



LIVING WITH LIONS ANNUAL REPORT 2010

LAIKIPIA PREDATOR PROJECT LION GUARDIANS PROJECT KILIMANJARO LION CONSERVATION PROJECT MARA PREDATOR PROJECT

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Photo by Philip J. Briggs



1. Executive Summary

We are working to restore, conserve and manage viable populations of Africa’s large carnivores by developing management techniques that foster the coexistence of people, livestock and predators in areas bordering parks and other regions without formal protection.

It was a remarkable year for Living with Lions. In the Amboseli region, the drought of 2009 killed off 70-85% of lions’ wild prey, forcing them to turn to the remaining Maasai livestock, itself reduced by at least 60%. Starving lions started invading Maasai homesteads (*bomas*) to kill cattle, and in the first three months of 2010, 18 lions were speared or poisoned in retaliation. Sixteen killings occurred in the one small part of the region which as yet had no LWL Lion Guardians program (Fig. 1); in response, we expanded the Guardians program to that area. Elsewhere, the Guardians stopped at least 45 lion hunts by persuading angry warriors to let the lions live, when necessary calling in Kenya Wildlife Service (KWS) rangers or Game Scouts for help.

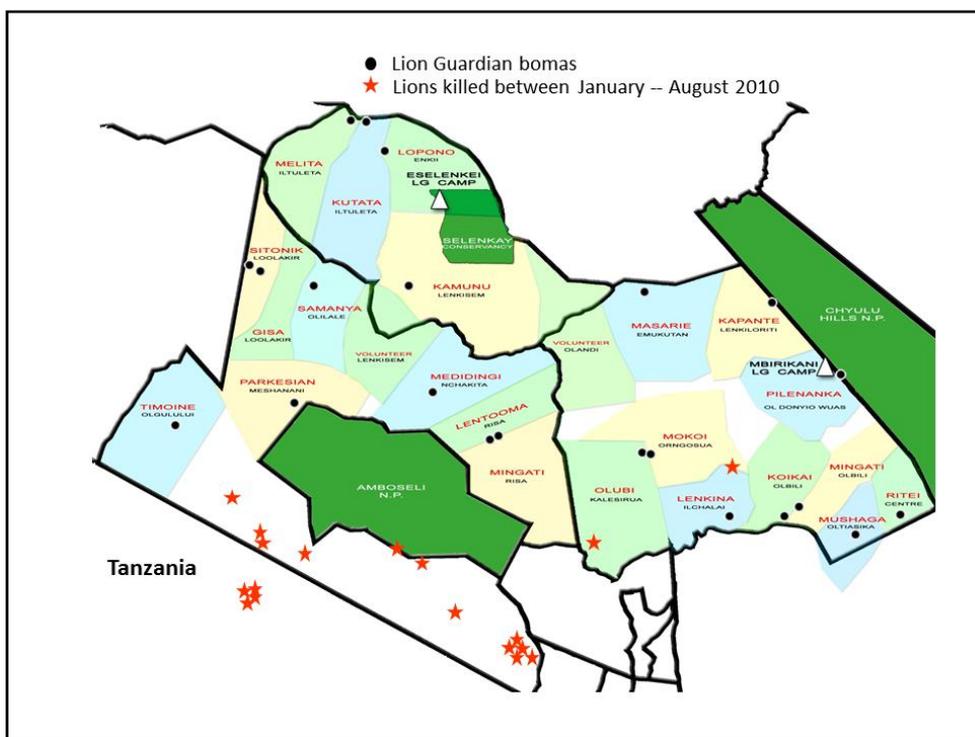


Figure 1. Lion Guardian zones and lion killing between January –July 2010. Nearly all killing occurred where there was no Guardian program in effect.

Many were skeptical when Leela Hazzah first proposed the idea of using Maasai warriors, most of them former lion killers, to protect lions. However, the Guardians’ stunning success in protecting lions during the worst crisis they have ever faced in this region has shown this to be an extraordinarily effective lion conservation strategy for areas outside parks, where lions conflict with humans over livestock. To a biologist, perhaps the most impressive development has been the Guardians’ efficacy at finding, identifying, and cataloguing the region’s lions. Persecuted predators in human-dominated landscapes are nocturnal and very shy; in the case of Amboseli lions, they have also become extremely rare. However, with the help of the



Guardians, biologist Stephanie Dolrenry and her colleagues Philip Briggs and Kylie McQualter, have identified essentially every lion in the region, documenting lengthy movements and immense home ranges. Thus, we have highly detailed information not only on lion numbers, but also on critical population parameters such as reproduction, mortality, home ranges, movements and diet. This is an unprecedented accomplishment, remarkable testimony to the field skills of the Lion Guardians and incredibly hard work by dedicated LWL biologists.

