SAVE THE ELEPHANTS

Annual Report
2005/2006

Save the Elephants' Mission

"To secure a future for elephants and to sustain the beauty and integrity of the places where they live; to promote man's delight in their intelligence and the diversity of their world and to develop a tolerant relationship between the two species."

SAVE THE ELEPHANTS

November 2006

Dear Supporter,

Threats to the continued existence of elephants shift over the years. The syndrome of "too many elephants" in parks and reserves, described in the 60s, gave way to devastating ivory poaching in the 70s and 80s, until the trade was banned. In the 90s, and up till now, a massive human elephant conflict is perceived, where expanding people come face to face with elephants in former elephant territory, but the older threats are still there in the background.

In this increasingly human dominated world, elephants will only be able to survive where clear policies and planning takes place that allows them sufficient space, resources and the means for co-existence. More than ever before our research is relevant to planning. One of our aims for the next three years is to develop our understanding of the Human Footprint, that is the impact of human development, in our study areas of Northern Kenya, the semi-desert of Mali, the forests of Congo and the bushveld of South Africa. With this information, in collaboration with government and NGO partners, we intend to help conserve essential dispersal areas and corridors for movements of elephants and other critical species.

Our core speciality is the GPS/GSM elephant tracking that enable us to follow their movements 24 hours a day. This technology means that collared elephants now send us text messages like a mobile phone every hour, with details of their location and air temperature. Combined with knowledge of individuals we can probe behaviour as never before and begin to understand elephant needs. We will extend this work now to other key species to establish the vital connectivity within whole ecosystems where we work, and how co-existence with man can work.

In this, our annual report, we present a collection of individual accounts by our staff, that vary, from summaries of scientific papers and theses, to stories of particular elephants, and details of our education projects. This is to give you a flavour of the innovative ideas, geographical scope, high tech solutions and productive partners we have enjoyed at Save the Elephants during the past year. It is intended to lead to solutions for securing a future for elephants, other species, and the integrity of the natural environment.

None of this important work could be undertaken without both financial and personal support from our friends, colleagues and donors. We rely entirely on funds, grants and donations from around the world, and I would like to take this opportunity to thank all of you who have been so generous in the past. I hope you will enjoy our latest report.

With best wishes,

Iain Douglas-Hamilton
Founder

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Long Term Monitoring David Daballen

The long-term monitoring of the Samburu elephants is the core project on which all other Save the Elephants projects depend. I have been in charge of the field team recording the elephants for the last five years. Four of us live at the research centre in the Samburu and between us we locate and record all significant data of the elephants in the region on most days.

The Save the Elephants team in Samburu. Back row, left to right: Chris, Lekomet, Gilbert, David Daballen. Front row, left to right: Maina, Kiripis & Daniel Lentipo.

To monitor the elephants successfully we drive along routes which divide the Samburu and Buffalo Springs National Reserves into subsections. These routes, when followed at regular intervals, allow us to locate all the elephants within the park and thus indicate any population changes along with the elephants' movements, behaviour, birth and death rates. We also obtain the satellite position of each observation using a GPS so that we can understand the demographics of the elephants in the reserves.

The results from the LTM project this year have been fascinating. We are now able to confirm that since 1998 the elephant population here has been growing, and continued to do so last year. If poaching should surge again we will detect the trend immediately.

We are also beginning to understand more of the subtleties of specific individual elephant and herd behaviour. For example the Rift Lakes is an elephant family that appears in the park for only one month each year, generally between August and September, when it is extremely dry and when most other elephants are elsewhere due to the lack of food. We have seen over time that the Rift Lakes are less dominant than most other families encountered in the area and it may well be that they cannot compete for resources with other families.

An elephant family

This theory is further seen during the rainy season when approximately 700 elephants are found in the reserves enjoying more abundant food and water, but the Rift Lakes are notably absent. It may be that they need a certain plant found in the park but can only come to feed on it at the driest time when the other elephants are not around. Further long term monitoring will help solve this question!

The LTM project is what keeps us in tune with elephant behaviour and how planning and management can meet their needs. It helps us to identify if elephants are being forced to compete over dwindling resources with encroaching livestock for example. We are then able to tackle the problems as they develop.

Individual Identification Project Caroline Mullins

The long term monitoring research being carried out in Samburu requires individual recognition of each elephant that enters the reserve. For this reason, it is vital that an accurate reference system exists to ensure that elephants are identified correctly by researchers in the field. As a recent zoology graduate from Durham University I have been helping as an intern this summer to sort and edit the ID image filing system.

Individual elephants can be identified easily if they have particularly distinguishing features, such as a bad leg or other permanent injuries. An otherwise healthy animal must be identified primarily by differences in its tusks and the unique patterning of nicks and tears in its ears. These details change gradually over time, with tusks being worn down and new nicks appearing on the edges of the ears. However some aspects, like the patterning of blood vessels on the ears, are relatively immutable.

Calves are identified initially with reference to their mothers until they grow up

The identification of elephants in the field has previously relied on the observers' memory and extensive, but aged, photo files. We are now replacing these files using *Google Picassa* as a database system containing ID photographs in digital format of each elephant.

The elephants are sorted into their family units and the photos are all labelled within the programme which can search for any elephant in the system by name or code number. The programme has also allowed us to modify older photos of elephants, for example adjusting contrast and brightness, to complement the new photos we are currently taking in the field.

Markings, veins and notches on the ears are very useful for identifying adult elephants

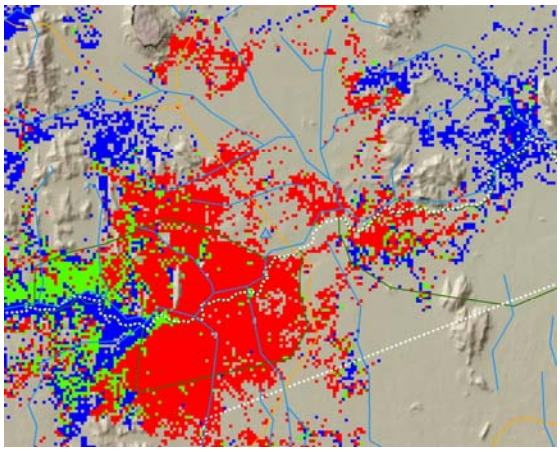
Most of the resident elephant families now have the full complement of ID images. For families which are more infrequent visitors to the reserve, priority is given to obtaining photos of the breeding females in the group. This is because the younger elephants can all be identified by associating them with their mother, rendering ID photos of their smoother ears and undeveloped tusks unnecessary. Some trips to the West (outside the reserve boundaries) have also enabled us to obtain ID photos of the non-resident bulls.

One of our international volunteers, Caroline Mullins, has been assisting our team in Samburu to create this new electronic photo-file system.

Tracking Animals for Conservation by Iain Douglas-Hamilton

Save the Elephants pioneered GPS tracking of elephants. With the support of Safaricom and Vodafone Foundations we continue to be very high profile in the field. In February 2004 we launched our GSM (Global System for Mobile Communications) Animal Tracking Project. This new cell phone technology allows us to pinpoint animals, and to download an almost continuous stream of data, while affording a longer battery life than before. The overall objective is to develop, implement and replicate the new collars for tracking elephants *and* other important species.

The deployment of this new technology helped us to acquire highly detailed spatial data, which are now being used for landscape and conservation planning in the Ewaso watershed in the Samburu, Laikipia, and Isiolo Districts of Northern Kenya. The innovative of the project attracted a great deal of interest from the media and won an award from the GSM Association, in the field of "Mobility in the Environment".



Safaricom network coverage as mapped out by our collared elephants. Full network coverage is red, partial coverage green, no coverage blue.

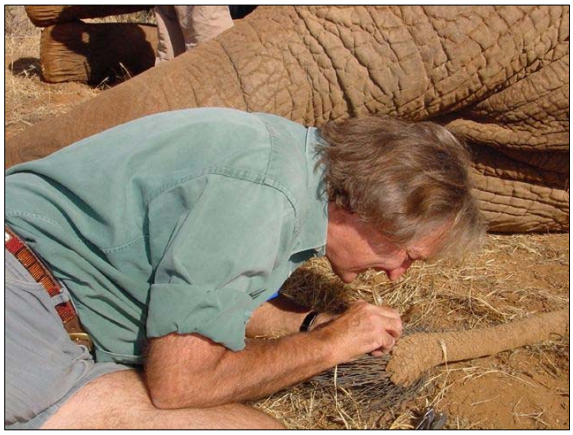
We now intend to lift the process to an entirely new level by applying the lessons learnt to a wider multi-species context.

The elephant movements recorded by collars thus far have been integrated into a grid analysis system across the Ewaso ecosystem from which it was possible to define priority areas for conservation. The information is successfully helping identify migratory corridors and the connectivity of districts, safe havens and various land units used by elephants. It is assisting in the planning of farming areas and is informing policy on fencing, poaching and animal reintroduction. The result is a reduction in the risk of human/wildlife conflict.

From our tracking research some exciting findings have emerged. We detected unusual movements in the elephant population during the severe drought of early 2006 that alerted management to a gross shift in the range of some elephant families from Samburu and Buffalo Springs national reserves to an area South East

of Isiolo. This rare movement had not been recorded before, and highlights the effect of short-term environmental perturbations that have considerable importance in the planning process.

Another highly original outcome was from combining the GPS tracking data with isotope tracking of diet in elephant tail hairs. This was used to reconstruct the history of what the elephants ate during the year. This allowed us to understand the feeding strategies of the Samburu elephants and how some had taken to raiding crops to supplement their diet in areas outside protected areas, as this could be traced in the isotopic signature along the length of the tail hair. (Cerling et al., 2006)



Iain extracts a tail hair from tranquilised elephant

In Laikipia and in the Imenti Forest, for the first time we have data on the nocturnal and seasonal crop raiding of elephants measured in precise detail. Strategies to reduce crop raiding are being developed by Max Graham's PhD Study (see page 24).

A most significant development for conservation has been the use of the project data in the first Ewaso Landscape Planning Workshop, which was attended by all leading public and private stakeholders from the area in January 2006. Our data on elephants provided critical maps showing the most important areas that need to be safeguarded for the future of elephants, even though some of these are outside officially protected areas or private wildlife sanctuaries, like the new Northern Rangelands Trust. This exercise highlighted the importance of gathering movement data on keystone species as an integral part of landscape management.

The overall collar performance and tracking data has significantly improved, and we have shared these benefits widely with other scientists and wildlife managers. Now we are piloting a new geo-fencing project on Ol Pejeta Ranch. This technique warns small-holders and management authorities of the approach of crop raiding elephants, and may lead to more humane and effective ways of dealing with crop raiding elephants in future. We plan to develop this in collaboration with Cambridge University in a new major project funded by the Darwin Initiative.

We have also started a pilot tracking project for Grevy's zebra, with Lewa Conservancy and Princeton University as partners. We will also tag new critical and endangered wildlife species, like wild dog, lions, and selected herbivores, in collaboration with specialist partners. Tracking animals will become an integral tool in landscape and conservation planning. The principle project area will be the Ewaso Ecosystem in northern Kenya, but participation will be open for partners with special self-contained projects in other parts of the country where species would particularly benefit.

