



# Strengthening Community-Based Conservation in Laisamis, Kenya



Annual Report 2015

## Acknowledgements

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## Introduction

One of the most important yet least protected populations of Grevy's zebra is found in Laisamis, northern Kenya. Laisamis was identified as a high priority area for Grevy's zebra conservation in a landscape planning workshop in 2006 (Didier *et al.*, 2010) and is also highlighted as a focal area for increased conservation effort in Kenya's national Grevy's Zebra Conservation and Management Strategy (KWS, 2012). In addition, a ground survey undertaken in February 2010 to assess the status of Grevy's zebra in the far north of Kenya where the aerial survey could not cover, showed that Grevy's zebra populations as well as those of other large mammals have significantly declined (Low *et al.*, 2010). Some of the key threats affecting the species in Laisamis include poaching, limited access to water during the dry season, lethal mud flats and disease.

The Grevy's Zebra Trust established the Grevy's Zebra Warrior Program in January 2012 as a response to the threats affecting the species in the region. The program was designed with the following objectives: to use community-based wildlife monitoring strategies to understand the Grevy's zebra population status and inform local conservation actions; to secure dry season water access for the species; to reduce the impact of natural disasters such as lethal mud flats; and to raise awareness and engage local communities in conservation.

As part of meeting these objectives, GZT currently employs 10 Warriors from five different communities in Laisamis. The Grevy's Zebra Warriors have been trained to collect data that supports continuous monitoring of Grevy's zebra in Laisamis and also conduct community outreach sessions that enhance conservation awareness within the community.

GZT worked towards the following goals in 2015:

- To increase grass roots conservation awareness among 600 community members and 250 school children
- To secure dry season water access at 10 water points for Grevy's zebra and other wildlife
- To reduce the proportion of wildlife mortality from lethal mud flats to 5%
- To enhance community- based wildlife monitoring through geo-referenced photographic documentation
- To build our knowledge of the Laisamis Grevy's zebra population through stripe-identification surveys

This report outlines the activities accomplished and presents the results of preliminary analyses of the data collected.

## Results

### To increase grass roots conservation awareness among 600 community members and 250 school children

#### Laisamis Community Outreach

Through community outreach, GZT works to raise awareness about Grevy's zebra and conservation issues as well build the capacity of communities to effectively manage their natural resources to benefit both livestock and wildlife. In total, 621 community members were reached through these outreach efforts.

The Grevy's Zebra Warriors conduct their own community outreach meetings and GZT conducts community workshops, and community film nights throughout the Laisamis region. Each outreach activity focuses on increasing knowledge on Grevy's zebra, activities conducted by GZT, and empowering people with the tools to improve their grazing and water management.

Three community outreach sessions were conducted by the Grevy's Zebra Warriors in Laisamis during 2015 in Lkawa, Lependera and Naimarei reaching a total of 110 community members. Of these 16% were elders, 54% were women and 30% were warriors. The main topic of discussion was on grazing plans here the Grevy's Zebra Warriors were helping the community to plan their grazing.

The Laisamis Regional Coordinator also conducted 7 meetings within the region that reached a total of 220 community members. Of those, 53% were elders, 34% were women, 10% were warriors and 3% were local leaders. The main focus of discussion was to raise awareness on the sand dam that GZT constructed in the Laisamis River and the formation of the Water Resource Users Association to govern water use in the Laisamis River.

Our community outreach workshops engage women, elders and warriors within selected partner communities to discuss their conservation challenges and to explore potential community-based solutions. Each workshop lasts four days. One day is dedicated to each group with the fourth day bringing the three groups together. During the days when we have each group present, we draw a problem tree identifying the root causes of problems identified in the community and then discuss what solutions are available and draw a solution tree. We also present a session on holistic planned grazing and then cover Grevy's zebra facts and GZT activities, with emphasis on the work of the Grevy's Zebra Warriors.

The fourth workshop, consisting of three elected warriors, elders and women making up a Core Group, focuses on feedback from the community, planning for practical conservation activities, and suggestions of how to mobilize their community for conservation.

In Laisamis during 2015, two community outreach workshops were conducted reaching 291 community members of which 98 were elders, 118 were women and 75 were Warriors. Each workshop elected a Core Group to take forward the resolutions identified in their Community Action Plans (Table 1). GZT provides follow up to these Core Groups to support them in implementing their Community Action Plans. In addition, four films nights were held during the community workshops.

*Table 1: Activities identified by each core group in Laisamis to address conservation issues*

<b>Kamatonyi</b>	<b>Laisamis Town</b>
<ul style="list-style-type: none"><li>• Designation of dry season grazing areas</li><li>• Create awareness on grazing plans</li><li>• Inclusion of warriors in monitoring implementation of grazing plans</li></ul>	<ul style="list-style-type: none"><li>• Enforcement and dissemination of dry season grazing areas with support from Melako Conservancy</li></ul>

- Formation of an environmental committee
- Exposure tour to learn about land rehabilitation and planned grazing
- Clear the invasive *Acacia reficiens*

- Invite immigrant grazers to live in Laisamis villages so that they stay in line with grazing rules
- Disseminate workshop information
- Elders to take more responsibility in managing land degradation
- Involve women in community meetings
- Target communities that violate grazing rules



Community film night



Rikapo, a GZT Regional Coordinator addresses women participants during a community outreach workshop in Laisamis

### Laisamis School Outreach

GZT's school outreach program in Laisamis aimed to complete two interactive visits to educate and enhance ownership of Grevy's zebra with young children in three schools. A total of 223 children were reached including 117 boys and 106 girls. The curriculum included a theoretical session where posters were used to illustrate and depict Grevy's zebra facts and conservation status, give a background to GZT activities and the ways in which students can participate in conservation. Practical sessions utilised temporary Grevy's zebra tattoos and thumb printing on 'Citizen for Conservation' cards that mimic the Kenyan National ID card. These activities provided visuals that could be shared with family and community members, increasing the conservation awareness platform. A set of three posters has been left at each of the schools visited to encourage continued learning and increase awareness for all the school's visitors.