In the Mara, Sara Blackburn has demonstrated the accuracy and efficiency of her lion monitoring method that depends on training tourism guides and their guests in accurate lion identification. Operating in the Mara North Conservancy along the Mara River, she demonstrated that a relatively small number of motivated and well-trained guides can provide accurate lion population and movement information over a large area. Her work has attracted very positive attention in neighboring conservancies, and she is expanding her coverage from about 350 to over 1000 square kilometers of this critically important region.



A guide records a lion sighting for the project. Photo by Sara Blackburn

Alayne Cotterill is continuing her dissertation work to determine if lions can change their spatial and temporal use of the landscape to reduce conflict with people and livestock. Pastoralists can adapt their behavior to better live among lions by, for example, improving husbandry to reduce lion attacks, but can lions adapt to live amongst increasing numbers of pastoralists? Long time LWL biologist Steven Ekwanga continues to work with Alayne, but has increasingly spent his time working with Stephanie and Philip in the Amboseli area. He has trained Marc Napao, who is supervising LWL scouts on Laikipia ranches, and introducing Sara's lion monitoring system to local lodges.

Long time collaborator and supporter Michael Calvin has re-activated the lion tracking website he developed several years ago, which plots the details of GPS-collared lion movements on Google Earth, allowing anyone to see how our study animals are using the landscape. <http://www.abycats.com/laikipialionmap/> and <http://www.abycats.com/klplionmap>.



As Project Administrator, Lisette Gelber has transformed LWL into a far more organized and efficient organization. In 2010 LWL became officially incorporated in Kenya and in 2011 we will be incorporating as a US nonprofit.

LWL has also undergone some major changes in personnel. Long time webmistress Amy Howard has returned to the UK to train as a teacher, biologist Kylie McQualter has returned to Australia, and Liz Carabine has returned to postgraduate studies to do her PhD. in Botswana. Working with Philip Briggs and Stephanie, Steven Ekwanga has taken on major responsibility for lion monitoring in the Amboseli region, while Marc Napao is taking up many of Steven's responsibilities in Laikipia, as well as working with Sara in the Mara. Antony Kasanga has moved from LWL to our colleagues the Maasailand Preservation Trust, and Luke Mamaai has transitioned from Leela's research assistant to Lion Guardians head coordinator, while Eric Ole Kesoi continues to work as community liaison officer for LWL in Maasailand. Thus, our Kenyan staff is building experience in all aspects of lion research and community conservation, while contributing their own distinctive expertise to each LWL project area. As the LWL team grows in size, it retains the close-knit highly collaborative character that has always been our greatest strength.

To show all our Kenyan staff our appreciation of the hard work they have done at the end of an extremely challenging and productive year, we are providing each of them with a [D. Light S 250 solar lantern/phone charger](#). They will be able to use their lanterns in their searches for lost livestock as well as to provide illumination in their homes at night, rather than having to use smoky kerosene lanterns.

2. Lion Guardians Project

The Lion Guardians project is now in its fifth year and covers most of the Amboseli region. We started in January 2007 with eight Lion Guardians covering the 1,200 km² of Mbirikani Group Ranch and now employ 29 Guardians covering 3,500 km². In 2010 alone Lion Guardians stopped 45 lion hunting parties by dissuading angry warriors, sometimes with assistance from the local Game Scouts or the Kenya Wildlife Service. Since the inception of the Lion Guardians in 2007, there have been over 58 lions killed in neighboring areas where there was no active Lion Guardian program, while only two lions were killed (for local political reasons) in Lion Guardian areas during this same period.



The 2010 Lion Guardians

Photo by Philip J. Briggs



Maasai usually kill lions in response to livestock depredation. Therefore, a major priority for Lion Guardians is working within their communities to minimize conflict with predators. Due to changes in Maasai husbandry practices and warriors leaving home to find work in cities after the drought of 2009, most herding is done by inexperienced youngsters. This has resulted in an increase in the number of livestock lost in the bush at night, where they are vulnerable to predators. In 2010 the Lion Guardians searched for at least 6,708 lost livestock, and successfully found 5,874 of these, an 88% success rate; many of these would have been killed by predators if not found. This direct conflict mitigation has increased community tolerance and reduced lion killing. The second most common source of livestock loss occurs when lions enter *bomas* at night. This type of attack used to be rare, but with around 80% of wild prey dying in the 2009 drought, starving lions started attacking *bomas* regularly in 2010, leading to the killing of at least 18 lions in the first months of 2010, all in the one part of the Olgulului Group Ranch south of Amboseli National Park where there were no Guardians. In mid-year, we expanded the program to include this final region, providing reliable protection to lions which leave the Park.



Photos by Philip J. Briggs

This cow survived an attack by lions inside a boma at night. Many livestock do not survive such attacks (inset).

In an effort to reduce livestock/predator conflict, Lion Guardians reinforced 300 *bomas* that experienced lion incursions in the past year. Predator-proofing *bomas* is a big job, so they work together with *boma* owners, ensuring that the community participates actively in conflict mitigation. Community leaders say that one of the most valuable aspects of the Lion Guardians is that they warn herders to avoid areas where lions are present. One third of the region's approximately 60 lions are radio collared, allowing the Guardians to preempt conflict by using tracking equipment to determine the exact location of the lions.

