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POPULATION DYNAMICS OF THE AFRICAN LION (Panthera leo L.) WITHIN THE MAASAI MARA REGION OF SOUTHERN KENYA

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Globally many large carnivore species have declined in number and range to be considered threatened or at risk of extinction (e). The lion (*Panthera leo L.*) is the second largest cat species and has been an important cultural icon throughout the Old World for millennia. Lions have been extinct in Europe and most of Asia for centuries, with wild viable populations only remaining in Africa. Despite its conservation flagship status and associated attention aimed at preserving the species, lion populations throughout Africa have precipitously declined from an estimated one million cats to 23,000 today (Bauer & Van Der Merwe 2004). One of the last strongholds of the African lion is in southern Kenya and adjacent Tanzania. On the Kenyan side of the border (40,000 km^2) only an estimated 825 lions remain, concentrated primarily in the Maasai Mara region in the southwest of the country and the Amboseli – Tsavo ecosystem in the southeast (Frank et al. University of California, Berkeley, unpublished data). This landscape is dominated primarily by acacia woodland, interspersed with open plains and riverine woodland and is primarily owned by the Maasai tribe, a pastoral and nomadic people that shares a significant cultural history with lions.

Lion decline in southern Kenya can most likely be attributed to human-wildlife conflict primarily caused by the long history the Maasai tribe shares with this large carnivore. Historically when a lion would prey upon cattle the Maasai would retaliate by killing the problem lion. Lion deaths have increased concomitantly with rapid human and livestock population growth and expansion in recent decades. Declining lion numbers and their increasingly fragmented habitat have prompted numerous organizations, most notably the Mara-Naboisho Lion Project (MNLP), to undertake efforts to protect these large cats by mediating conflict with local Maasai land owners. In addition, MNLP has initiated scientific research that seeks to build a population database of lions in the Maasai Mara region to improve understanding of lion resource use patterns and population dynamics, particularly as they respond to conservation and human and climactic pressures.

Over the past three summers, I have partnered with the MNLP in the collection of data designed to collect baseline population information critical for science-based management and conservation of around 100 individual lions within the Naboisho conservancy of southern Kenya. Naboisho conservancy is approximately 200 km^2 and lies just north of the famous Maasai Mara National reserve. The initial research project for this summer centered on collecting non-invasive genetic hair samples for testing, however due to permitting difficulties with the Kenya Wildlife Service, I was unable to continue with this work. My research for this summer therefore shifted to continuing the initial population dynamic study through both visually monitoring individual

lions and through the use of camera traps that I was able to purchase thanks to the Summer Research Creativity Grant awarded by the University of Kentucky.

Twice a day this summer I lead a team of volunteers, tracking and identifying lions, recording their activity level, social behavior and taking their GPS coordinates. All lions within Naboisho are identified and profiled, through unique whisker spot patterns, ear tear patterns, injuries, age and sex. Using these field marks we were able to separate individual lions from each other. In addition to visually monitoring lions, I also managed grids of 12 camera traps placed in the conservancy at natural funnel points that would force individual lions within those regions to cross in front of the camera. Tracking and monitoring of lions was primarily done through the use of a 4x4 vehicle, but at times tracking on foot was necessary to determine the exact location of individuals. At the end of every week sightings were uploaded onto an excel spreadsheet and GPS coordinates were uploaded to Google earth maps. Through the collection of these data we were able to identify prides, their structures and estimate their home range sizes.

During the course of the past two years many important discoveries were made in Naboisho that were critical for the conservation of this threatened species. In total 59 lion, from 6 different prides, have been identified and profiled within the conservancy. The largest pride is the Enesikiria pride with 31 individuals. This is followed by the Ol Kinyei that we estimate to have anywhere between 20 and 30 lions. Currently only 11 from within this pride have been successfully profiled; however, we have seen this pride at night and confirmed over 20 individuals are present within this region of the conservancy. Four smaller prides of lion inhabit the perimeters of the conservancy and we believe that they are all approximately 10 to 15 lions in size. These prides include the Enoolera pride, the Ilki Sieu Sieu pride, the Molyban pride, and the Emaarti pride. Very few lions from these areas are known and therefore they form the focus of