*Citizen for Conservation card*



*Grevy's zebra temporary tattoo*

Two schools in Laisamis and Wamba completed a preliminary survey during the first school visit. A total of 210 students were surveyed, of which 44% were female; no significant difference was detected between male and female students during preliminary analysis. The low levels of awareness regarding Grevy's zebra conservation status is evident in their responses to question 1 (Table 2) where 56% of students said Grevy's zebra were not endangered. Despite their low awareness levels, the majority of students demonstrated positive attitudes towards Grevy's zebra, coexistence and conservation. The majority of students did not believe that wildlife causes conflict in their community, however 32% said they do; this may be a result of where the students are from and their direct interactions with wildlife.

*Table 2: Preliminary school outreach survey results*

Question	No	No Idea	Yes
1. Are Grevy's zebra endangered?	56%	8%	36%
2. Is it important to you to have Grevy's zebra in your community?	10%	3%	87%
3. Can wildlife and livestock coexist peacefully in your community?	30%	5%	64%
4. Do you think conservation only benefits wildlife?	59%	12%	29%
5. Does wildlife cause conflict in your community?	59%	9%	32%

The preliminary surveys highlighted the low awareness level but confirmed the potential to increase support based on their positive attitudes towards conservation and Grevy's zebra as a species.

As part of the school outreach program, five children from Laisamis that won a creative art and writing competitions joined other school competition winners from the Wamba and El Barta regions for a four-day safari to GZT's Field Camp in Westgate Conservancy in December 2015.



*Students from Laisamis, Wamba and El Barta say goodbye after a three-day visit to learn about Grevy's zebra and their conservation*

In addition to enhancing the conservation messages spread during the school visits, the safari also aimed to demonstrate the realities of wildlife conservation on the ground through observing various approaches towards wildlife conservation, interacting directly with key conservation actors operating on the ground, and understanding the challenges involved in wildlife conservation and the opportunities and benefits that wildlife conservation brings to communities. As insecurity and conflict are negatively affecting wildlife populations in many regions, the trip also provided a unique opportunity for children from different communities and tribes to come together and appreciate each other for their differences rather than see their differences as an opportunity for conflict.

### [To secure dry season water access at 10 water points for Grevy's zebra and other wildlife](#)

Within GZT's strategic plan, there are five conservation targets: Grevy's Zebra, Rangelands, Ewaso River, Laisamis River, and Luggas, Streams and Wells. Water availability and access within the Laisamis River target is critical for the survival of the Grevy's zebra population.

In 2015, GZT focused its resources on managing three key water points for Grevy's zebra in Laisamis. It also managed two other water points outside the Laisamis Region for a total of 5. GZT provided fuel to pump water for both the Manyatta Lengima wildlife trough and Melako Conservancy's Nchoro wildlife water pan. We also ensured continuous access to water in the Laisamis River, during the dry season. GZT monitored these three key water points using camera traps to assess trends in their use by Grevy's zebra and other wildlife. The results are reported under the scientific goal of building our knowledge on the Grevy's zebra population through stripe-identification surveys.

Based on two years of camera-trap monitoring and community feedback, GZT built a sand dam and a wildlife dedicated water trough at Laisamis River in August and September 2015 in order to increase water availability for Grevy's zebra and other wildlife.



*Building the sand dam wall*



*Finished sand dam wall*



*Building the wildlife well*



*Finished wildlife well*



*Sand dam during the November 2015 rains*



*Completed wildlife trough 450m from the river*

A water pan at the trough is pending construction which will ensure availability of water to smaller wildlife species, including sand grouse which are one of Melako Conservancy's famous attractions.



### To reduce the proportion of wildlife mortality from lethal mud flats to 5%

In order to reduce the threat of lethal mud deposits that form along the Milgis River as a result of upstream rainfall, four community members make up the Grevy's Zebra Mud Rescue Patrol Team which is mobilised during high risk months. In 2015, due to the ongoing drought, the Milgis River was not a threat until the rains broke in November. The Mud Rescue Team was therefore deployed in November and December but thankfully no incidents occurred. The team is equipped with a GPS camera and therefore records its patrols so that we can verify their patrol location and importantly any rescue cases.

### To enhance community-based wildlife monitoring through geo-referenced photographic documentation

The Grevy's Zebra Warriors collect demographic and ecological data on Grevy's zebra on picture-based data sheets. In addition, a new monitoring tool using GPS cameras was introduced in 2015. This enables us to verify their sightings, and empowers the Warriors to record their work as well as their daily life.

Monitoring by the Warriors has been carried out since 2012 in their home areas of Kamatonyi, Korr, Lependera, Logologo and Naimarei. During the dry season, the Grevy's zebra disperse to the lava plateaus, and there are very few Grevy's zebra left in these five locations, especially Korr, Naimarei and Lependera, due to limited water and heavily degraded rangeland. In response to the shifting distribution pattern of the zebras and to verify this dispersal and get a more complete picture of the Laisamis Grevy's zebra population, GZT has extended its Warriors' patrol areas to include this dry season range.

To support the patrols in these remote and isolated lava plateaus which are only accessible on foot, we use camels to carry camping equipment and food supplies. In addition to monitoring the zebras, the Warriors also use their position as respected members of their communities to engage people in conservation activities and to raise awareness.

During the regular patrols in their home areas from January to August, the Warriors recorded 1,255 Grevy's zebra sightings. However, in just over one month of camel patrols on the plateaus, the Warriors recorded 625 Grevy's zebra sightings, half of the total captured in the previous 8 months. During the camel patrols, the Warriors took 5,955 geo-referenced images of Grevy's zebra, other wildlife, landscapes and their activities while on patrol.