In 2011 we will continue refining the program in the Amboseli ecosystem while, with funding from Panthera, helping to start two new Lion Guardian programs: we will work with the Serengeti Lion Project in the Ngorongoro Conservation Area in northern Tanzania, and with the Ruaha Carnivore Project in southern



Tanzania. We are very excited about the opportunity to replicate our successful Kenya model in other areas where carnivores are threatened by conflict with people.

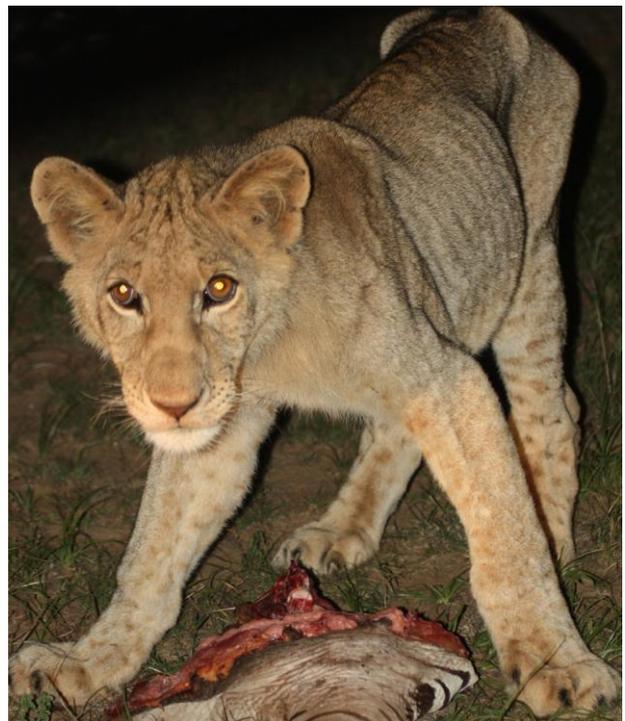
Leela's PhD Research

Besides directing Lion Guardians, Leela is also completing her PhD dissertation research on the motivations and circumstances of lion killing by Maasai. In collaboration with warriors, she collects habitat data, a GPS fix, bones, and other specifics of each killing in the region since 2003. With a relatively complete dataset on lion kills, LWL will be able to reconstruct the lion population of the recent past, finally addressing the question of how much the lion population has been reduced.

Leela's research investigates the current transition in Maasai attitudes towards lions, which appear to be largely due to climatic factors (drought), changes in land tenure, globalization and tourism, and a shift in religious values. As Maasai traditions and pastoral identity fade, a new market-based livelihood and culture is developing that directly affects the way that Maasai coexist with wildlife. When she first began this research for her Master's work five years ago, the chief motivations for killing lions were the traditional rite of passage by warriors and retaliatory killings in response to livestock depredation. However, today we are witnessing a growing trade in illegal lion parts and increased potential for retributive political killings due to escalating problems resulting from the prolonged drought of the past year. Leela and Masumi Gudka carried out a market survey on the coast of Kenya to assess the potential threat from the illegal trade in lion parts, and a publication has been submitted to *Oryx*. Leela is working on multiple publications on various aspects of lion killing, and a final piece on the efficacy of Lion Guardians in halting lion killing. She plans to defend her dissertation by June 2011, after which she will continue her work with Lion Guardians full time.

3. Kilimanjaro Lion Conservation Project

This past year has brought many achievements as well as massive challenges for the Kilimanjaro Lion Conservation Project (KLCP). According to the Kenya Wildlife Service, the severe drought of 2009 killed at least 72% of zebra and 83% of wildebeest in the region; the loss of their main prey led to widespread starvation of lions, an eightfold increase in lion attacks on livestock, and 18 lion deaths due to spearing and poisoning outside Lion Guardian areas. In previous years, lions fed primarily on wildebeest and zebra, but after the drought of 2009, we noted a large increase in the number of lion predations on giraffe and ostrich as well as rarer species such as aardvark.



Nosieki's cub featured in LWL's 2009 Annual Report – now dead due to starvation. Photo by Stephanie Dolrenry



Although lions were lost from the regional Amboseli population, KLCP biologists and the Lion Guardians managed to save and identify many more individual lions. In 2009, we began piloting and implementing several new monitoring techniques. KLCP biologists trained the Lion Guardians as field biologists, incorporating traditional Maasai tracking techniques into modern monitoring methods. This union of tradition and modern science has proven to be exceptionally successful.

KLCP has been monitoring lions on Mbirikani Group Ranch since 2003, expanding with the Lion Guardians program to Eselenkei and northern Olgulului Group Ranches in 2009. We completed the expansion onto southern Olgulului in 2010, and are now confident that not only are we effectively protecting lions throughout the 3500 km² area where the Lion Guardians operate, we also know nearly every lion residing in the region.

