04041	KUD04042						154	113	39
21-22/01	DC	KUD04043	KUD04044						154	113	39
21-22/01	DC	KUD04201	KUD04202			064D-E2A0			131	100	40
22-23/01	DC	KUD04049	KUD04050						142	119	42
22-23/01	DC	ECO13642	EC013643						154	104	43

22-23/01	DC	ECO13842	ECO13843	X	X				148	102	40
22-23/01	DC	KUD04480	KUD04481	X	X				146	105	40
22-23/01	DC	ECO13359	ECO13360	X	X				155	110	42
23-24/01	DC	KUD04094	KUD04095						143	97	37
24-25/01	DC	KUD04004	KUD04005	X	X				149	105	40
24-25/01	DC	ECO13980	ECO13981	X	X				145	109	40
24-25/01	DC	KUD04451	KUD04452	X	X				149	105	42
24-25/01	DC	KUD04203	KUD04204						140	97	43
24-25/01	DC	KUD04205	KUD04383		X				142	100	39
24-25/01	DC	KUD04207	KUD04208						142	101	40
25-26/01	DC	KUD04209	KUD04210						158	118	43
29-30/01	DC	KUD04217	KUD04218						143	87	42
01-02/02	DC	ECO13853	ECO13854	X	X	064E-74A4			157	108	47
01-02/02	DC	KUD04088	KUD04089			064D-DFB5			159	109	44
01-02/02	DC	KUD04032	KUD04033	X	X	064D-C71B			155	106	40
02-03/02	DC	KUD04051	KUD04052						-	-	-
02-03/02	DC	ECO13890	KUD04065		X	064D-5188			152	110	42
02-03/02	DC	KUD04059	KUD04060			064D-FAD3			140	109	39
02-03/02	DC	KUD04057	KUD04058			064E-02A5			145	105	40
02-03/02	DC	KUD04223	KUD04224			064D-FEF9			141	106	40
03-04/02	DC	EC013359	ECO13360	X	X	064D-6C25		X	150	114	42
03-04/02	DC	KUD04221	KUD04222			064E-0E61			154	110	39
04-05/02	DC	KUD04219	KUD04220			064F-1213			145	100	42
06-07/02	DC	KUD04322	KUD04323	X	X	064D-BA61			150	107	39
06-07/02	DC	KUD04251	KUD04252			064E-0F0B			169	121	44
07-08/02	DC	KUD04090	KUD04091			064D-D541			147	109	39
08-09/02	DC	KUD04092	KUD04093			064E-020C			144	110	40
11-12/02	DC	KUD	KUD			O64E-5FC2			150	108	43
14-15/02	DC	ECO13719	ECO13720	X	X	064D-55FC		X	159	110	40
14-15/02	DC	KUD04055	KUD04056			064D-E548			149	109	40
14-15/02	DC	KUD04053	KUD04054			064E-0214			149	109	42
14-15/02	DC	KUD04068	KUD04069			064D-A5AE			152	113	41
14-15/02	DC	KUD04059	KUD04060			064D-FAD3			140	112	41
14-15/02	DC	KUD04253	KUD04254			064D-D3EC			147	109	40
14-15/02	DC	ECO13744	ECO13745	X	X	064E-0114		X	153	110	40
14-15/02	DC	KUD04263	KUD04264			064D-E299			153	109	45
15-16/02	DC	ECO13777	ECO13778						-	-	-
15-16/02	DC	ECO13787	ECO13786						-	-	-
16-17/02	DC	KUD04322	KUD04323	X	X	064D-BA61		X	149	107	40
16-17/02	DC	KUD04322	KUD04323	X	X	064D-BA61		X	149	107	40
19-20/02	DC	KUD04041	KUD04042	X	X	064D-FFCD			141	103	37
20-21/02	DC	ECO13889	ECO13890	X	X	064D-5188		X	145	112	43
20-21/02	DC	KUD04430	KUD04431	X	X	064D-5F14		X	-	-	-
21-22/02	DC	KUD04066	KUD04067			064D-DE9H			147	99	37
25-26/02	DC	ECO13777	ECO13778	X	X	064D-5F7C		X	157	115	47
25-26/02	DC	KUD04255	KUD04256			064D-E7AE			155	106	42

DATE	Species	Monel Tag LFF	Monel Tag RFF	Rec LFF	Rec RFF	CCL	CCW
15-16/11	LO	ASF10351	ASF10352			70	68
15-16/11	LO	ASF10301	ASF10302			72	70
16-17/11	LO	KUD10601	KUD10602			70	70
16-17/11	LO	KUD10677	KUD10678			70	72
20-21/11	LO	KUD10729	KUD10730			73	72
21-22/11	LO	KUD10768	KUD10769			72	71
22-23/11	LO	KUD10603	KUD10604			75	72
23-24/11	LO	KUD10605	KUD10606			68	69
23-24/11	LO	KUD10711	KUD10712	X	X	74	71
23-24/11	LO	KUD10670	KUD10671			75	71
25-26/11	LO	KUD10607	KUD10608			68	67
25-26/11	LO	KUD10662	KUD10663			-	-
25-26/11	LO	KUD10652	KUD10651			75	68
25-26/11	LO	KUD10644	KUD10645			73	69
27-28/11	LO	KUD10656	KUD10657			-	-
29-30/11	LO	KUD10680	KUD10681			72	73
29-30/11	LO	KUD10667	KUD10668			70	69
1-2/12	LO	KUD10660	KUD10661			70	70
2-3/12	LO	KUD10612	KUD10613			73	70
7-8/12	LO	KUD10607	KUD10608			68	67
10-11/12	LO	KUD10618	KUD10619			72	72
10-11/12	LO	KUD10664	KUD10665			70	67
13-14/12	LO	KUD10653	KUD10666			72	70
13-14/12	LO	KUD10674	KUD10675			73	70
14-15/12	LO	KUD10672	KUD10673			72	76
23-24/12	LO	KUD10643	KUD10644			68	66
27-28/12	LO	KUD10694	KUD10695				
11-12/01	LO	KUD10641	KUD10800			67	64
22-23/01	LO	KUD10697	KUD10698			69	67
26-27/01	LO	KUD10646	KUD10647			74	70
11-12/02	LO	KUD10626	KUD10627			72	70