The evolution of the Warrior program to include GPS cameras and expand the patrols using a mobile camel unit has strengthened the Grevy's zebra monitoring program in the Laisamis region. The Warriors' camera results provide vital additional information to the demographic and ecological data as the records are verifiable. The results of their camera data are discussed in detail in the Warrior Workshop section below. The combination of monitoring both wet and dry season range of Grevy's zebra will provide a more complete picture of how the population uses resources in the region.

In addition to the valuable ecological data from the GPS cameras, we also get an otherwise unobtainable insight into the daily lives of the Warriors. This photographic documentary of their work and lives has inspired a collaboration with Kenyan professional photographer Mia Collis on a project called ZEBRA PEOPLE, which exhibits portraits of the Warriors themselves by Mia and prints of their own photographic work. Proceeds from exhibition sales will be used to invest in further exposure and training for the Grevy's Zebra Warriors.



*This picture was taken by Lolomongoi, one of the 10 Grevy's Zebra Warriors. Petro, who is walking beside the camel said of the picture, "Harugurah was talking to the other Warriors in the group. I was telling Harugurah to stop talking to other people and talk to the camel instead".*

### Results of Grevy's Zebra Trust Warrior Workshop 2015

In 2015, the Grevy's Zebra Warrior workshop was held at GZT's Field Camp Conservancy on 11<sup>th</sup> and 12<sup>th</sup> November, facilitated by GZT staff. Westgate Community Conservancy and Ewaso Lions also attended the workshop.



*The Laisamis Regional Coordinator, Joel Loongo'nyo, addresses the Warriors during the workshop*

## Workshop Objectives

- Review and discuss results of Warriors' Grevy's zebra monitoring
- Review and discuss results of Warriors' camel patrols and camera results
- Review and discuss results of the Laisamis joint patrols
- Review and discuss results of community outreach activities
- Review and discuss Grevy's zebra mortality in 2015
- Review and discuss Laisamis River water management

## Data Collection

Data is collected in five key locations in Laisamis including Kamatonyi, Korr, Lependera, Logologo and Naimarei. In the past, two Warriors jointly patrolled each of these locations throughout the year. However, in September 2015, the Grevy's Zebra Warrior Program expanded its monitoring range to include the Rusarus and Sengereruwa plateaus. Due to the remoteness and long distances required to monitor within the plateaus, the Warriors use camels to access the area. From camp sites that are established within the plateau, groups composed of two Warriors each disperse to three different localities and collect data on Grevy's zebra in these respective locations.



*Grevy's Zebra Warrior monitoring locations in the wet season (blue boxes) and the dry season (orange box)*

The information the Warriors collect during their patrols includes data on Grevy's zebra numbers, age and reproductive status (demographic data) and Grevy's zebra associations with different types of habitat, wildlife, livestock and settlements. The Warriors record all this information for every Grevy's zebra observed and geo-reference all their observations using GPS units.

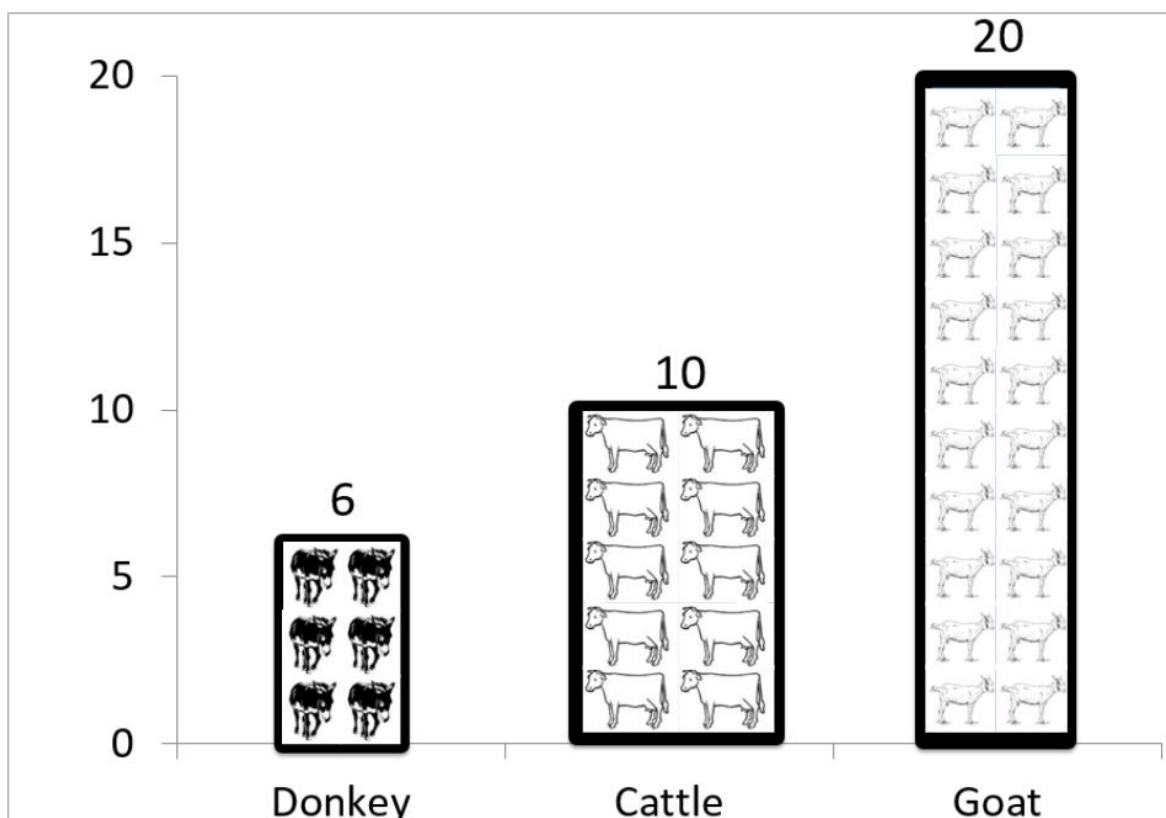
## Results and Discussion

The results presented are based on 1) an analysis of the Grevy's Zebra Warrior monitoring in the five key locations (Kamatonyi, Korr, Lependera, Logologo and Naimareii) from January to August 2015; and 2) the Sengereruwa and Rusarus plateaus which were monitored through the camel patrols during September and October 2015.