Although lions outside protected areas are notoriously difficult to count, we now have considerable confidence in our population estimate for Mbirikani, Eselenkei and most of Olgulului Group Ranches. The Guardians continuously patrol their individual zones (about 120 km² each) on foot. When they come across lion tracks, they call in a KLCP biologist and together they follow the lion, either by tracks or radio signal, until they are able to identify it. Very few 'new' lions have been detected in those areas since December of 2009; we repeatedly find the same individuals moving vast distances. Coverage by the Lion Guardians is thorough; it is unlikely that we are consistently missing any resident lions. Of course, occasional individuals originating elsewhere no doubt wander through and may establish themselves in the region.



Lioness and cub on Olgulului Group Ranch. Photo by Philip J. Briggs

Identified lions are those which can reliably be recognized and distinguished from others, and include those collared in community lands by KLCP or within Amboseli National Park by the Kenya Wildlife Service (KWS). We identify individuals from whisker spot patterns and other unique marks such as scars, ear notches, and nose patterns. Thus we are certain that at least 44 adults, 7 sub-adults and 25 cubs exist in the KLCP-Lion Guardians project region, and that there are an additional 4 to 8 female adults, up to 10 subadults and up to 9 cubs still to be positively identified in the new southern Olgulului area. These represent a minimum of 51 and a maximum of 67 adults and subadults in the region; these estimates will be much more accurate by mid-2011, when the new Lion Guardians in the southern Olgulului area have identified those lions. Due to high mortality rates, cubs are normally not counted until they are a year old. In 2010, KLCP monitored 14 collared lions – 10 with VHF collars (6 of these were KWS-collared lions from Amboseli National Park) and 4 with GPS collars.



GPS collars have shown that some of these lions have the largest home ranges ever documented outside of desert habitats. Collared male lion Sikiria traveled from our sites across southern Kenya down to Tanzania and then back to the Chyulu Hills National Park - a range of 5,626 km² (Fig.2). He is the most extreme example, but nearly all our lions exhibit larger than average home range sizes, probably due to very low population density and social structure disrupted by persecution.



Figure 2. Sikiria's movements in 2010

In this past year, Philip Briggs transitioned from the Lion Guardians project to the KLCP biologist team, monitoring lions and working very closely with the Lion Guardians. His superb photography, Swahili and tracking abilities have been immense assets to the project. Philip was assisted by Lenkai Nkiinti on all aspects of Lion Guardians and lion monitoring work across all of Eselenkei, northern Olgulului and Mbirikani Group Ranches. Lenkai joined our team in May of 2009 and is an essential part of the vital relationship between KLCP lion monitoring and Lion Guardians' lion reports. When Lenkai started working with us, he did not speak Swahili, nor could he write his name. Today, he is fluent in Swahili and submits daily written lion reports. We are very proud of Lenkai and Philip's achievements and contributions to our team.



Stephanie's PhD Research

The analysis of lion movements and demography, as well as the effectiveness of local people at providing accurate data on large carnivore populations, are all parts of Stephanie Dolrenry's PhD studies through the University of Wisconsin-Madison. Stephanie completed her coursework and passed her qualifying and preliminary exams this year, and plans to complete her dissertation by late 2011/early 2012.

Stephanie's research takes place in the heart of Maasailand, where livestock, people, and wildlife share the land and limited resources. Her PhD dissertation examines the demography and movements of lions which reside outside protected areas. She is specifically interested in how the behavioral ecology and movements of large carnivores are impacted by high densities of humans and livestock and how they differ from behavior documented in populations in protected areas.

Stephanie is also testing the accuracy and effectiveness of applying traditional Maasai knowledge to monitoring carnivores. Her research will contribute to the growing literature on adaptive co-management by providing an empirical example of a successful participatory conservation method, while also evaluating her monitoring and censusing methods across large areas. Lastly, she is assessing which factors predict the vulnerability of Maasai homesteads to carnivores. Overall, her dissertation will enhance our understanding of carnivore behaviors across human-dominated landscapes, illustrating the importance of using non-invasive and local knowledge-based monitoring techniques to study persecuted carnivore populations and mitigate their conflict with humans.

4. Laikipia Predator Project

The Laikipia ecosystem in the central highlands of Kenya is one of the few places left in Africa where livestock and humans still coexist with large carnivores at relatively high densities. Because different landuse and socioeconomic systems exist side by side, representing different levels of carnivore-human conflict, Laikipia is an ideal laboratory for testing conflict mitigation methods, the primary focus of the Laikipia Predator Project (LPP). Alayne Cotterill, who has been with LWL since 2004, continues to lead the LPP as she works on her doctorate at Oxford University studying how lion respond to the risks of living in a fragmented human-dominated landscape, thus providing vital information to better craft species conservation strategies.