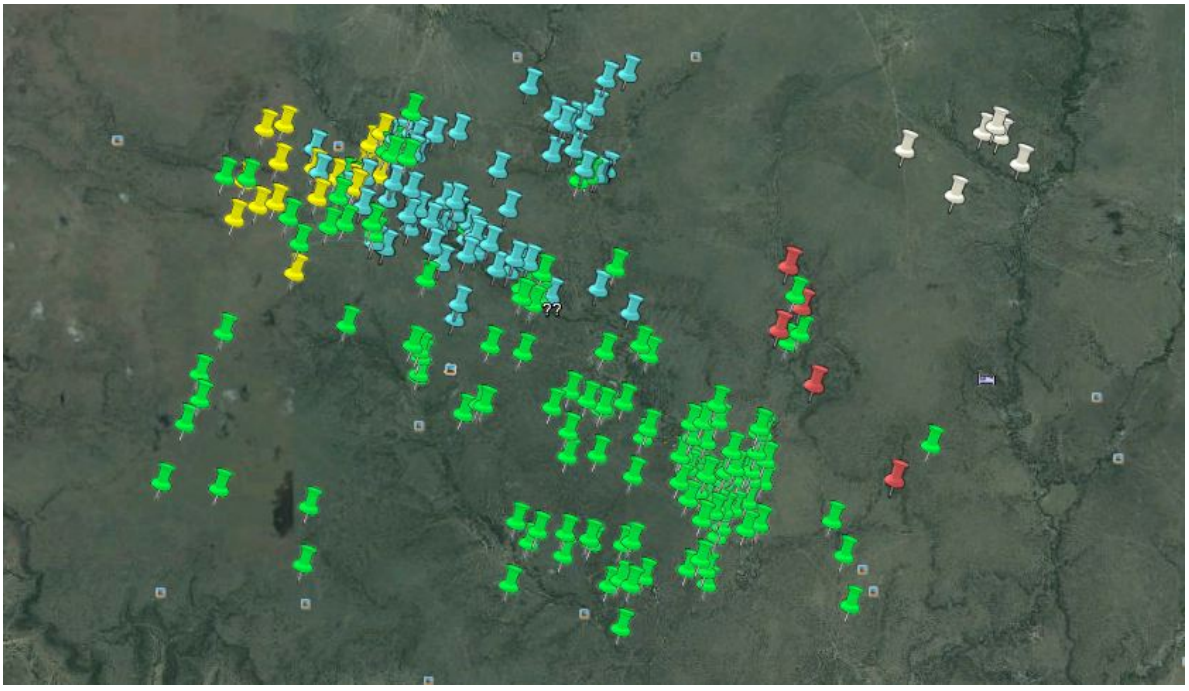

Figure 1 Lion sightings for the past two years within Naboisho Conservancy uploaded to Google Earth. Green pins represent Enesikiria pride, Blue pins - Enoolera Pride, Yellow Pins - Ilki Sieu Sieu pride, White Pins - Ol Kinyei Pride and Red Pins represent unkown individuals.

our research efforts. In addition we also believe there to be another pride, located in the north-eastern parts of the conservancy known as Pardamat. These lions are under tremendous human pressure and locals believe that only four lions remain in this area.

Figure 2 Camera trap picture of an Ilki Sieu Sieu female lion.

A complication with understanding lion home range size is that their territories expand and contract depending on the season and the amount of rainfall that has been received. On arrival in Naboisho this year Kenya had experienced one of its wettest years in recorded history and because of this many of the already profiled lions had completely disappeared from their traditional home ranges. I was tasked this year to track and relocate these missing lions as well as concentrate on completely identifying the Ilki Sieu Sieu pride. In the two and half months that I was able to work in Naboisho my team and I relocated the Enoolera and Enesikiria prides, and through the use of camera traps successfully located 2 adult females lions within the Ilki Sieu Sieu pride. Through these camera traps we were able to concentrate on specific areas with our vehicles, and in late June we were finally able to make visual confirmation and profile these individuals. These findings provided crucial information to conservancy management that aided them in developing better grazing plans for cattle that minimized human wildlife conflict within the conservancy.

Other interesting developments that took place within the lion populations of Naboisho this summer included the arrival of a completely unknown pride of lions into the core home range of the Ensesikira pride. Initially this new pride of 11 lions completely avoided the dominant pride, but in the days before I left they began to interact. Surprisingly, there reactions to one another were not as aggressive as predicted, prompting numerous questions into the relatedness of these individuals. Another interesting behavioral observation that was made this summer was a complete pride swap by two coalitions of males within the conservancy. Essentially the Enoolera pride males and the Enesikiria pride males switched territories and prides. Both of these field observations indicate just how important understanding the population dynamics and the genetics of these lions is to management and conservation.

One of the most challenging aspects of this summer was my inability to work on my initial genetics project. As a result, throughout my time there I began building connections with Kenya Wildlife Service officials and with local leaders. Through these relationships that I have now developed I believe I have an understanding of how to work in the Maasai Mara on lions if funding for graduate school becomes available. The most important aspect of large carnivore research is continuity. The population dynamic studies that are going on now are laying a foundation for future work such as my envisioned genetics project. Through visual observations

that I was able to make this summer I realized that my initial hair sampling ideas would possibly be less efficient than collecting scat from individual known lion through scat collecting transects and through visual observations of lions marking their territories. My hope is that as MNLP continues there work it will open up both research and financial doors for me to come in and do genetic sampling of this lion population. The genetic results from these future studies would build on the existing population dynamic studies and could be used to manage corridors to connect existing populations of lions both within and outside the conservancy. Ultimately if this project could be expanded to include most of the Mara ecosystem a tremendous amount of information could be gathered that would aid in the preservation of this large remaining population of lions.

I would like to thank the Summer Research Creativity Grant for providing me with the opportunity to continue my research in the Mara as well as supporting me in my career ambitions. I would also like to thank Dr. John Cox, my faculty advisor at the University of Kentucky, African Impact, The Mara Naboisho Lion Project and the Naboisho Conservancy Management for supporting me and providing me with a wealth of knowledge that was critical in order for this summer to be considered a success.

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