Collar Performance Analysis Emma Knott

Save the Elephants have been collaring elephants since 1998, using five different types of GPS (Global Positioning System) collar, the Lotek 1000, Lotek 2000 series, Televilt, AWT SAT (Africa Wildlife Tracking Satellite) and AWT GSM (Africa Wildlife Tracking Global System for Mobile Communication) collars. I came to STE for the second time in 2006 as an undergraduate intern from Durham University. I analysed collar performance.

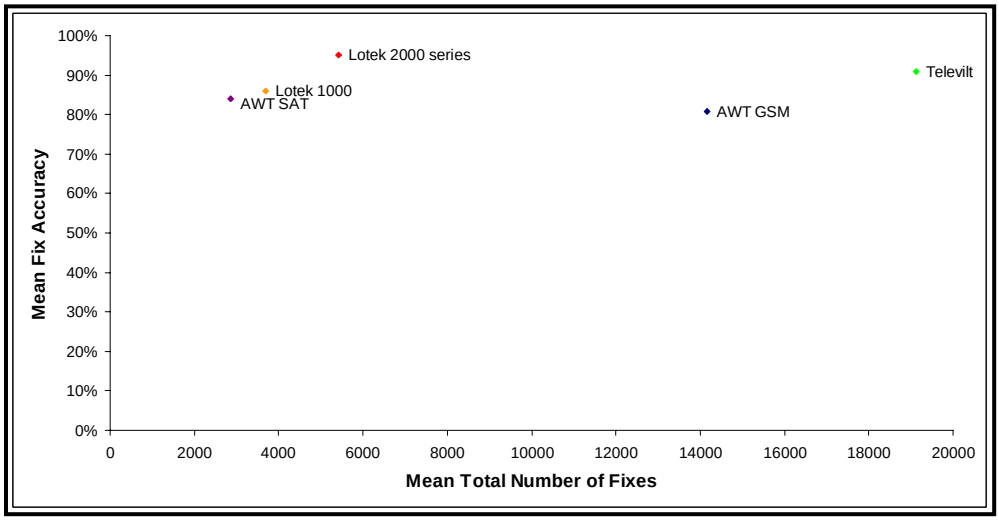
The data from all these collars was taken and analysed for collar performance. The collar accuracy was calculated, that is the number of fixes actually recorded compared to the number of fixes that should have been recorded during the time the collar was on the animal, as well as the life of the collars and the number of inaccurate fixes. Using these data along with the specifications of the collar types it was possible to see which collars gave the best data.

The latest collars, AWT GSM collars, have one great advantage over all the other collars. As reported last year, these collars contain a Safaricom sim card and they send an SMS (short message service) text message to a base station every hour containing the latest GPS location of the elephants which can then be downloaded through the internet using the STE Animal Tracking software. This has allowed analysis to be carried out on the data from these collars whilst they are still deployed on elephants.

The collars have generally improved over time as far as battery life is concerned, but the most accurate collars were Lotek 2000's which have been used since 2000. Unfortunately these collars also have a short lifespan, and as a result the report concluded that the Televilt collars, with the longest lifespan and second highest accuracy, were the most successful of all the collars used by Save the Elephants. Hopefully some of our findings will be used by the collar companies to improve their products in the future.

SAVE THE ELEPHANTS

Graph to show the mean fix accuracy and mean total number of fixes for each collar type



Spatial and Social Structure of the Samburu Elephant Population Dr George Wittemyer

I began research on the Samburu elephant population in 1997, started the individual ID file that is used and updated by STE today, and set up the Samburu research camp. I have also helped train the STE team during my nine years with Save the Elephants. In 2000, I began fieldwork for my doctoral dissertation which I completed in 2005 through the University of California at Berkeley. My doctoral work explored the ecological factors influencing the reproductive biology, social behavior and spatial organization of the Samburu elephants.

The results of my work are available both in my doctoral thesis title and scientific publications. I am currently a National Science Foundation International Post Doctoral Fellow working on the population genetics of the Samburu elephant populations as well as the genetic basis for the social and spatial organization among focal individual elephants.

Results from genetic analyses, carried out in collaboration with researchers from the Wildlife Genetics Project at Makerere University in Uganda and the University of Copenhagen in Denmark, will elucidate the role of kinship in defining social structure. The genetic data was collected non-invasively from fecal samples from over 400 known individual elephants utilizing the Samburu and Buffalo Springs National Reserves.

David Daballen collecting dung samples for DNA analysis

My work includes use of the GPS data to explore the genetic basis for differences in individual ranges and spatial behavior. In addition to the genetic work, I have been using stable isotopes to explore foraging behavior among focal elephants and am involved in projects looking at endocrine functioning in relation to reproduction and chemical communication.

Quantitative analysis of elephant social structure for my doctoral work was carried out on association data of 382 elephants: the 111 most frequently observed breeding females and 271 of their constantly associated offspring. Results quantitatively demonstrate the existence of four social tiers (1. mother-calf dyads, 2. family units, 3. bond groups and 4. clans) in a free-ranging population of African elephants from a cluster analysis of individual association data, with the existence of the third tier dependent upon season.

Additionally the analysis suggests that neither families nor bond groups coalesce around an ideal size but that families led

by matriarchs 35 years and older (those more likely than not to be grandmothers) are significantly larger than those of younger matriarchs. This is the first time that the existence of four organizational tiers has been statistically demonstrated in any non-human animal, as has been published in the Animal Behaviour journal under the title *"The socioecology of elephants: analysis of the processes creating multitiered social structures"*.

The function of higher order structuring in elephant societies is thought to serve as a platform for intra-specific information exchange during times of drought and may also emerge during periods of human predation.

Building on the social organization work, analysis of GPS radio tracking data suggests that ranging behaviour of family groups is influenced by social relationships. Specifically, dominant groups appear to control access to limited resources driving lower ranking groups to travel further for water and forage. Social influences on spatial behavior were only manifested during the dry season when resources are clustered and monopolizable. Seasonal variation in resource availability was also found to drive the reproductive timing among the Samburu elephants.

Demographic work shows the probability of successfully conceiving in Samburu is strongly correlated to the amount of vegetative productivity in the ecosystem. During droughts and excessively dry periods, the Samburu elephants appear to experience anoestrous and stop all reproductive activity until conditions improve.

Reproductive Tactics of Male African Savannah Elephants Dr. Henrik Rasmussen

I joined STE in 1999 and completed my M. Sc. thesis from Aarhus University in 2001. In 2006 I finished my D.Phil. thesis on "Reproductive Tactics in Male African savannah Elephant (*Loxodonta africana*)" from Oxford University. I am currently working with STE on the GPS radio collaring program as well as continuing my research on reproductive tactics and spatial ecology of bulls.

In my doctoral thesis I investigated aspects of the reproductive strategy of bulls. Using a multidisciplinary approach I combined data on behaviour, endocrinology, GPS tracking and DNA micro- satellite analysis to evaluate differences between alternative conditional dependent reproductive tactics in bull elephants (pdf files on my scientific publications and my complete D.Phil. thesis is available from the STE website.)

Results from my research showed for the first time special reproductively active periods in younger non-musth bulls and distinctly different reproductive tactics in younger and older bulls

PretiBomBom is taking a break during his musth period in Samburu N.R.

As part of my thesis I investigated the correlation between behavioral indicators and physiological parameters in free-ranging bulls in collaboration with Dr. Andre Ganswindt from the German Primate Centre in Goettingen.

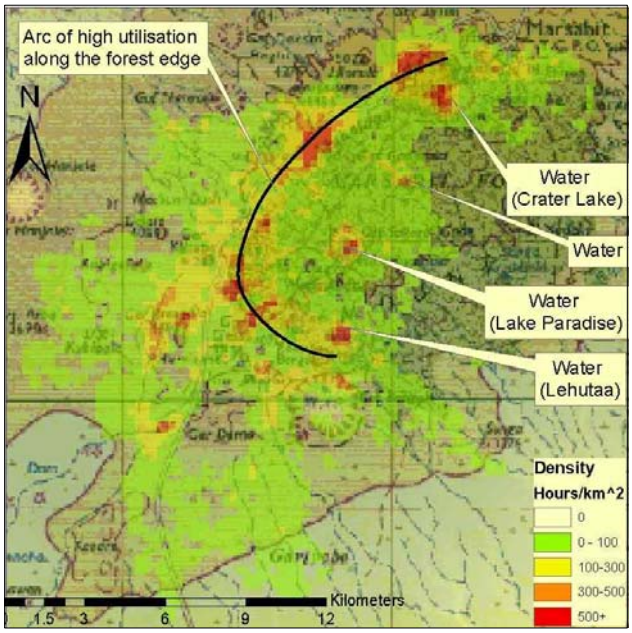
A combined analysis of male sex and stress hormones (androgens and glucocorticoid) in relation to age, reproductive state and musth signals confirmed previously reported elevated levels of androgens during periods with temporal gland secretion and urine dribbling (Musth) but further showed that this increase is indeed linked to the presence of musth signals and not to the age of the individual. Androgen levels were generally increased during sexually active periods with a two-fold increase seen in active non-musth bulls and a four to six-fold increase in musth bulls. Contrary to expectations, increased stress levels were not seen in musth bulls but were seen in reproductively active non-musth bulls. Behavioural changes and onset of musth signals occurred after an initial change in androgen levels suggesting that sex steroids may play a role in activating sexually active periods as well as activation of the musth tactic within sexually active periods.

The first study of genetic paternity in free-ranging African elephants, again conducted as part of my thesis work showed that the youngest (non-musth) bull to sire offspring was only 21 years although older musth bulls above 35 years had a much higher age specific reproductive success compared to bulls below 30 years. However on a population level, bulls less than 30 years contributed 30% of the reproduction and 20-25% could be attributed to non-musth bulls. Hence reproduction is not monopolised by bulls in musth, although skewed towards older males. This part of my research with STE was conducted in collaboration with Dr. George Wittemyer (University of Berkeley) and Dr. John Okello from the Wildlife Genetics Project (Makerere University, Uganda, and University of Copenhagen, Denmark) and Iain Douglas-Hamilton.

After finishing my thesis in March 2006 I have been working with Save the Elephants GPS tracking program and have carried out a number of GPS collaring operations at different locations in Kenya as well as other parts of the African continent.

Collaring of an elephant in the remote Zakouma National Park, Chad near the border of Sudan and Central African Republic.

I am currently working with the elephant GPS tracking project in Marsabit funded by People and Parks Support. This project, implemented by Save the Elephants in collaboration with KWS, contributes to the overall strategic studies conducted by KWS to provide baseline data on human and wildlife land-use and interactions within the Marsabit forest and surrounding areas. The results will be used for developing better land-use planning and mitigate human-wildlife conflicts in the area. The long-term aims are to facilitate a land-use development that will support the needs for both sustainable human economic development as well as conserving wildlife and the existing biodiversity in the area.