The discussion of the results is based on peer reviewed literature as well as opinions and feedback from the Grevy's Zebra Warriors, the GZT management and partners that were present during the workshop.

### Presenting the results to the Warriors

The majority of the results were presented in graph form. A short presentation on how to read and understand graphs was given to address the varying literacy levels between the Warriors and ensure the presentation of results would be understood by everyone.

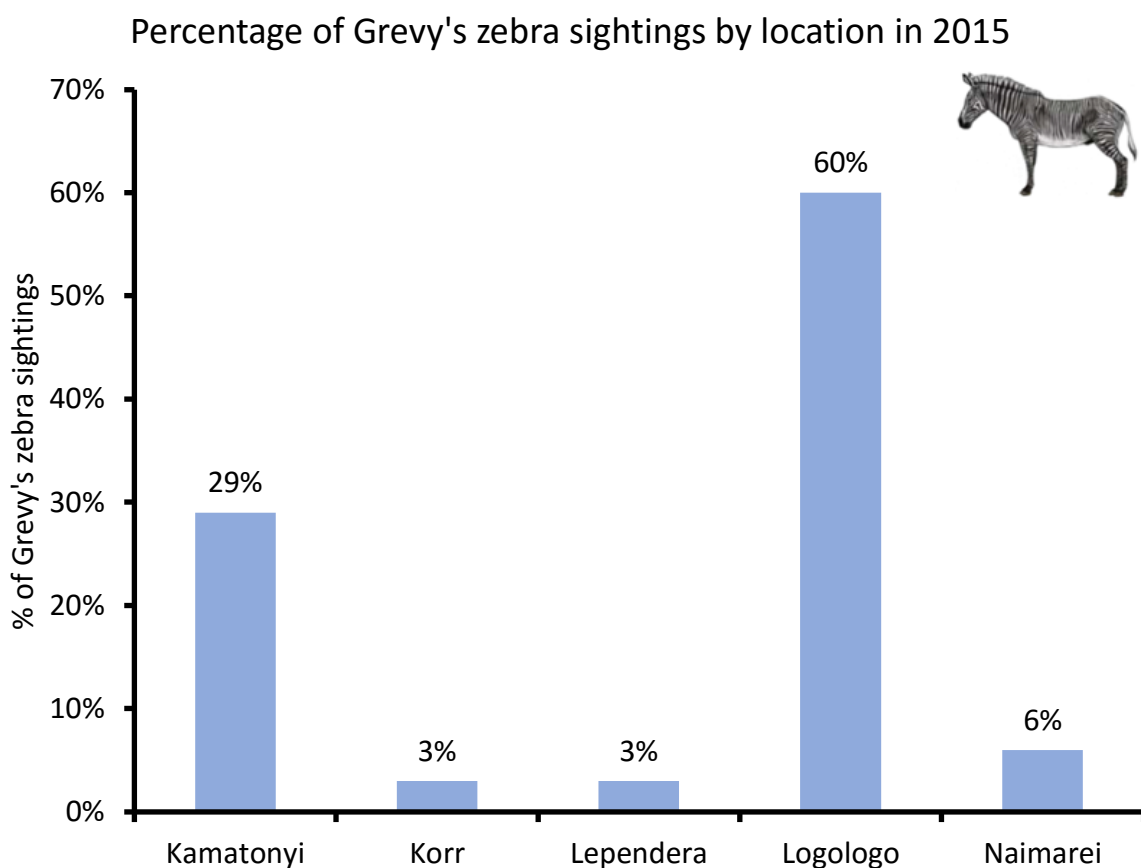


*Figure 1. One of a series of graphs that simplify the process of what graphs illustrate.*

Figure 1 is part of a series of graphs that demonstrated the process of data collection through to graph development. Through an interactive discussion on graphs, this process was a useful tool both in determining the levels of understanding of the Warriors in interpreting graphs and addressing the gaps using a variable (domestic livestock) that the Warriors can easily relate to. The Warriors found this to be a useful tool for understanding how graphs represent and condense results.

## Grevy's Zebra Demography and Herd Size

Understanding Grevy's zebra sub populations plays a key role in understanding the population as a whole. This is also vital information that informs management strategies at all habitat scales that the species occupies. Grevy's zebra is one example of many sets of fission-fusion species and populations (Sundaresan *et al*, 2007) and it can be challenging to characterise populations that utilise this type of behavioural mechanism. For such fission-fusion species, conditions at local scales play a significant role in the viability of a species. Factors such as increasing isolation for example, through habitat fragmentation and degradation can affect population genetic variation which can have a devastating impact on a species whose population is already very low. In addition, determining conservation management plans for a species and deciding how to meet them needs to be informed by a diversity of local conditions (Low *et al*, 2009). Thus, understanding the population of Grevy's zebra in the various locations in Laisamis will provide key information to further understand the population as a whole in the region.



*Figure 2. The percentage of Grevy's zebra sightings by location in 2015*

Logologo, with 60%, had the highest number of Grevy's zebra sightings in comparison to the other locations (Figure 2). Kamatonyi, with the next highest number of sightings at 29% is significantly lower than Logologo. Korr and Lependera had the fewest number of sightings with 3% each. This trend is similar to other years, although there is a high variation of the number of sightings in Kamatonyi across years.