Research

Due to depredation on livestock and consequent persecution, lions are typically the first large carnivore to be eliminated from pastoralist areas. However, human-dominated rangelands form a significant part of the lion's remaining range, creating a 'landscape of fear' for lions. Lions are a behaviorally sophisticated animal that can change key aspects of their behavior in response to humans. When foraging, selecting habitats and routes, lions make choices that reduce the probability of encountering people, and thus increase their chances of survival.



Summary of Research Achievements

Fourteen prides in Laikipia have VHF collars. To document differences in movement and activity patterns as lions move from low risk commercial ranch land to higher risk pastoralist land, all four prides using the northern unfenced boundary areas between commercial and pastoralist land have been GPS collared this year.

- Lions showed a significant avoidance of high risk pastoralist areas ($P=0.049$), using them less than was expected from resource distribution alone. Use of pastoralist land increased under the cover of darkness, when people and livestock were not active ($P=0.053$) indicating an understanding of risk.
- GPS collars revealed the average home range size of lion prides as 423 km². Core home range use changed seasonally, avoiding the higher risk pastoralist land during the drier periods when increased densities of pastoralist people and livestock were present.



Figure 3. Map showing how the core home range (50% KDE's) for LF161's pride changed seasonally over the last year. Use of pastoralist land increased when people and livestock moved out of the study area to their wet season grazing areas.

- When travelling through high risk pastoralist areas, lions move significantly faster ($P= 0.01$) compared to speed of movement on ranches.
- Lions spend significantly less time stationary (resting or feeding) on high risk pastoralist land ($P=0.045$). Comparisons of activity data showed night time activity (acceleration) levels increased in higher risk areas while people and livestock are present, but differed little between the land use types during the wet season, when the majority of pastoralist people and livestock moved away.

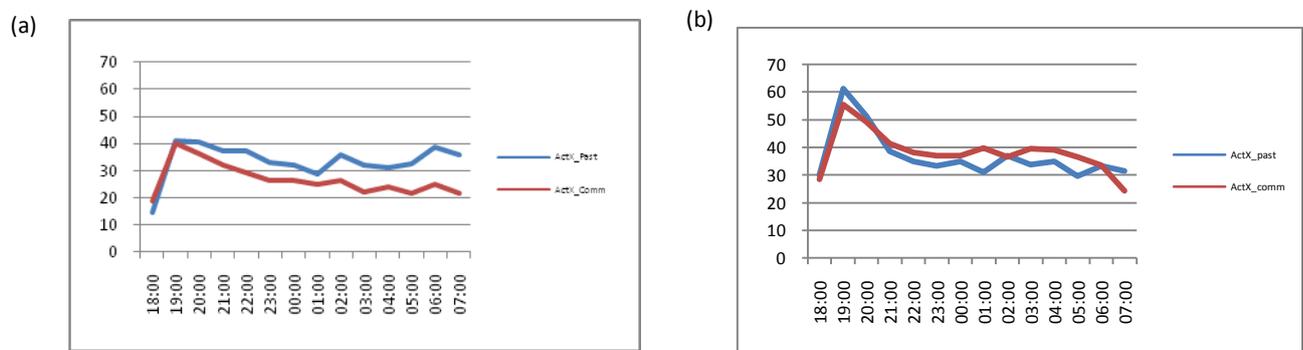


Figure 4. The comparative acceleration for LF176 while on pastoralist vs. commercial ranch land during (a) dry season when pastoralists and livestock are present (b) wet season when most pastoralists and livestock had left.



- GPS tracking reveals the lion's spatial and temporal use of habitats within the landscape. Rocky or densely vegetated areas may provide refuge habitats where the probability of encountering livestock and people is minimised.

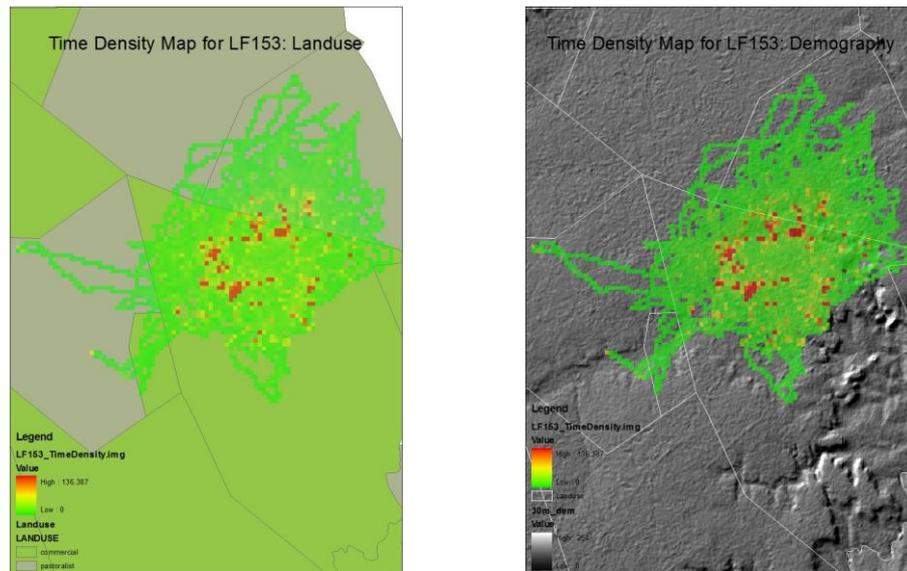


Figure 5. Time density analysis estimates the amount of time spent in each 250m grid cell based on lion movement path characteristics. Both land use and demography combine to influence lion movements; only 19% of LF153's hourly locations were on pastoralist land, and areas of high use (red/orange grid cells) on pastoralist land were almost entirely restricted to the rocky escarpment areas. On the safer commercial ranch land, however, areas of high use include flat, open plains.