GPS radio tracking of 8 elephants is now providing vital information on habitat utilisation within the Marsabit region (Special quarterly reports available on request from STE).

Elephants & Bees Project Lucy King

Crop raiding by elephants is a major cause of increasing levels of conflict between local people and wildlife management strategies across Africa. The economic damage caused to small-scale farmers can be crippling and far outweigh the benefits of costly rural development initiatives. Unless a cost-effective method of limiting crop damage is found, the pressure on wildlife managers to implement radical methods (such as culling) will inevitably become a reality, particularly as population growth in many African countries is causing farmland encroachment into traditionally game-dominated areas.

GPS technology used by Save the Elephants has shown that unfenced elephant populations spend a significant proportion of their time outside protected areas, thereby fuelling the conflict between farmers and wildlife. Conventional methods for keeping elephants away from crops use mostly fortified boundaries, typically electric fences. However these are expensive, difficult to maintain and have met with only limited success.

The urgency of finding a practical solution to the problem of elephant depredations cannot be overemphasised. Research now needs to focus on alternative, low cost deterrent methods that can be managed and implemented by the farmers themselves. The use of chilli peppers, either as disincentive crop or as a deterrent spray has been pioneered by Loki Osborn in Zimbabwe with promising, but limited, success.

Using African bees may be an equally effective, and often more applicable alternative to using chilli powder as a deterrent which also provides economic long-term benefits. Save the Elephants' Chairman, Professor Fritz Vollrath and Iain Douglas-Hamilton have successfully completed an experiment investigating the level of elephant damage on trees hosting empty or occupied beehives. They were able to demonstrate that trees with hives receive significant protection from elephant damage, especially those occupied by bees. Anyone who has seen the destruction of trees by elephants will appreciate the importance and implications of this study.

Elephants particularly like to feed on acacia trees, often pulling down a whole tree to feed on just a few branches.

Behaviour Research

Clearly, wild elephants know about bees as well as hives, and will go out of their way to avoid both. This discovery leads to a number of questions: What are the detailed interactions occurring between bees and elephants that cause the avoidance? Do elephants get used to bees? How do we use our knowledge of this elephant avoidance behaviour to be able to effectively deploy 'Guardian Bees' against crop-raiding and tree-felling elephants?

Understanding what happens to an elephant when confronted with a natural threat (bee sting) may further our understanding of how these intelligent animals respond to fear, how they perceive and anticipate pain, and how they go about avoiding a low-level and natural threat. An understanding of the process of habituation and avoidance tactics will lead to a better application and design of using beehives as natural barriers to crop raiding and tree damage.

Community Case Study

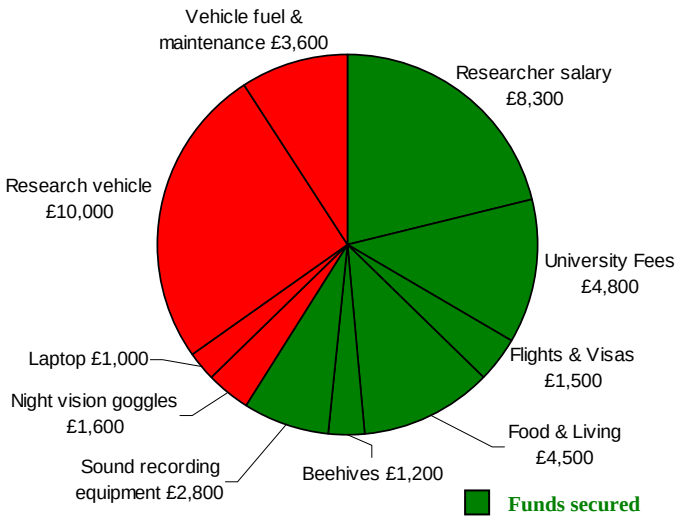
Beekeeping has been recognised as one of the activities that can enhance food security and also contributes to environmental conservation (National Poverty Eradication Plan 1999-2015). Beekeeping contributes to conservation through the pollination activities of bees and also gives communities income from the retention of natural vegetation (as opposed to cutting trees for charcoal). It is estimated that beekeeping has the potential to contribute US$150 million to the Kenyan economy and provide a cash crop in arid and semi-arid areas unsuitable for agriculture.

Honey is already harvested in some (but not all) parts of our study site as a low-maintenance/high income crop. The possibility of turning this economically beneficial activity into a crop-raiding deterrent is a highly attractive proposal. The concept fits extremely well into the emerging strategy of developing simple farmer-based approaches to self-protection and, if verified, could lead to an effective wildlife management strategy to reduce human-elephant conflict.

Within our study site, the Ndorobo Tribe are experienced beekeepers although largely on a subsistence level. The Samburu Tribe live further north in semi-arid areas and are traditionally pastoralists who have no history of beekeeping.

Like many pastoralist tribes across Kenya, the Samburu have become more settled around new clinics and schools and have begun small-scale agricultural practices to sustain their families. The changes in cultural and social dynamics that this change has created are not well understood, however, the change in lifestyle appears to have been hard and many are living on or below the poverty line. Extra pressure has been placed on these farmers due to erratic rainfall conditions and the occurrence of crop raiding by elephants in these newly farmed lands. Using this as a Case Study, I will investigate the social consequences and the practicalities of introducing beekeeping as both a harvestable crop and an elephant deterrent to a Samburu tribe using beekeeping experience and techniques learnt from the Ndorobo Tribe.

Funding Summary for Elephants & Bees Project for 2007



I have been awarded a scholarship to undertake this important research at the University of Oxford. Joint funding from both the Economic and Social Science Research Council (ESRC) and the Natural Environment Research Council (NERC) means that most of my personal costs and field equipment is funded. I am now fundraising to secure a 4x4 field research vehicle for myself and my Kenyan research assistant as well as a laptop and a pair of the latest night vision goggles so I can study elephant behaviour at night.

Fundraising Target:
£16,200

Elephants Avoid Costly Mountaineering

Jake Wall

Understanding the behavioural decisions underlying animal movements is a major challenge. Here, in collaboration with Dr. Iain Douglas-Hamilton and Prof. Fritz Vollrath, we report evidence for the importance of the abiotic terrain feature 'gradient' in guiding the movements of African savannah elephants.

Global Positioning System (GPS) tracking data overlaid onto digital elevation and surface gradient models show that elephants tend to avoid steep slopes. Energy calculations suggest that even minor hills are considerable energy barriers for heavy animals.

Early studies of elephant movements deployed radio tracking from the air and provided rather infrequent 'fixes' which painted an incomplete picture of spatial utilisation. Modern GPS collars using a satellite and/or cell-phone link allow us to collect movement data with high temporal and spatial resolution, reflecting true range use by also mapping areas not visited. Long-term elephant tracking studies are beginning to show how regions of high elephant density are linked by a network of corridors cutting through localities that are otherwise avoided. Understanding what makes a density 'hot-spot' as compared to a corridor (and what distinguishes either from a no-go area) will be crucial for securing safe niches for elephants in the face of ever expanding human influence.

The Samburu/Isiolo/Laikipia districts in northern Kenya cover a combined area of 32000 km2 of mostly unprotected habitat and are home to ~5400 elephants. GPS tracking data give insights into the requirements of this population which are important both ecologically as well as scientifically. In order to understand and explain the ecology of this population, we are studying the various factors that might affect elephant movements, such as geography, hydrology, vegetation cover and land use, as well as the demographies of elephants, humans and livestock.

Regional topography affects variables such as soil moisture, nutrient concentrations and vegetation, and may thus affect local elephant ecology indirectly. Here we show that terrain may also directly affect elephant movements by imposing considerable energetic costs on travel.

By overlaying the elephant tracking data onto a digital elevation model (DEM) covering 237km2 centred on our study region, we found that elephant density decreased exponentially on increasing hill-slopes.

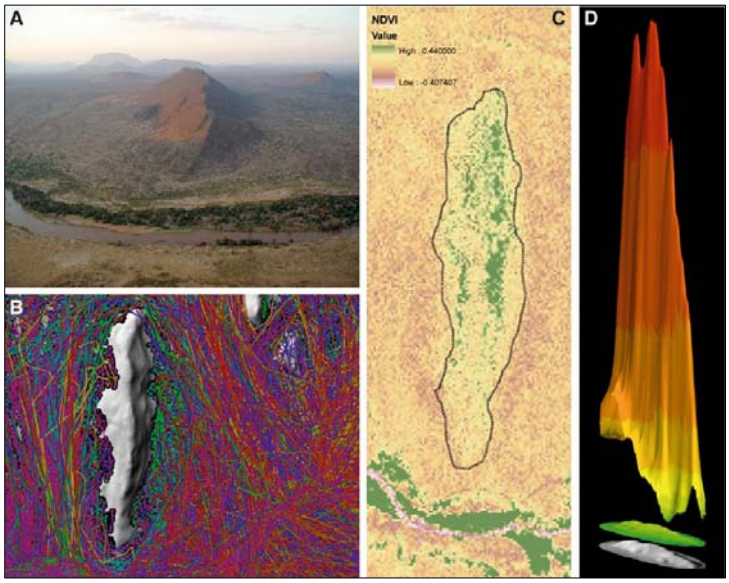


Figure 1: (A) Koitogor Mountain – a prominent feature of the Samburu Landscape rising 300m above the adjacent plain. (B) Three-dimensional model of Koitogor with individual elephant tracks shown as coloured lines. (C) NDVI image (February 2000) demonstrating that even in the dry season (February 2000) the hill (outlined) is greener than the plains although not the river banks (bottom). (D) Energy calculations for the costs of ascending Koitogor (grey, map topography) for a 100 kg animal (middle) and a 5000 kg elephant (top) with the colour coding indicating the basic cost of ascent from green to red.

Elephant avoidance of an isolated, prominent hill, Koitogor (Figure 1A), serves to illustrate this general behaviour pattern (Figure 1B), showing that the elephants even ignore Koitogor's substantial vegetation cover (Figure 1C). While in addition to slope there may be other important reasons for the elephants' general avoidance of climbing this hill — such as overheating, risk of injury, lack of water or unsuitability of forage — we suggest that energetic considerations could be one of the main factors for the following reasons.

Shifting 1 kg of bodyweight vertically upward 1 meter increases its potential energy by 9.8 J. Thus, at a typical muscle efficiency of ~25%, moving upwards would in principle add an estimated extra 39.2 J kg–1 to the basic metabolic cost of level movement.

Thus climbing might cost a 4 ton elephant an additional 160 kJ m-1 over and above the estimated 4 kJ m-1 of level walk. Apparently muscles are a third more efficient when climbing, thus working at 33% efficiency a 4000 kg elephant would incur extra expenses of about 100 kJ (or 25 kcal) for every meter climbed. This computes to ~2500% of the cost of level walking.