The Warriors highlighted that Korr and Lependera have low abundances of Grevy's zebra and sightings in these locations have been continuously low. They attributed this to scarce water and pasture availability and especially due to lack of rains in 2015. The low number of sightings of

Grevy's zebra in Naimarei was also attributed to limited rains however the presence of dams that provide a permanent water source for the species attracted some Grevy's zebra to the area and accounted for the higher abundances in the locality compared to Korr and Lependera. The rains were more much more abundant in Logologo and this resulted in a higher Grevy's zebra presence in the area compared to other locations.

To further understand the population dynamics of Grevy's zebra in each of the locations, the percentage of sightings (i.e. sightings of each individual) was plotted against the percentage of encounters (i.e. encounter with the species) to give an indication of the herd size and composition of Grevy's zebra in each of these locations.

Percentage of Grevy's zebra encounters and sightings by location in 2015

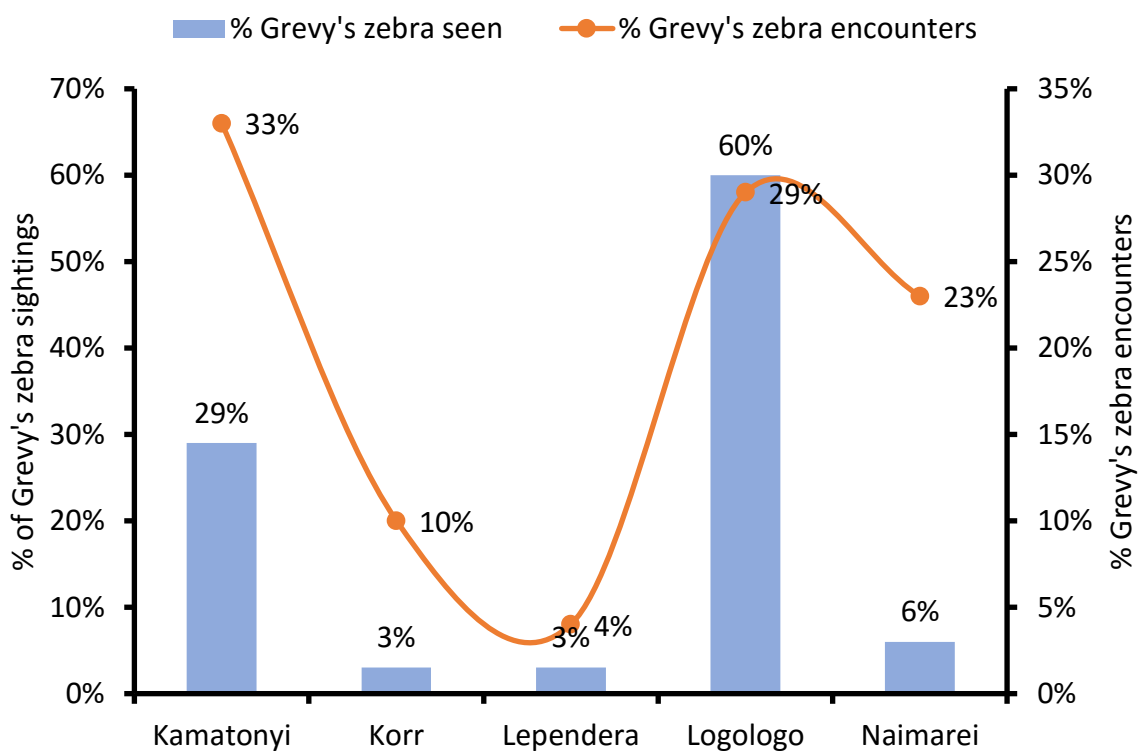
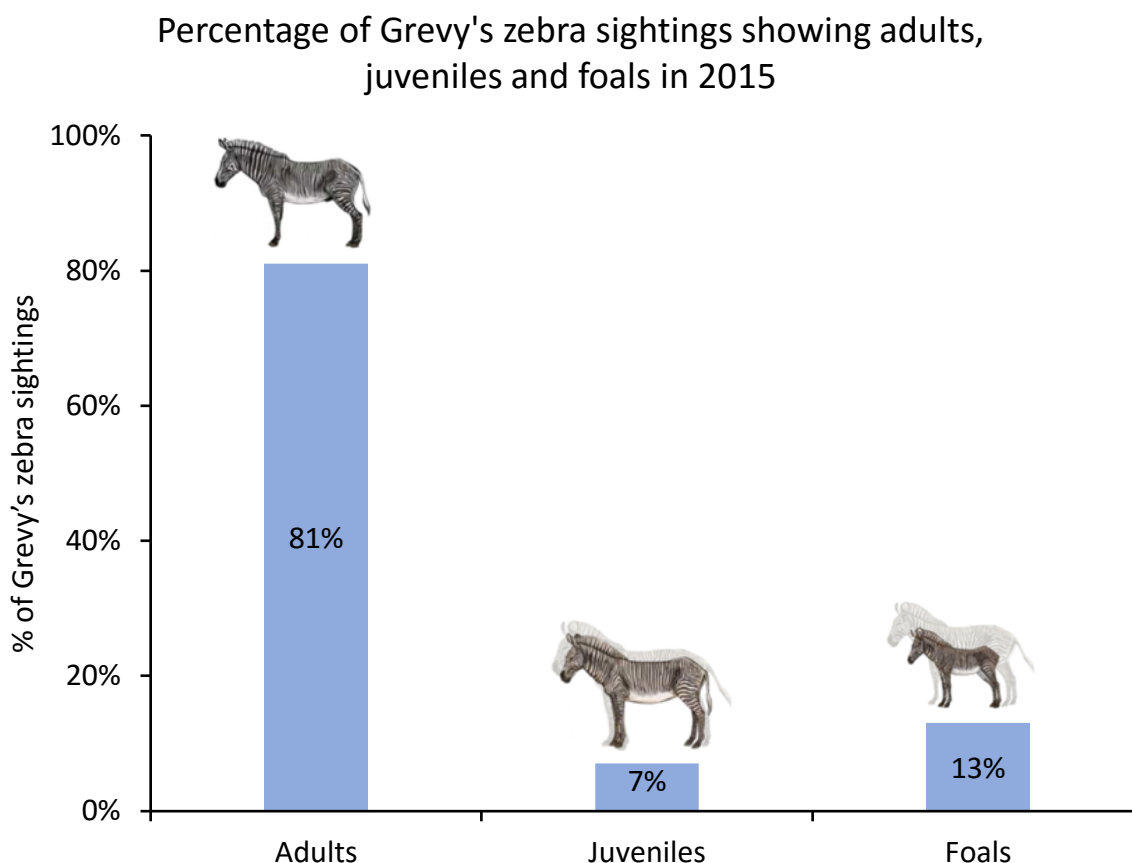