- Despite the fact that livestock form more than 50% of the available herbivore biomass and are easier to kill than wild prey, only 7% of lion diet was comprised of livestock. Although lions avoid conflict with people over killing livestock, some do become habitual livestock killers.

Incident Report System

Of all the large carnivore species in the area, lions pose the greatest threat to livestock under current management practices. The incident reports continue to provide a rich source of data. Whereas night time attacks on livestock in bomas used to be the main problem in the region, improvements in *boma* design have caused more attacks on livestock during daylight hours.

Habitat Data

To allow us to map lion movements in relation to resources and human factors, we are using (and in some cases creating) GIS layers including roads, permanent water, permanent human settlements, property boundaries and habitat type for the core study area.



Wild Prey and Spoor Counts

Wild prey counts started this year, and will be repeated every dry and wet season to understand how prey movements across the landscape vary seasonally and how these influence lion movements and conflict. Spoor counts are being run simultaneously to document large carnivore density. A series of six 3 km transects are driven morning and afternoon for 6 days. We record all wildlife larger than dikdiks, livestock, people, *bomas*, and human habitation, distance from the car, bearing from the transect, and GPS location. These data are analyzed using the program 'Distance' which calculates animal densities. Spoor transects for carnivores yield an absolute density estimate and provide an index of abundance for comparison over seasons and years.

Conservation Achievements

Conflict monitoring

An incident reporting system is in place to collect data on human/large carnivore conflict on commercial ranches, and has been a successful method of disseminating information on good livestock husbandry back to those that need it most. One of the aims for next year is to adapt and expand this monitoring system on pastoralist areas, where collecting reliable information is much more difficult.

Large carnivore monitoring

Lions have been monitored across this landscape by LPP since 1998, using radio telemetry and GPS tracking. Additionally, non-invasive and more cost effective methods of monitoring are being developed by Living with Lions with a view to expanding these methods. Sara Blackburn's Mara photographic ID database is being adapted for use in Laikipia, and guides and drivers at six northern Laikipia lodges are being trained by Marc Napao to collect standardized carnivore sightings data and ID photographs. Spoor counts have been instituted across the region, to provide density estimates of hyenas and other carnivores, as well as lions.

Training

A three day field course was developed by LPP last year to provide training for scouts and field personnel from other conservation organizations on carnivore ecology, recognition, monitoring, and conflict mitigation techniques. This year, Northern Rangeland Trust scouts, guides from 3 lodges, and the scouts from Segera Ranch (the Zeitz Foundation) have been trained by Steven Ekwanga and Marc Napao. A major goal for 2011 is to expand this outreach training in collaboration with more conservation organizations in this area and other parts of Kenya.

5. Mara Predator Project

The Mara Predator Project has continued to focus on cataloguing and monitoring northern Mara lion populations through lodge guides and lodge visitors. An expansion into new lodges and conservancies has seen increased participation and a consequent increase in the number of known lions. We have also focused on quality rather than quantity of reporting, and have developed an effective training course and new reporting system. The online database and information booklets have also been improved. We now have a



polished and tested system for effective lion monitoring, and have shown that trained guides are able to report lion sightings accurately and efficiently.

The online database was redesigned in early 2010 to make it more interactive and user friendly, and manageable through a content management system (CMS). Sara can now easily edit the contents of the site, allowing for new study areas, lodges and lions to be added quickly. The online database can be accessed through the LWL website by visiting www.livingwithlions.org/mara. The old website has been developed into two regional databases for Amboseli and Laikipia, to assist with expanded lion monitoring in these areas, and has been adapted for local use in the Mara conservancies. Newly designed booklets and leaflets have also been produced with the aim of simplifying participation and minimizing error for both guides and guests. Our aim for 2011 in this area is to increase guest participation and maximize benefits to participating lodges.



The Mara lions database www.livingwithlions.org/mara

We have introduced monitoring into the Olare Orok (OOC) and Naboisho Conservancies (NC), through participation of Mara Plains Camp and Porini Lion Camp (covering OOC) and collaboration with the African Impact volunteer program (covering Naboisho), with support from the Kicheche Trust Fund, Olare Orok Conservancy Trust and Basecamp Foundation Kenya. With further refinement in 2011, regular monitoring will now cover a total area of approximately 1000 km². We have baseline estimates of lion numbers from OOC and NC, and will shortly be profiling all individuals for accurate monitoring. We have also reinstated monitoring within Lemek Conservancy (LC) through Kicheche Mara Camp and Saruni Mara Camp – Saruni Mara will continue these monitoring efforts into 2011.