The calorific value of a savannah elephant's forage is about 10,000 kJ kg–1 (2,500 kcal kg–1) dry. Daily the animal consumes about 1% of its bodyweight of dry food, with a 4 ton elephant eating 42kg dry (or 162 kg wet) vegetation. Hence in its average 16–18 hours of daily foraging this animal would have an hourly intake of ~2 kg dry forage or 20,000kJ. Climbing 100m would 'burn' 10,000 kJ which would have to be either replenished by an extra half hour of foraging or paid for by using up body reserves. Clearly, climbing is not something that an elephant should undertake lightly!

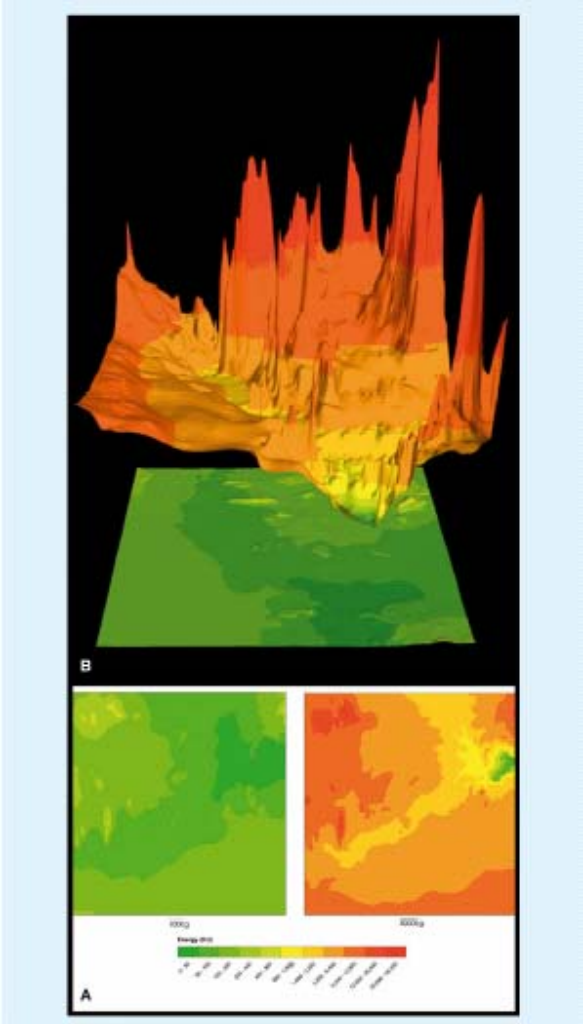


Figure 2: Energy 'scapes' depicting the predicted costs of climbing for a lightweight (100 kg) and a heavyweight (5 ton) mammal moving in the Samburu environment. (A) Topographical two-dimensional map showing energy expenditure required to lift the animal's weight. (B) Three-dimensional energy maps illustrating how costly the 5 ton elephant (upper map) would find the terrain.

Intimate Elephant Becky Walter

I am a high school student from Maryland, USA. During the summer of 2006 I came to stay at the Save the Elephants research camp as an intern. I took many high quality photos of the Samburu elephants whilst travelling with the research team as they carried out their duties. My aim was to try to get a more intimate view of the elephants. A selection of my favourite photos follows.

Death of a Matriarch Shivani Bhalla

In October 2003, whilst monitoring the elephants in Samburu, I witnessed the death of a matriarch, Eleanor, within one elephant family unit named the First Ladies, and the reactions of other elephants towards her death. New light was shed on the behaviour towards ailing and dead elephants and on the relationships of those individuals who were involved in these encounters. My photos and observations were published in 2006 in the Journal of Applied Animal Behaviour Science with my STE colleagues. The observations show that elephants, like humans, are concerned with distressed or deceased individuals. The extent to which elephants hold behavioural traits in common with human beings is relevant to the ethics of how we treat them.

Day 1, Eleanor was found at 6:14 pm with a swollen trunk which she was dragging on the ground. She had abrasions to an ear and one leg as well as a broken tusk, probably damaged in a previous fall reported by the rangers. She stood still for a while, then took a few slow small steps before falling heavily to the ground at 6:21 pm. Two minutes later, Grace, matriarch of the Virtues, rapidly approached her, with tail raised and streaming with temporal gland secretion. She sniffed and touched Eleanor's body with her trunk and foot. Then she lifted Eleanor with her tusks back on to her feet.

Day 1, Eleanor stood for a short while, but was very shaky. Her back legs began to collapse and she was unable to maintain her upright position. Eleanor falls again after a further 8 seconds**.** Grace appeared very stressed, vocalizing, and continuing to nudge and push Eleanor with her tusks.

Day 1, At 6 minutes after Eleanor's first fall, Grace was left by the rest of her family, but continued alone to try and lift Eleanor, with no success. Eleanor was too weak to take advantage of her help. Grace stayed with her for at least another hour as night fell.

Day 2, 11th October 2003. Eleanor never got up again and died at about 11:00 am. Maui, from the Hawaiian Islands family, hesitantly approached Eleanor's body, extended her trunk, sniffed the body, touched it, and then tasted her trunk. She hovered her right foot over the body, nudged the body, and then stepped over, pulling the body with her left foot and trunk, before standing over the body and rocking to and fro. All this attention lasted just under 8 minutes.

Day 3, Rangers from Samburu Game Reserve came to remove the tusks. Babylon, Jerusalem and Eleanor's 6 month old calf stood by Eleanor's body. No bulls were seen visiting Eleanor either while she was dying or when she was dead. The calf remained with Eleanor's body after the rest of her family had been pushed away. Eleanor's calf did not survive long, and was recorded as missing presumed dead within 3 months of the death of her mother.

Monitoring the Illegal Killing of Elephants

Onesmas Kahindi

In the past, the elephant population in Samburu-Laikipia region experienced wanton ivory poaching to supply the thriving ivory black markets. But rigorous law enforcement after the creation of Kenya Wildlife Service (KWS), and the ban on global ivory trade drastically brought the destruction under control. However, a continuous mortality monitoring system is essential to detect changes in mortality trends especially on illegal hunting triggered by a demand for elephant ivory.

Save The Elephants and Kenya Wildlife Service (KWS) have been collaborating with CITES and their monitoring illegal killing and hunting of elephants (MIKE) project since year 2002. The Samburu-Laikipia MIKE elephant range hosts the second largest in Kenya, and is the only MIKE site that does not fall entirely within wildlife-protected areas.

The site is comprised of a complex network of national reserves, trust lands occupied by nomadic pastoralists, private ranches, group ranches, community conservancies, small-holder agricultural farms and settlement schemes. I have been working within this complex ecosystem as the Save the Elephants MIKE Project Officer since April 2002. As an Honorary Game Warden for the Kenya Wildlife Service (KWS), I am personally responsible for visiting each of these stakeholders to collect data on every dead elephant that is found.

This database of elephant mortality gathered through a combination of MIKE methodology and local information networks serves as an early warning

Local herdsmen act as a network of information and help Onesmas to find over 65% of dead elephants in the Samburu-Laikipia ecosystem.

system for changes in poaching intensities as well as recording changes in elephant population dynamics. Results from the STE MIKE project indicate that there has been no significant increase in ivory poaching within Samburu-Laikipia Site for the past four years and is within sustainable limits, but we are a long way from being complacent.

Despite its importance to the conservation of elephants in Samburu-Laikipia, the STE MIKE project has a big challenge to sustain in its current state and functions. At present it requires substantial budget support to train local scouts employed in the community-owned conservancies, as well as herdsmen living outside such conservancies on how to make accurate elephant carcass reports. Given the high number of primary stakeholders and participants, and the threat of a potentially resurgent ivory trade, there is also a dire need to improve coordination of information concerning elephant mortality in Samburu-Laikipia region.

The Story of Dorobo

By David Daballen, Caroline Mullins and Emma Knott

A year ago George Wittemyer reported seeing a previously unknown adult female elephant and six calves in Buffalo Springs National Reserve, the first time this had happened in six years. George made a careful analysis of the ages and family structure of this unusual herd and came to the conclusion that they were the remnants of a family that must have formerly contained at least two more breeding females. He named the matriarch Dorobo.

Evidently, Dorobo had come from an area where elephants suffered high mortality. It may be that the other adults were killed by humans, and Dorobo moved her family into the reserve for refuge. She certainly appeared nervous when she encountered vehicles, but she was also seen greeting other well known elephants implying that she had already met them somewhere before. We were fascinated to find out where she came from originally.

On the 25th August 2005 we tagged her with an AWT GSM collar which sent a text message every hour that allowed us to follow her movements on the internet. She initially stayed in Buffalo Springs and just south of the border in Ngare Mara for the first two months, made one short trip to the east, but then headed out of the reserve to the south west down to Ilngwesi. We were beginning to wonder if she was originally a Laikipia elephant, but then on the 16th November 2005 she trekked back through Isiolo West and back to Buffalo Springs. Gradually she started spending more time further east and slowly moved southward towards Isiolo where she stayed within 20 km of this town for the next 5 months, with only one visit back to Buffalo Springs in late April 2006.

The signs were that the Isiolo region was Dorobo's core range. However we were sadly unable to prove this conclusively because on 6th June 2006 her collar showed the mortality signal; that is it stopped moving on our computer screens. The dot representing Dorobo was stationary for 6 days…and then it jumped three kilometres. What was going on? Had the collar dropped off and was it being carried by people, or was she actually still alive?

A team of us, consisting of three STE research assistants, David Daballen, Chris Leadismo and Gilbert Sabinga, two volunteers, Caroline Mullins and Rebecca Walter, and two armed Kenya Wildlife Service rangers, went to where the GPS signals had come from. We drove as close to the GPS points as possible and completed the journey on foot.

At the location where the mortality signal had come on we discovered the carcass of an elephant. It was Dorobo.

Not only that, but she was burnt to ashes.

We searched the area for the collar, and for bullet cartridges or any other signs of cause of death, but this was difficult due to the intensity of the fire. However, it was evident from the skull that her tusks had been pulled out after death, not hacked out showing that she had been dead for a few days before they were removed.

After a thorough investigation we then walked the three kilometres to the second GPS location where we found the collar lying on the ground. It had been cut in half using a sharp knife.

The area where both the carcass and collar were found is fairly remote, although a few temporary bomas and farmsteads were seen by the team. This is an unusual event and KWS are trying to get to the bottom of who killed this elephant and who carried the collar away from the ashes.

The future for Dorobo's six calves is uncertain. Without a matriarch to lead them it's unlikely they will survive. Their only hope would be to join another herd, a phenomenon which happens very rarely.

Ewaso Ngiro Elephant Research and Conservation Project

This project was designed and carried out by Max Graham as an STE representative and supported by the US Fish and Wildlife Services and the World Conservation Society. In addition the Laikipia Wildlife Forum (LWF) loaned the project a motorbike. This was STE's first project in Laikipia and involved the following ongoing activities:

1. GPS tracking of elephants in Laikipia (supported by Safaricom Foundation) to assess movement behaviour in relation to land-use and establish the location of these important movement corridors for a conservation strategy.

2. An elephant scout programme to establish the location and temporal patterns of negative forms of human-elephant interaction and support STE's MIKE programme. On the back of this project a spatial and temporal model for crop-raiding was generated. The latter was carried out in collaboration with Mpala Research Centre.