Figure 3. The percentage of Grevy's zebra sightings and encounters by location in 2015

The rate of Grevy's zebra encounters is highest in Kamatonyi, Logologo and to a lesser degree, Naimarei (Figure 3). However, only in Logologo is the encounter rate proportionally similar to the percentage of sightings. This may indicate that herd sizes are much larger in Logologo. Another reason for the variations observed between encounter rate and sightings may be due to dynamics within reproductive classes in these areas; territorial males may occupy areas where the Grevy's zebra encounter rate is high and the total number of sightings is low. The Warriors found these results to be a true representation of their observations on the ground. In Naimarei, the Warriors have observed that territorial males are the dominant reproductive class in the area with only small groups passing through Naimarei to access the dams it contains. The low Grevy's zebra encounter rate and Grevy's zebra sightings in Korr was attributed to lack of water in Korr itself and also within its vicinity.

### Grevy's Zebra Age Structure

The health of the Grevy's zebra population as a whole can be determined by its demographic structure which can help to determine the population's potential for growth. A healthy age structure is one where juveniles and foals account for at least 25% of the population.



*Figure 4. The percentage of Grevy's zebra sightings by age class in 2015*

In 2015, approximately 80% of total Grevy's zebra sightings in the five key locations combined were composed of adults (Figure 4). The combined juvenile and foal population, 7% and 13% respectively, was 20%. This result suggests that the health of the Laisamis population is below ideal. The Warriors felt that the results were not a true indication of the reality on the ground as there is a difficulty in differentiating between juveniles and adults, and between 6-12 month foals and juveniles. Ageing Grevy's zebra will therefore be a core component of training in 2016. Age structure recorded from camera-trap images and the Warriors' photographs will also be analysed so that we can compare them with the results of the Warriors' data and get a better insight into the demographics of the population and the extent to which there may be error in recording foal and juvenile age classes.

In addition, this analysis only covers from January to August 2015 and does not include October and November which are months during which there is usually a peak in foaling which coincides with the rains. Results presented in the camel patrol section for the month of October, how the demographic structure to be healthier, which may have been a result of births as well as preferable forage for lactating females in the plateaus.

Percentage of Grevy's zebra sightings by reproductive class in 2015

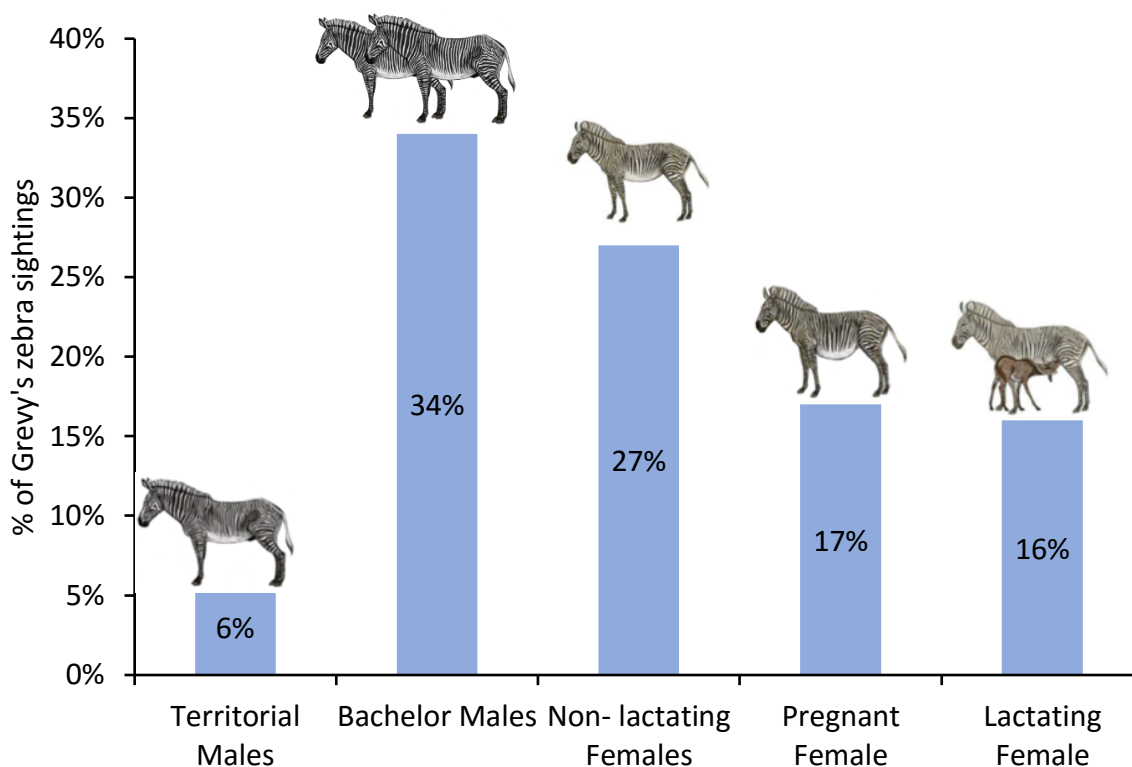


Figure 5. Percentage of Grevy's zebra sightings by reproductive class as a proportion of the whole adult population