A complete guide training course has been developed for guides, and the reporting system has been refined and standardized. From June, guides from Offbeat Mara Camp, Saruni Mara, Karen Blixen Camp, Kicheche Mara Camp and Elephant Pepper Camp Lodges across the Mara North Conservancy (MNC) were trained in monitoring, including lion identification, guest involvement and responsible lion viewing. This extended coverage has allowed us to resume monitoring in Lemek Conservancy and the southern areas of the MNC. Cameras have been supplied to reporting guides, increasing the number of useable reports by 70%.

As the project is rapidly expanding, two promising applicants have been trained in Laikipia, and Tonny Kiprikuri will be beginning work in the Mara as project assistant in March 2011. He will be based within the Olare Orok Conservancy, and his main role will be to reinforce guide participation through further training and regular collection and assessment of reports. Funding and support for the assistant has been provided by the Kicheche Trust, Olare Orok Conservancy Trust through Billy Winter, and Basecamp Foundation Kenya.



In late 2010, we analyzed guide accuracy and reliability and measured the percentage of the known lion population they encountered. Guides were able to accurately identify most adult lions in game drive areas within three months. Highly trained guides were consistently accurate when identifying lions, and the percentage of individuals that they were able to identify increased over time.

The data showed that training a small number of guides comprehensively across numerous lodges is more efficient than training many guides across fewer lodges, as guide accuracy is related to training intensity, and guides within the same lodge visit the same areas. We believe that accurate monitoring can be accomplished by just two motivated guides per lodge among lodges chosen to cover a wide geographic area.

Emphasis will be on training the appropriate number of guides to this proven effective level, ensuring that they are able to continue monitoring independently. This will be important in ensuring the long term viability of the project, considering the regular changes in lodge management teams.

We estimated lion density within MNC and LC over a period of five months by using a simple mark-recapture technique, assuming that most lions would be encountered at least occasionally by guides traversing game drive areas. There were 45 lions resident in the area during this period, a density of about 10/100km². This number of lions is comparable to many prey-rich savannahs in fully protected parks, a testament to the effectiveness of conservation efforts in the unprotected rangelands northwest of the Masai Mara National Reserve. Pride sizes (measured by the number of adult females) within MNC and LC are relatively small (1-3); however, mature females born into small prides have also apparently emigrated. As prey densities across these conservancies are high, other factors influencing pride size should be explored, in particular those related to conservancy management.



Mara lions. Photo by Sara Blackburn

Despite increased monitoring, the total number of unique adult lions encountered in the five-month period is just half the total number (90 individuals) identified in the 30 months that Sara has been working in the region. At least eight breeding females from three groups have disappeared, including one entire pride. Our analysis shows that this is not simply due to insufficient monitoring efforts, although it is important to recognize that areas do exist where vehicle-based, observational monitoring is not suitable, for example on the Siria Escarpment, where lions are known to exist. However, as the known ranges of several missing individuals include areas with reported human-wildlife conflict, it is possible that some of these lions have been killed. However, it is probable that we do not yet know the full annual home ranges of many Northern Mara lions. This is also suggested by intermittent, extended absences of adult females during which their location is unknown. Expansion of guide monitoring to neighboring conservancies will no doubt greatly increase our knowledge of pride ranges, and may reveal some of the missing lions.



All newly identified lions within the MNC and LC over the past year have been immigrant males. Two coalitions of three (one coalition moving from LC to MNC) have replaced single pride males in the MNC. Rapid male turnover has resulted in only one litter born in 2010 surviving past 2 months of age. Understanding the origin of immigrant males is important if we are to understand and conserve a large number of viable prides within all conservancies.

There have been a number of lions speared or poisoned in 2010, with all known cases attributed to conflict with livestock. The Anne Kent Taylor Fund began *boma* improvement using chain-link fencing within and around the Mara North Conservancy in 2010. Continued monitoring efforts will help to assess the effectiveness of such mitigation techniques.



Lioness hunting buffalo. Photo by Sara Blackburn

Focus for 2011

As efforts in 2010 have focused on refining guide reporting, training and monitoring efficiency, 2011 will see effort directed to guest participation with introduction of the new offline database into lodges. 2011 will also see extended monitoring efforts through the reintegration of previously involved camps and lodges and the introduction of new partners, all aided by the new project assistant.

Because existing teams of conservancy scouts and rangers are already undertaking community conservation efforts, we have decided that an LWL community conservation effort would duplicate their efforts unnecessarily. The LWL team will train these scouts and rangers in conflict mitigation and work with conservancy management to offer advice and assistance. In March, Steven and Marc will train Olare Orok Conservancy scouts, showing our film, *Eramatare Naada Dupoto (Profit through Better Management)*, and lion identification and monitoring.