3. Community Based Problem Animal Control demonstration sites. These were established in crop-raiding hot spots in Laikipia with the objective of providing small-scale farmers with cheap and simple elephant deterrents. This includes chilli-based deterrents.

4. Community education through the production and distribution of a community-orientated booklet entitled 'Kuishi Pamoja' (Living Together). The booklet describes why elephants are valuable, why people and elephants are coming into conflict and how people can avoid risks associated with living in an elephant range. The booklet was launched in May 2005.

'Having completed his four year field work period, Max is now keeping his head down writing his PhD Thesis at Cambridge and we are looking forward to some great insights into human/elephant conflicts and how to alleviate it when he has finished.' Iain Douglas-Hamilton.

This is a picture of a particularly large bull elephant, Cigar, together with Max Graham and his assistants during a collaring operation on Borana Ranch in North-East Laikipia. Large bull elephants possessing tusks of these dimensions are now rare in Kenya and the presence of such an animal is testament to the successful conservation initiatives that are taking place on both private and communally owned ranches in Laikipia.

The project will be expanded in the future as a Darwin Initiative project with STE as the main local partner and Max Graham as executive officer, and Cambridge as the UK Institution.

Education Programme Shivani Bhalla

The Save the Elephants and Elephant Watch Safaris Education Programme was initiated in 2000. Bursaries are given out to students embarking on their secondary school education. It is a personal and hands-on programme where students are selected carefully depending on their background. Seven students have successfully completed their education through our programme and are now actively involved in eco-tourism and conservation. Currently, 24 students are being sponsored. A development in our programme has been the introduction of wildlife educational tours, where we have travelled the districts showing wildlife films and increasing conservation awareness. Daniel Lentipo continues to assist me on the programme and we have had a very active year!

Towards the end of 2005, Daniel and I travelled to Maralal, Kisima and Ol Donyiro. Here we visited head-teachers of schools, our sponsored students and interviewed potential candidates for our 2006 student selection. It was an immense and successful trip.

Kisima school visit

Educational Tours

During the first week of June, I traversed the entire Samburu District conducting a cheetah census. During this 2-week census, I carried our mobile film unit with us and showed predator and elephant films at various locations. This was a huge success and the local people were enthralled at the moving images which sparked off great excitement, interest and enthusiasm, especially at Baragoi where we had a chaotic crowd of 400 students, elders, warriors, women and children watch the film! I also distributed educational posters and visited some of the home areas where our sponsored students come from. I met Patina Lemooli's crippled mother in the village of Ndonyo Wasin and Veronica Leluata's home area of Naisunyai.

Following the success of this trip I completed two further educational tours to schools in Marsabit (almost 400km north of Samburu), and Isiolo District.

Students

We selected 9 new students for our Education Programme in 2006. Two students were from Marsabit, a critical elephant area, and one was from Ol Donyiro where a vital elephant corridor is located. All are doing well and returned to school a few weeks ago to begin their final term of the year.

Elephant Art Competition Results

I held our 2nd art competition in March this year, entitled "Living in Harmony: Elephant Expressions". More than 60 students from six schools participated and the results were fantastic. Entries included paintings of elephants and people, poems and short stories. 1st, 2nd and 3rd prize students won an aerial flight over the reserves and elephant range-lands with Iain! It was an unforgettable experience.

1st prize - Letoo Wilson from Uaso School, Archers

Conservation Day
On July 28th, 6 schools participated in a wildlife drama competition in the STE research camp in Samburu. The schools had to choose 6 students who would each act and dress as an elephant, lion, landscape feature, livestock and human being. Students performed their wildlife skits with singing, dancing and poetry. The costumes were fantastic and we had brilliantly animated talking mountains, trees, goats and elephants!

Education Party
We held our annual Education Party on August 4th. Nineteen of our sponsored students attended and it was a great opportunity for the new students to get to know the others. The students watched a few wildlife DVDs, we had a number of talks and prizes were given for achievements over the year.

Students and Education Officers

Lewa marathon
On June 24th, Lewa Wildlife Conservancy held their annual Safaricom sponsored marathon. We sponsored 4 participants from Samburu: Alowa and Peter entered the under 15-year old category and Jackson and David, from the Elephant Watch Camp, participated in the 40 kms full marathon. This was the first time they had entered an official marathon with world-class runners and all did incredibly well.

Girgir Students at Kenya Music Festival
We funded 40 students from Girgir Primary to travel to Eldoret, Western Kenya to represent Samburu District in the annual Kenya Music Festival. The students came 1st which qualified them for the finals at Nakuru, where they came 4th. This was a great first time experience for the Girgir students who did tremendously well and we are extremely proud of them.

Kiltamany Opening
On August 14th, we opened a new building at the Kiltamany Primary School. Thanks to a very generous donation we were able to construct a staff office that was desperately needed. The day was opened with a blessing from Kiltamany village elders, students sang and danced for the donors, as did the Kiltamany Women's Group ladies. A donation was also made towards new desks for this school and others in the area.

Lpus Leluai School Food Assistance
Our programme once again assisted with food delivery to Lpus Leluai Primary in West Gate. The struggling school was having problems and there was a food shortage for the students. We assisted them in 2005 and once again in July this year, with maize, beans and cooking fat.

So much has happened this year and 2006 is not over yet! I am looking forward to a great few months ahead, where more students will be selected, with a focus on higher education and I hope to conduct more wildlife educational tours in the area. Thank you all for your continued support and enthusiasm in our Education Programme.

Predator Project Shivani Bhalla

Ecology and Conservation of Lions

Lion conservation has recently become a global issue. Statistics revealed that lion numbers have been reduced from 200,000 to the current 23,000 – a staggering loss of almost 90% over the past two decades. This reduction is largely due to habitat loss and conflict with humans.

The objective of the study that I am undertaking is to investigate the factors affecting the population dynamics of the lions, *Panthera leo,* in and around Samburu, Buffalo Springs and Shaba reserves. My study will allow an understanding in the underlying factors which drive pride establishments, their associations and movements in the wild, the extent of human-wildlife conflict, and the impact of habitat loss on the lion. Overlaying data on lion movement patterns with STE elephant tracking data will hopefully reveal the most important wildlife corridors used by both these key species.

The reserves and their buffer zones, have been identified as highest priority areas for conservation and research, and are critically important areas for breeding lions and their dispersal within the whole Samburu-Laikipia landscape. This study is going towards my PhD, the results of which will I hope enhance the survival of a vulnerable and rare species by gaining a better understanding of the issues facing the future of lions in and around protected areas.

Cheetah Census in Samburu & Isiolo Districts

STE, in collaboration with Cheetah Conservation Fund Kenya, conducted the first ever cheetah censuses in Samburu and Isiolo Districts in June and again in September 2006. The goal of the Samburu and Isiolo Cheetah Census Project was to collect baseline information on cheetah (*Acinonyx jubatus)* populations and conservation needs in these Districts, in order to establish their conservation status in this part of Northern Kenya.

Cheetah team, council rangers and myself

The fieldwork was carried out by driving through 20km^2 transects across the districts, interviewing the local people, taking GPS points of predator tracks or sightings, livestock and people and water sources. Habitat photos were also taken every 10 kilometres.

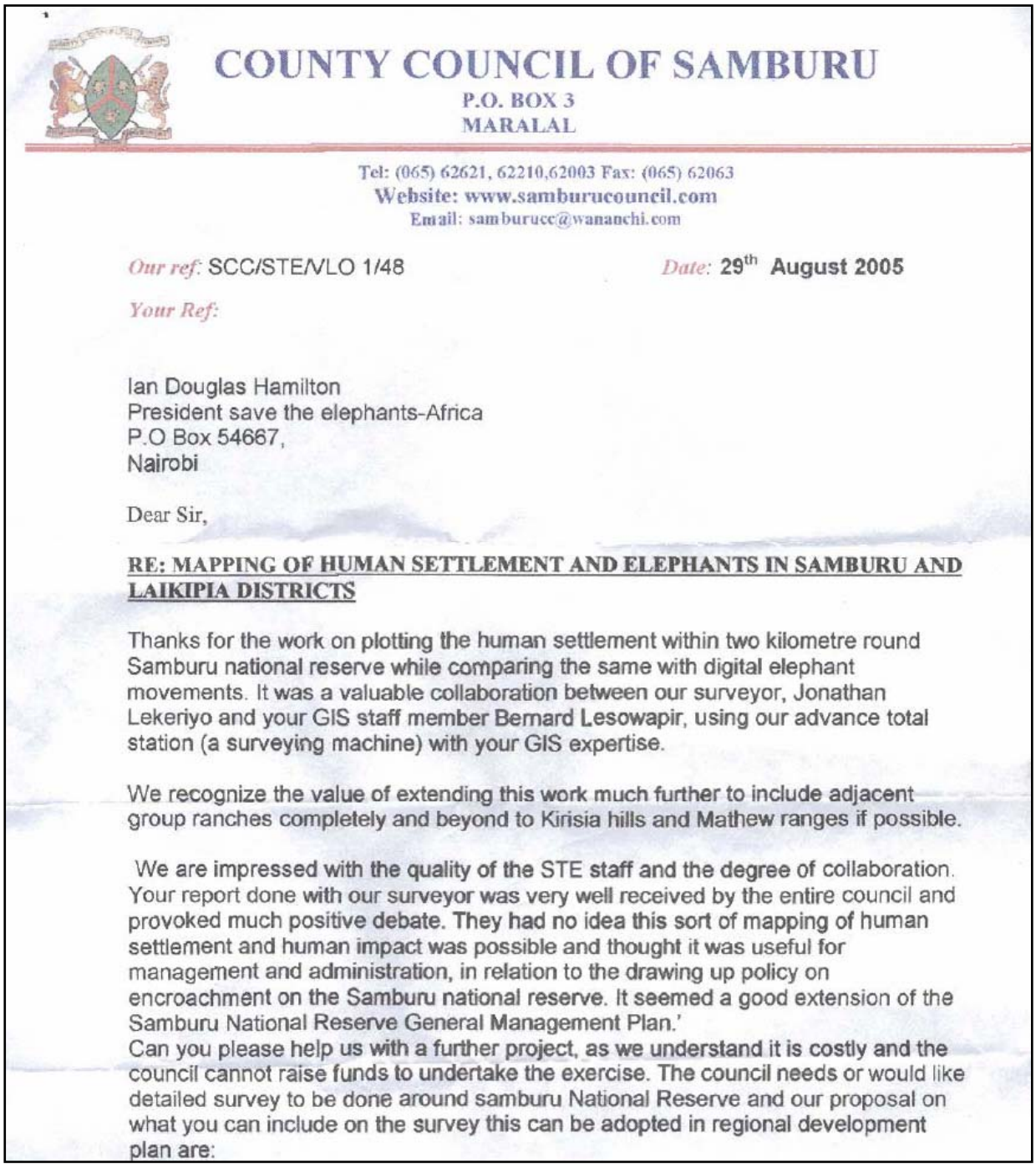
The cheetah censuses were a great success with preliminary results showing viable cheetah populations with higher numbers than early predictions. Plans for conducting a census in Marsabit District towards the end of the year are now being made.