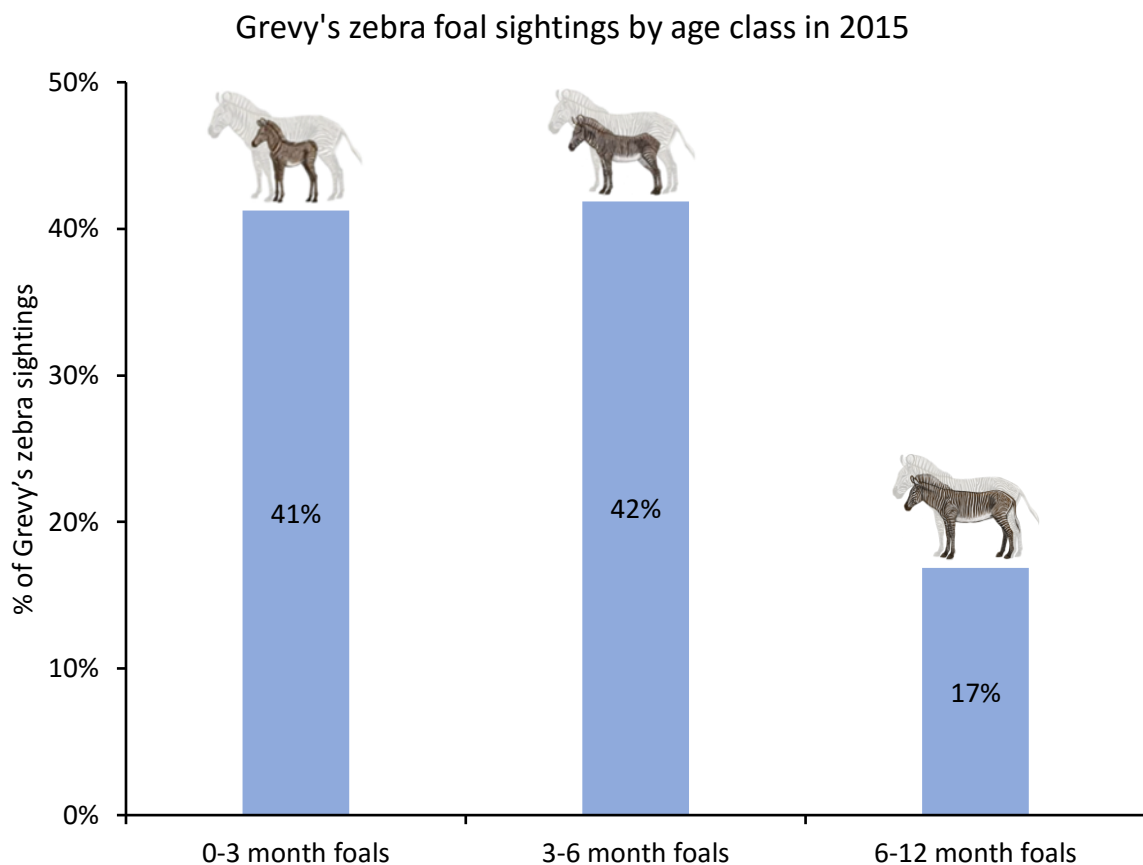
The highest percentage of sightings were of bachelor males with 34% followed by non-lactating females at 27%. Pregnant and lactating females made up 17% and 16% of the total adult Grevy's zebra sightings respectively. In the equid family, a 50% breeding value in the adult female age class is healthy. This value is exceeded (55%) in the results presented in Figure 5 above. Territorial males had the lowest number of sightings at 6% and were seen predominantly in Naimarei and Kamatonyi (Table 3). This is to be expected as only the most successful males in the population become territorial males.

Table 3. Percentage of Grevy's zebra sightings per reproductive class in each location in 2015

Location	Territorial Males	Bachelor Males	Non-lactating Females	Pregnant Females	Lactating Females
Kamatonyi	30%	17%	16%	26%	43%
Korr	13%	2%	2%	4%	3%
Lependera	2%	3%	3%	2%	2%
Logologo	19%	76%	76%	67%	43%
Naimarei	38%	2%	3%	2%	9%



Table 3 shows that Kamatonyi and Logologo are important areas for lactating females (highlighted in orange). The results also support the assumption that territorial males occupy areas where the encounter rate is high and the total number of sightings is low as illustrated by Figure 3 where Naimarei and Kamatonyi had some of the highest numbers of Grevy's zebra encounters and much lower Grevy's zebra sightings compared to Logologo. Despite the relatively similar encounter rate in Naimarei and Kamatonyi, the latter had a higher number of Grevy's zebra sightings suggesting that the herd size of Grevy's zebra was higher in Kamatonyi. Table 3 also supports this hypothesis as the percentage of sightings of each reproductive class, except for territorial males, was much higher in Kamatonyi compared to Naimarei.






*Figure 6. Percentage of Grevy's zebra foal sightings in all locations in 2015*

Foal sightings made up 13 % of the whole Grevy's zebra population in 2015. As a proportion of all the foals sighted, the 0-3 and 3-6 age month age category made up a similar percentage of total foal sightings with 41% and 42% respectively (Figure 6). The 6-12 age month category had the lowest number of sightings at 17%. In 2014 there was a more even distribution across the foal age categories.