We do not yet know the full home ranges of study populations, and it is important to ensure that monitoring is comprehensive and consistent. We plan to expand monitoring efforts into the Mara Triangle and Ol Kinyei Conservancy, through further collaboration with Porini Camp. Increasing the project's staff and volunteer base will also aid the expansion. Sara is planning to start a PhD program in 2011, which will focus on comparing lion population dynamics across the conservancies, establishing a wider, long term study to fully understand the dynamics of the Mara lion population, including complete home ranges and seasonal movements, pride dynamics and population changes over time.



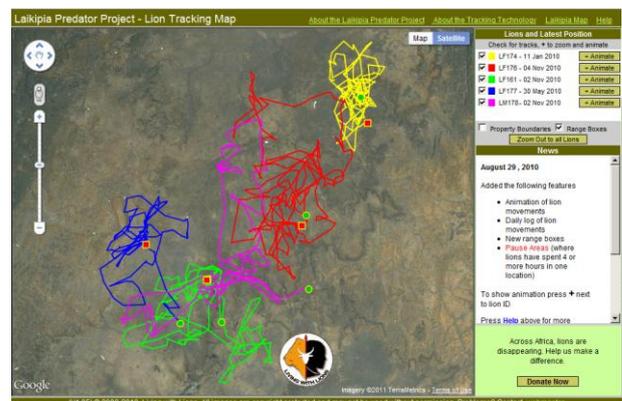
6. Websites

Living with Lions Website

The project's website www.livingwithlions.org features information about the Living with Lions projects, lion conservation, photos and articles, and also includes the Mara Predator Project online ID database of lions (www.livingwithlions.org/mara).

Lion Tracking Websites

Both Laikipia and Amboseli lion movements are now updated by our long time collaborator Michael Calvin in Google Maps <http://www.abycats.com/klplionmap> and <http://www.abycats.com/laikipialionmap/>, allowing anyone interested to see how our GPS collared lions are using the landscape. In the case of GPS collars which transmit data via satellite, these movements appear almost in real time; data from collars that must be 'manually' downloaded using a UHF link are added monthly. Interested viewers may be able to pick up likely kill sights (where a lion spends several hours in one spot during the night) or locations of small cubs (where a lioness returns over and over again to the same location).



Lion tracking website for Laikipia lions

Living with Lions Blogs

The Lion Guardians blog continues to be updated with posts written by Eric ole Kesoi, whose creative writing style has given readers a real insight into the project, and has encouraged over \$10,000 in donations through the blog. We are very grateful to Panthera for taking over from WildlifeDirect as the blog donation facilitators, meaning that the Lion Guardians receive 100% of the money donated to us through the blog. Visit <http://lionguardians.wildlifedirect.org> to read the latest posts. The Lion Guardians have an active and growing online Facebook community, and are also reaching a new audience of supporters through Twitter.



Lion Guardians blog

Sara continues to update her Mara Predator Project blog (<http://marapredatorproject.blogspot.com>).



7. Media

BBC: Sara Blackburn was interviewed for the mini-series '*Lions: The Truth*' which will be aired on the BBC in the UK in March 2011. Directed by Colin Jackson and presented by the BBC Big Cat Diary's Jonathan Scott, the programme focuses on current issues in lion conservation.

Lion Warriors Film: Stephanie Dolrenry, her assistant Lenkai and Kylie McQualter were filmed for the National Geographic's '*Lion Warriors*' Film which aired in the US on December 8th.



Sara is interviewed by Jonathon Scott

National Geographic Kids Magazine: *The* May 2010 issue featured Antony Kasanga and the Lion Guardians.

National Geographic Magazine: June 2010 National Geographic Magazine (US edition) featured a one page piece on the Lion Guardians.

8. Publications

Popular Articles

Frank, L.G. 2010. Hey Presto! We Made the Lions Disappear! *Swara*. 2010(4): 17-24

Technical Articles

Frank, L.G. In Press. Living with lions: lessons from Laikipia. *Conserving Wildlife in African Landscapes: Kenya's Ewaso Ecosystem*. Smithsonian Institution Scholarly Press.

Shrestha, B., Reed, J.M., Starks, P.T.B., Kaufman, G.E., Goldstone, J.V., Roelke, M.E., O'Brien, S.J., Koepfli, K. Frank, L.G., Court, M. In Press. Evolution of a major drug metabolizing enzyme defect in the domestic cat and other Felidae: Phylogenetic timing and the role of hypercarnivory. *PLOS One*.

Hazzah, L. Gudka, M., Dolrenry, S., and Frank, L.G. Submitted. Red in Tooth and Claw: the illegal trade in African lion parts in Kenya.



9. Donors

We would like to thank our 2010 donors:

PRIDE MALES (\$10,000 and above)



Panthera
The Flora Family Foundation
Kaplan Graduate Awards
Defenders of Wildlife
The Arthur Blank Family Foundation
Jonathan Vannini
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