Local Government Support Bernard Lesowapir

From our research camp in Samburu Game Reserve, Save the Elephants works closely with Samburu County Council who manage the reserve and have ultimate land-planning responsibilities for both the reserve and surrounding areas.

In 2005 we were able to produce a baseline study and a set of maps to identify the distribution of human settlements within 2km of the border of Samburu. A total of 851 individual houses were counted within the survey area (see letter).

This survey was so well received that in 2007, on request from the council, we plan to extend this project to mapping all human settlements within a much wider range of the reserve boundaries using satellite imagery analysis.



COUNTY COUNCIL OF SAMBURU
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MARALAL

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Website: www.samburucouncil.com
Email: samburucc@wananchi.com

Our ref: SCC/STE/VLO 1/48 *Date:* 29th August 2005

Your Ref:

Ian Douglas Hamilton
President save the elephants-Africa
P.O Box 54667,
Nairobi

Dear Sir,

RE: MAPPING OF HUMAN SETTLEMENT AND ELEPHANTS IN SAMBURU AND LAIKIPIA DISTRICTS

Thanks for the work on plotting the human settlement within two kilometre round Samburu national reserve while comparing the same with digital elephant movements. It was a valuable collaboration between our surveyor, Jonathan Lekeriyo and your GIS staff member Bernard Lesowapir, using our advance total station (a surveying machine) with your GIS expertise.

We recognize the value of extending this work much further to include adjacent group ranches completely and beyond to Kirisia hills and Mathew ranges if possible.

We are impressed with the quality of the STE staff and the degree of collaboration. Your report done with our surveyor was very well received by the entire council and provoked much positive debate. They had no idea this sort of mapping of human settlement and human impact was possible and thought it was useful for management and administration, in relation to the drawing up policy on encroachment on the Samburu national reserve. It seemed a good extension of the Samburu National Reserve General Management Plan.'
Can you please help us with a further project, as we understand it is costly and the council cannot raise funds to undertake the exercise. The council needs or would like detailed survey to be done around samburu National Reserve and our proposal on what you can include on the survey this can be adopted in regional development plan are:

Human structures

- Human population
- Livestock numbers, movement and monitoring
- Existing and potential water points
- Schools
- Road network
- Clinics
- Elephant living, movement and migratory routes
- Vegetation status
- Hydrology
- Digital terrain model (elevations)

Any help in establishing GIS maps, which can be used as a baseline, against which future changes, can be measured, these can be used in planning, and exploitation and equal distribution of resources purposes will be very welcome. Requirements for this project to be successful are:

1. Good transport
2. Real time GPS (this will help the council in land administration and management.
3. A computer loaded with GIS programmes.
4. Up to date satellite images with the highest resolution
5. Photogrammetical photos with high resolution and accuracy to the
   Cadastral standards.
6. Both our surveyor, Jonathan Lekeriyo and your GIS expert to be Working together all/ the time. This will directly help them produce good work and in time.

Yours faithfully,

James Lenaiyarra
Clerk
Samburu County Council

Camels and cattle mingling with elephants are a familiar sight between Shaba and Samburu Reserves.

Ewaso Conservation Group

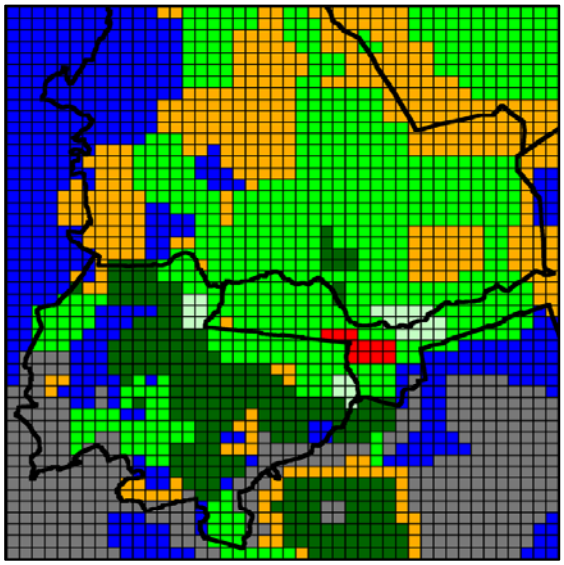
In January 2006 representatives of conservation organizations and local government working in the Ewaso Ecosystem came together to define challenges and seek solutions to conservation issues in the landscape using tools for conservation planning developed by the Wildlife Conservation Society.

WCS's conceptual modelling approach was adopted and used to map areas of common interests both to wildlife and the coexisting society. A map of current priority areas was developed based on distribution of selected target species; Elephants, Lions, Grevy Zebra and Wild Dogs.

Selection of target species was based upon a species' ability to represent important habitats and threats in the landscape, elephant topping the list. Kipsing valley emerged as the hottest spot requiring concerted conservation efforts by all workers in the basin. The meeting culminated in formation of the Ewaso Conservation Group (ECG) drawing its membership from the organizations represented. The main objective is to bring together different organizations to exchange information on their individual works as they identify common conservation targets that need immediate attention.

The ECG workshop brought together:

- *Save The Elephants*
- *Earthwatch Institute*
- *African Wildlife Foundation*
- *Ewaso Ng'iro North Development Authority*
- *Kenya Wildlife Service*
- *Laikipia Elephant Research Project*
- *Laikipia Predator Project*
- *Lewa Wildlife Conservancy*
- *Laikipia Wildlife Forum*
- *Mpala Research Centre*
- *Mpala Wildlife Foundation*
- *Northern Rangelands Trust*
- *Samburu County Council*
- *Samburu-Laikipia Wild Dog Project*
- *Samburu Wildlife Forum*
- *Wildlife Conservation Society*



Summary map of the Ewaso Landscape Planning Workshop. The red 'hotspot' defines the area of common conservation concern for elephants, Grevy's zebra, wild-dogs and lions, which highlighted where priority conservation investment was needed.

SAVE THE ELEPHANTS

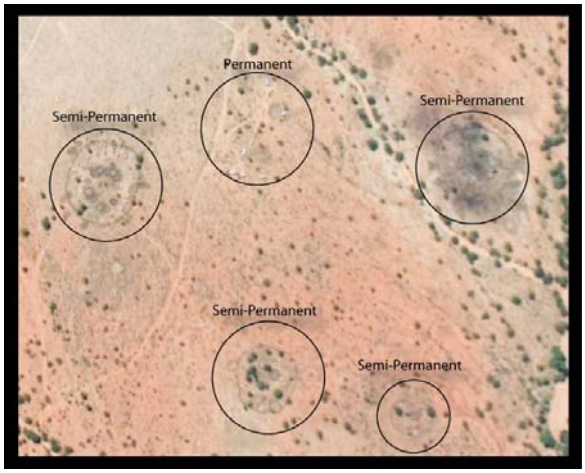
The Human Footprint Jake Wall

Save the Elephants (STE) is committed to researching and tracking elephant movements across Africa to understand the behaviour and needs of these important land mammals and to understand the impact that human population growth and development is having on the natural movement patterns. During our research we have become acutely aware of the apparent rise in human-elephant conflict issues and believe that one of the key agendas that need to be addressed is proactive landscape planning on a national and local government level to better manage the encroachment of human settlements into traditionally elephant dominated landscapes.

To understand this 'Human Footprint' better, we need to provide a baseline figure for human presence. During 2007, we plan to undertake this complex analysis within two of our most remote and important research sites for free-ranging elephants, the Ewaso Watershed in Samburu, Northern Kenya and the Gourma region in Mali. The commonality between the Gourma and Samburu is that both are vast, unfenced, semi-arid areas where elephants share space with semi-nomadic pastoralist tribes, and for the present are tolerated.

These remote, harsh habitats have only recently begun to see permanent settlements established and so it is essential that we start to monitor this settlement advancement now so that we can understand how this will affect the range of these remote, wild elephant populations.

Cattle and elephants competing for food and water resources in the Gourma, Mali



Semi-permanent and permanent urban settlements seen near Samburu Reserve that are identifiable by satellite analysis.

We are planning a large-scale ground-truthing expedition to both Samburu and the Gourma to map and set a baseline for the quickly changing human footprint in these two ecologically sensitive areas of Africa. We will explore the extent to which we can measure land use, soil erosion, tree canopy, and even perhaps elephants themselves, direct from space, as we believe that this will be the most cost effective and accurate approach for the long term challenges of tackling anthropogenic ecological degradation.

All of these data layers can be combined with our extensive database of elephant movements to explain elephant choices and to work toward solutions that will lead both to elephant survival, conservation of biodiversity, and the alleviation of human poverty through better spatial planning based on real data.

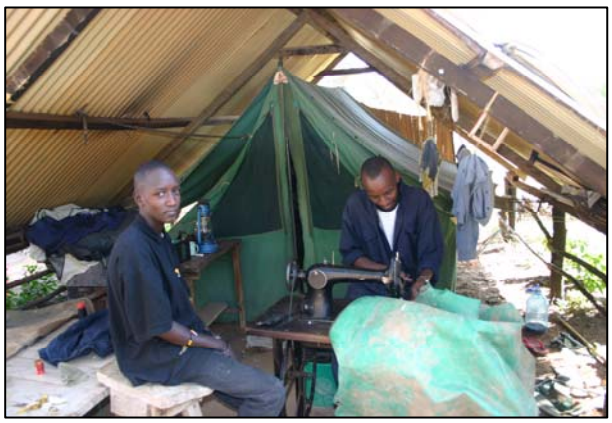
Research Camp News

Save the Elephants' camp in Samburu National Reserve is the heart of our research and where our Kenyan long term monitoring team is based. We have been delighted that so many of our donors and supporters have made the time to come and visit the camp and to get to know our staff and visiting researchers. We like to keep you up to date on some of the stories (and dramas!) that have happened in camp over the past year.

STE research camp in Samburu

Donors joining the STE long term monitoring team for a game drive

Many improvements have been made in camp recently, particularly in lieu of the floods which caused much destruction in April. Shivani's tent and shower room were knocked down completely by the water and had to be rebuilt! New roofs were also built over all the tents which had been in place for four years and so were getting very old. Also, after frequent invasions by Vervet monkeys, or more destructively by baboons, the tent zips are now being replaced every four months. The dry season (August-September) is the worst time for monkeys 'breaking-and-entering', when there is less food in the wild that they can find for themselves. Just last week monkeys broke into Shivani's tent and took most of the contents of a parcel which had taken 5 months to arrive from America – she was not amused…



Camp improvements after the unusually powerful April 2006 floods washed away some of our research tents and shower rooms

New Well

For the last seven years STE researchers have been driving 2km to fetch water from a rangers' camp using a Bowser. With the camp growing, this method was costing a lot of time and resources and so a bore hole has now been dug next to the kitchen in the camp to provide a constant, reliable and clean water source. The well was dug 25-30m deep so that it fills only with groundwater. However, an electric pump is still needed before water can be easily drawn from the well.

Tree Protection

Three years ago, STE with the Samburu County Council conducted a research study into the amount of damage caused by elephants on *Acacia Elatior* trees, which came to the conclusion that half of the trees along the river-line were dead as a direct result of elephant browsing. Elephants have been entering camp frequently and so to discourage them from browsing in the area, wire mesh has been attached to the base of the trees. Dead branches have also been placed around the base of the plants to further deter the elephants. This method has proved such a success that 13 tendrils of chicken wire were given to the community in Westgate so that they could protect the trees in their public campsites in the same manner.

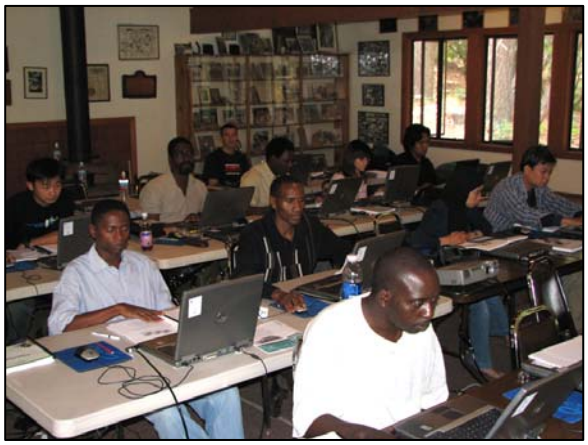
Protecting our trees from elephant browsing

Elephant in camp!

GIS Support

SCGIS Training

We were very proud that Save the Elephants GIS analyst in training, Festus Ihwagi ,was awarded a scholarship by the Society for Conservation GIS international (SCGIS) to attend advanced training in GIS at ESRI's Redlands Campus in California, USA in August 2006. Along with an international group of 33 scholars from around the globe, Festus received two weeks of full time training from ESRI's top GIS instructors.



Festus at the ESRI Training Centre in California

Major support from ESRI

ESRI invited Jake Wall and Festus Ihwagi to attend their 26th Annual User conference at San Diego 2006, an event that drew together an estimated 15,000 participants show-casing their use of GIS in different fields. Representing Save the Elephants, Jake and Festus gave presentations on elephant densities in relation to land use, resource availability and terrain. They were able to demonstrate STE's radio tracking work and database and even managed to take a used elephant collar to the presentation which generated huge interest! ESRI have donated vital software through their local distributor Willy Simons of Oakar Services Ltd, Nairobi.

Festus and Jake at the ESRI Conference in San Diego

M.Sc. Course sponsored by Save the Elephants by Festus Ihwagi

"I am very grateful that STE has fully sponsored me through a two year M.Sc. degree course at the University of Nairobi. I have just finished my first year and looking forwards to carrying out a research project in my second year. I wish to study bark dietary and chemical quality in relation to the debarking intensities (by elephants) of different riverine trees in Samburu and Buffalo springs National Reserves."

The World Wilderness Congress

In October 2005, Shivani and Emmanuel Hema from the Mali Elephant Project were both awarded scholarships from the Wild Foundation to attend the World Wilderness Congress in Anchorage, Alaska. During the first week, they went through a training course entitled "International Wilderness Concepts and Practice", a joint programme between the Wilderness Action Group, South Africa and University of Montana. Following this week long course, the congress begun, where both Emanuel and Iain gave a presentation on the Mali elephants. It was a very successful two weeks, with a lot of contacts made and insight gained into global wilderness concepts.

Southern Africa Transboundary Project

Michelle and Steve Henley

Very little demographic information is known about the elephant population of the Association of Private Nature Reserves (APNR) on the western border of the 2.2 million hectare Kruger National Park in South Africa. Save the Elephants is helping to provide information for the APNR managers through radio tracking and monitoring of individually identified animals.

Telemetry study

Eleven collars are currently deployed; seven on bulls and four on cows. Seven study animals have been monitored for more than a year (Mac, Classic, Diney, Alex, Joan, Barry and Mandy).

Two collars currently deployed are still due for replacement (Alex and Joan). We are hoping to do this within the next couple of months, as both collars have exceeded their expected lifespan. In studying elephant movements and range use it is critically important to collect data over a number of years to determine patterns that are consistent over time in order to analyse how they relate to environmental conditions that change within and between years.

For this reason we feel it is important that the GPS satellite collars currently fitted to Alex and Joan be replaced with GPS-GSM collars and this be done while these collars are still functioning. Basic range statistics are given in the table below.

	Age & sex	Collared	Collar type	Collar's lifespan	Notes
Mac	prime ♂	May 2002	GPS-satellite	72	
Classic	prime ♂	May 2004	GPS-GSM	6 349	GPS-satellite collar replaced
Diney	ad ♀	May 2004	GPS-GSM	6 254	GPS-satellite collar replaced
Alex	ad ♂	Nov 2004	GPS-satellite	-715	
Joan	ad ♀	Nov 2004	GPS-satellite	-246	
Barry	ad ♂	May 2005	GPS-GSM	2 381	
Mandy	ad ♀	May 2005	GPS-GSM	2 330	
Brazen	prime ♂	Nov 2005	GPS-GSM	2 491	
Soshangane	ad ♂	Nov 2005	GPS-GSM	2 433	
Monarch	ad ♀	Nov 2005	GPS-GSM	2 539	
Striburus	young ad ♂	June 2006	GPS-GSM	6 221	

Table: Summary information of telemetry collars currently deployed. The expected collars life span is given in days with the present data recording schedule.

Future Studies

With the individual identification study we are close to our 80% re-sighting target for prime bulls. We still need to increase the re-sighting rate for the young bulls as they are proving to be the more fluid segment of the population in terms of elephant movements. The prime bulls, together with the breeding females represent the stable segments of the population. Although we have a low re-sighting rate of immature bulls; this age category does not represent the focus of the study as they are still closely bonded to the breeding units which are being studied more closely. We intend to collar eight elephants along the eastern border of the KNP with Mozambique. The funds have been secured to expand the project across these boundaries. This STE project is funded by the International Elephant Foundation.

Forest Elephant Project, Gabon Dr Stephen Blake

The Forest Elephant GPS Telemetry Program was initiated in 1998 in response to the near complete lack of information on the home range requirements, ranging patterns, and seasonal movements of forest elephants in central African forests. Savannah elephants use thousands of square kilometres when their ranging is unrestricted, and if forest elephants have similarly large area requirements, range management and national park design must be developed on an adequate scale. Operational in 3 nations, 6 national parks, and across a wide variety of habitats, this study provides critical information to land-use planners, park managers, and governments.

Our project is conducted in close collaboration with Save The Elephants that pioneered the use of GPS-telemetry for savannah elephant research and conservation. When first approached by WCS, Save The Elephants saw the potential of using GPS telemetry for forest elephant conservation, and funded the first 6 collars deployed in Central Africa. Save The Elephants continue to share their vast experience and expertise with the WCS team and have generously donated a total of 14 GPS telemetry collars.

The only significant enemy of the forest elephant is man, and man determines the distribution of elephants. As human populations grow, and roads, villages and towns encroach deeper into the forest, forest elephant range is becoming restricted and fragmented. Human-elephant conflict is inevitable as the two species compete for ever more limited space. Understanding ranging and habitat requirements of elephants will help planners avert irreversible impacts on elephant populations and mitigate the negative impacts of elephants on human well-being.

Despite the international ban on trade in elephant products, poaching for ivory is still the biggest cause of forest elephant decline. However as bushmeat supplies dwindle across central Africa, elephant meat is becoming commercially viable. Forest loss and fragmentation are reducing elephant habitat, fragmenting contiguous

populations and allowing easy access to formerly isolated elephant poachers.

Biologists and conservation site managers from WCS are working with collaborators to deploy a total of over 30 GPS collars across critical elephant conservation areas in central African forests. We are proud of the part we play in what has become a truly collaborative field research and conservation venture. We have developed sampling plans, which meet scientific and management information requirements, while respecting the pre-requisite of minimizing risk to both elephants and humans. Field veterinarians from the WCS Field Vet Program supervise immobilization and ensure the highest standards of elephant handling during collar deployment. A pygmy tracking team, composed of former elephant hunters of the BaAka pygmies, has been trained over several years to help veterinarians approach and dart elephants efficiently – their lifetime experience being critical to success in the thick forest conditions of central Africa.

The last of the Sahelian Elephants

The 450 strong elephant population of the Gourma in Mali, West Africa, is unique. It is the northernmost population of elephants remaining in Africa today and the last significant herd in the Sahel, a remnant of the once extensive populations that lived throughout West Africa. Save the Elephants have had exciting projects in Mali since 2000, and are now embarking on a new project that will take us from 2006 until 2009. Our support for this project will come from People and Parks Support (PAPS), through the personal interest of the late Paul Van Vlissingen. In the last three years Save the Elephants has been part of a consortium with Wild Foundation and the Environmental Development Group in Oxford.

The Gourma elephants are adapted to life in the harsh Sahelian margin of the Sahara desert, surviving by tracking the seasonal abundance of key resources through large-scale movements. They owe their continued existence to a unique relationship with the local communities whereby mutual tolerance allows water and forage resources to be shared. However this relationship is at increasing risk from changes in the balance of elephants and changing human/livestock populations and their use of habitats and finite water supplies.

Local Tuareg family

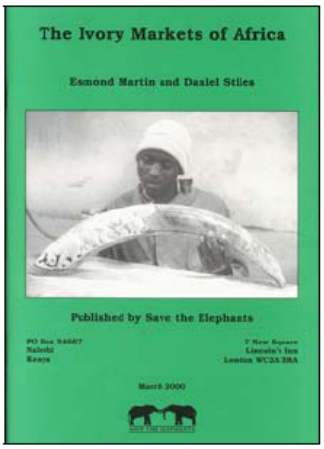
The GPS collar data of three elephants that we gained over 18 months in 2000-2001 has provided the crucial information required to enable us to understand some of the elephant needs and ecology throughout their migration. We have been following up on this radio-tracking to develop a survival strategy for the elephants in collaboration with Mali's Department National de la Conservation de la Nature. In brief, the summary of the results of this programme include (1) photo-identification of a minimum of 400 elephants; (2) establishment of the outer limits of the elephant range in the west and south; (3) analysis of the elephant migration corridors using the GPS collar data in conjunction with a range of existing data on the area's ecology and socio-economy; (4) identification of key conservation/management issues; (5) a consultative stakeholder workshop to disseminate and discuss these key conservation/management issues; (6) and the production of a brochure, maps and a photo-library to help increase awareness of the elephants, and communicate results and recommendations.

However, with only three animal movements recorded we are aware that there may be routes used by other elephant herds that have not yet been identified as priority areas for protection. Revealing these migratory routes is now our first priority before we can start to consult and offer informed guidance for the proposed development of an elephant management strategy by the Malian Government.

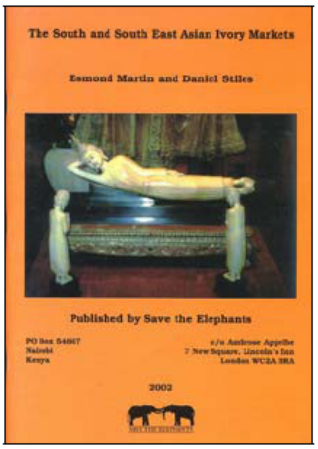
We therefore plan to launch a comprehensive three-week collaring expedition to Gourma supported by PAPS, in early 2007 to fit ten more GPS-Satlink collars onto ten more elephants. At the end of 2009 a retrieval expedition is planned to initiate the drop-off mechanisms on the collars and to retrieve the final data. With approximately 34 months of data on these collars we will have critical information allowing routes to be compared over three years.

The Ivory Trade Study

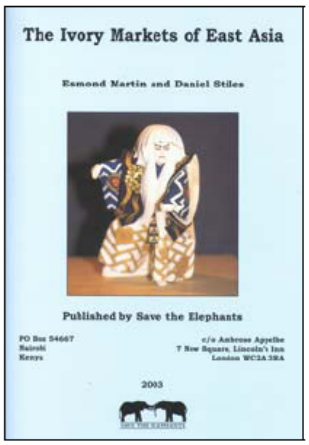
Between 1999 and 2004, Save the Elephants, realizing there was still an active ivory trade in many parts of the world, funded research for Drs Esmond Martin and Daniel Stiles to study the main ivory markets in Africa, Asia and Europe. As a result, four ivory reports were published in order to provide base-line data from which informed decisions could be made regarding ivory trade controls and law enforcement.



Africa



South and South East Asia



East Asia

Europe

They were each launched at the House of Commons in London, with further press conferences held in Nairobi. There was wide publicity on the findings world wide. Esmond Bradley Martin is now studying the ivory markets in the United States of America where there is a big internal market still. We look forward to his findings.

Elephant News Service

We are thankful to Melissa Groo for her key work in dispensing breaking elephant news on the web. It is often difficult for wildlife authorities, concerned NGOs and donors to gain access to all the latest developments through the news. Ever since 2001 we have provided an electronic information network, or listserv, that links and informs all persons interested in the management, conservation, and science of elephants worldwide. The STE Elephant News Listserv is a free email service that circulates news stories on elephants in the wild, new papers from peer-reviewed scientific journals, upcoming conference details, job posting, and any other new elephant-related stories to over 800 members worldwide. The service is run by Melissa, based in the United States, who conducts daily scans of news search engines and various databases to find and circulate the stories. This STE project is supported by the International Elephant Foundation.

STE Administrative Support

Behind our scientists and conservationists is a small administrative unit based in Nairobi which works tirelessly to support everyone in the field.

A special thank you goes to Wainaina Kimani and Njoki Kibanya who head the team. They work relentlessly on all administration from accounting to finding vital pieces of kit, at the eleventh hour. They deserve medals for their endurance!

Wainaina Kimani (above) and Njoki Kibanya (below)

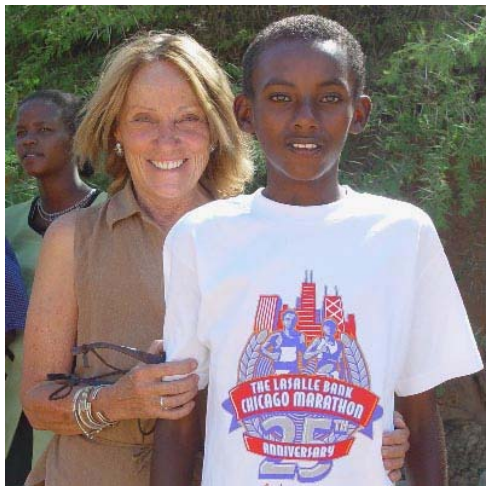
Thank you also to Peter Oduogo and Njoroge Ng'ang'a who run vital and endless Nairobi errands, like fuelling 5Y STE (our research Cessna plane) on time for elephant immobilization operations.

Thank you also to Fatma Salim who carries out all flight bookings (often at the last minute) for STE staff, researchers, interns and visitors.
At our STE Langata office thanks goes to Musyoka Ngoliai who feeds our staff and visitors, and Mwanzia Muli keeps our HQ clean.

We would like say a heartfelt "ashe" (thank you) to Oria Douglas-Hamilton, aka Mama One. Oria has supported STE in more ways than can ever be listed here. Many guests at her safari lodge, Elephant Watch, are now some of STE's top donors. Thanks Oria for helping to plan Iain's travelling itineraries, and for always being there for support in any crisis. When in doubt about how to handle a situation…. ask Oria!

Finally we would like to thank Lucy King and Jacky Sloane who helped to put together this report; and Stacey Iverson, Eve Schaffer and the entire WCN team for assisting with its printing and distribution to our donors.

Without our administrative team the work in the field simply would not be possible. We thank them for the heart and soul they put into helping everyone.



Oria and Mohammed, one of our scholarship students

Some recent media interest

Our research is regularly published in some of the most prestigious scientific journals, news from which is often picked up by popular journals, newspapers and the media. These scientific journals are peer reviewed by leading experts in the field and gives international recognition and authority to the research conducted by Save the Elephants.

Cerling, T.E., Wittemyer, G., Rasmussen, H.B. Vollrath, F., Cerling, C.E., Robinson, T.J., and Douglas-Hamilton, I., (2006) Stable isotopes in elephant hair document migration patterns and diet change. ***Proceedings of the National Academy of Science*** **Vol 103 (2) pp 371-373**

"Satellite data shows extent of elephants' risky crop raids"

"New tracking method may help endangered Pachyderms"

"It is aimed at helping conservationists decide where to site sanctuaries"

"A new technique…could inform ways to manage elephants more effectively, and thereby reduce their conflicts with humans"

Wall, J., Douglas-Hamilton, I., Vollrath, F. (2006) Elephants avoid costly mountaineering. Current Biology.

"Understanding the movement patterns of elephants is important in planning for their future habitat needs"

"The scientists at Save the Elephants claim that the elephants mainly avoided hills because they wanted to conserve energy"

"The findings provide key insights that could help protect elephants"

Douglas-Hamilton et al., (2006) Behavioural reactions of elephants towards a deceased and dying matriarch. Applied Animal Behaviour Science (*In press*)

"Dr Douglas-Hamilton's researchers were able to observe the reactions of other elephants to the death of Eleanor, the matriarch of a group called the First Ladies"

Vollrath F., Douglas-Hamilton I. (2002) African bees to control African elephants. Naturwiss.89; 508-511.

"Elephants avoided all the trees hung with full hives, report Fritz Vollrath, of the Mpala Research Centre and Iain Douglas-Hamilton, of the Nairobi-based conservation organisation Save the Elephants"

International Awards for STE

Disney Wildlife Conservation Fund Lifetime Achievement Award

Save The Elephants' founder Iain Douglas-Hamilton, Ph.D. was honoured by the Disney Wildlife Conservation Fund as a leading wildlife advocate for his work to preserve endangered animals. Douglas-Hamilton was one of five conservationists receiving this Disney honour. The others include international actress and model Isabella Rossellini, Dr. Jane Goodall, actor John Cleese and Nobel Peace Prize winner Wangari Maathai. All received $100,000 grants from Disney to continue their work in wildlife conservation.

"I am deeply honoured and delighted to receive this award. My life's work in elephant research has helped me approach conservation from an elephant's point of view. As these intelligent animals move through beautiful and varied regions, their survival depends on the ecological integrity of their habitat and on the attitudes of the human communities who share the same lands. The Disney award will greatly assist Save the Elephants in developing new solutions to allow people and elephants to co-exist peacefully." Dr Iain Douglas-Hamilton

The Special Achievement in GIS Award

Save the Elephants have won a particularly important award from the Environmental Studies Research Institute (ESRI) this year, *The Special Achievement in GIS Award* which acknowledges the use of GIS techniques for exceptional project work. During the award presentation, Jack Dangermond, the President and founder of ESRI hailed Save the Elephants for the highly successful GIS program in Kenya, noting that is amongst the best success stories in conservation. In particular he hailed the demo by Save the Elephants on tracking elephants in Northern Kenya.

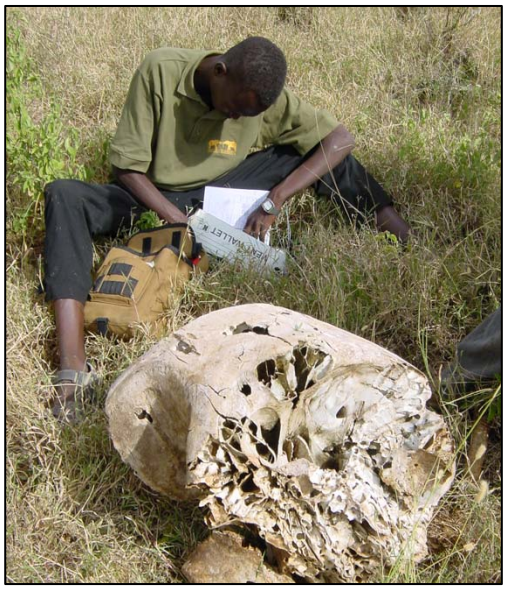
We were delighted that Festus Ihwagi was able to receive the award on behalf of Save the Elephants. Jack Dangermond, the president ESRI, presented the award during the ESRI annual conference in California in August 2006

Disney Wildlife Conservation Hero Award

Save the Elephants (STE) is very proud to announce that Mr Onesmas Kahindi was The 2006 winner of the Disney Wildlife Conservation Hero Award. This exceptional Kenyan National has been working as STE's Monitoring of Illegal Killing of Elephants (MIKE) Project Officer in Kenya since 2002 and his hard work, dedication and endurance in extremely arduous, and sometimes dangerous, working conditions has resulted in the resounding success of the MIKE programme in the Samburu-Laikipia elephant range.

Onesmas with his MIKE Project vehicle sponsored by Disney

Onesmas' monitoring programme relies heavily on his unique relationship with pastoralists, ranchers, communities and wardens alike and he has worked incredibly hard at building trust and respect from all whom he meets and works with. During the first year as STE MIKE officer he had an exceptionally tough job trying to build a co-operative information network with rural communities who were initially hesitant and suspicious in leading him to elephant carcasses. It took considerable perseverance and communication to emphasise to local communities that no retribution was involved in divulging the location of the carcasses.



Onesmas recording the location and cause of death of each elephant

Since 2002 Onesmas has driven 235,000 kilometres for fieldwork alone and his (Disney funded) vehicle is now so well known amongst these remote communities that he cannot pass a herdsman or village without being invited in. Despite his popularity, Onesmas has had to deal with some very remote and dangerous situations when confronting suspicious and aggressive locals. His commitment to the STE MIKE objectives has seen him through these close encounters and the success of the project, and the results that have come out of his research, are entirely due to his perseverance and personal integrity.

A harsh reminder that not everyone likes elephants

Thank You To Our donors

STE relies totally on the generosity of our supporters to continue our research and conservation projects. We would like to sincerely thank all of our donors over the years.

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