Table 4 (below) illustrates the distribution of foals across the five locations.

*Table 4. Percentage of Grevy's zebra foal sightings by age class in each location in 2015*

Location	0-3 months 	3-6 months 	6-12 months 
Kamatonyi	29%	48%	67%
Korr	2%	4%	0%
Lependera	0%	3%	4%
Logologo	58%	39%	19%
Naimarei	12%	6%	11%

Korr had the lowest percentages of all the different age classes of foals with no 6-12 month foals sighted during 2015. This was followed by Lependera which had no 0-3 month foals sighted during 2015. Kamatonyi was well represented by all the different age categories of foals. With 58% of the 0-3-month foal category, Logologo appears to be a breeding hotspot for females (orange shading), which is also supported by previous years' data.

Average herd size by location in 2015

*Table 5. Mean herd size of Grevy's zebra in all locations in 2015*






Logologo (19) 
Kamatonyi (8) 
Lependera (5) 
Korr (2) 
Naimarei (2) 

Table 5 further supports the assumptions made based on Figure 3. Logologo, with 19 individuals on average per herd, surpassed all other locations. Logologo has productive grasslands which are favoured by Grevy's zebra and other wildlife and is therefore an important focal area for their conservation. As suggested by Figure 3 and Table 3 above, Naimarei, with two individuals on average, had a very low herd size. Korr, with two individuals on average, also had a very low herd size however, in contrast to Naimarei, the encounters and sightings of Grevy's zebra in the area are also very low (Figure 3 and Table 3 above) indicating that the area is not favourable for Grevy's zebra possibly due to a lack of resources or due to an increasing human and livestock presence. The overall herd size for the combined locations in 2015 was nine. These results are similar to previous years.

### Grevy's Zebra Sex Ratio

Determining the sex ratio within Grevy's zebra populations is important as this gives an indication of the population's potential for growth. Within Grevy's zebra demographics, a 1:3 ratio of males to females is considered to be very healthy and would enable the population to grow if other threats to the species are removed.

*Table 6. Male to female sex ratio of Grevy's zebra in Laisamis*

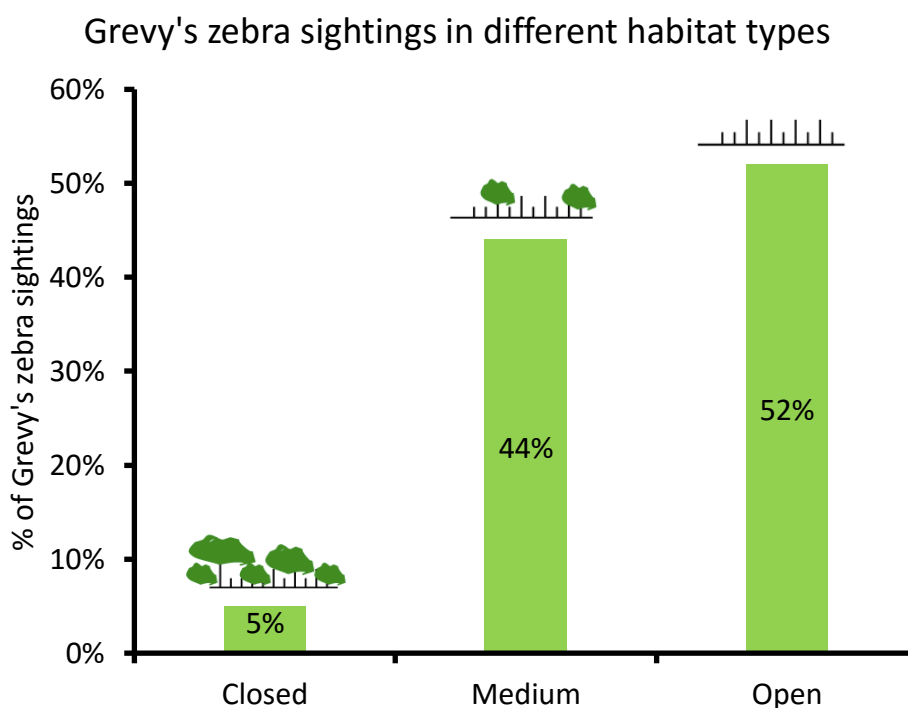
Location	Sex Ratio in 2015
Kamatonyi	1:2
Korr	1:1
Lependera	1:1
Logologo	1:1
Naimarei	1:1

When the sex ratio of males to females was estimated for each of the locations in 2015, all locations apart from Kamatonyi had a male to female ratio of 1:1, with the latter having a 1:2 sex ratio. These results suggest limited growth potential. Additional resources should therefore be investing in securing grazing and water resources for females to ensure optimum breeding conditions in the region.

### Grevy's zebra sightings in relation to habitat type, water and settlements

#### Grevy's Zebra and Habitat type

The density and area of occupancy of Grevy's zebra fluctuates seasonally as animals move in search of resources. Characterising habitat type is important to understand how the species utilises space and the habitats the species relies on. This is vital for prioritising conservation management plans.









*Figure 7. The percentage of Grevy's zebra in three different habitat types*

The majority of Grevy's zebra sightings were associated with the open habitat type (52%) followed closely by the medium habitat type (44%). At 5%, the closed habitat type had the fewest Grevy's zebra sightings associated with it. These results are very different to 2014 where only 19% of Grevy's zebra were seen in open habitat. 2014 was a drier year than 2015 and the Warriors explained that Grevy's zebra had gone into more bushy areas during 2014 because of the scarce grazing resources available.

The different reproductive classes were represented relatively equally as a proportion of their total population within the closed habitat type, ranging from 5% of bachelor males, pregnant and lactating females and 3% of territorial males and non-lactating females (Table 7).

*Table 7. The percentage of Grevy's zebra by reproductive class in three different habitat types*

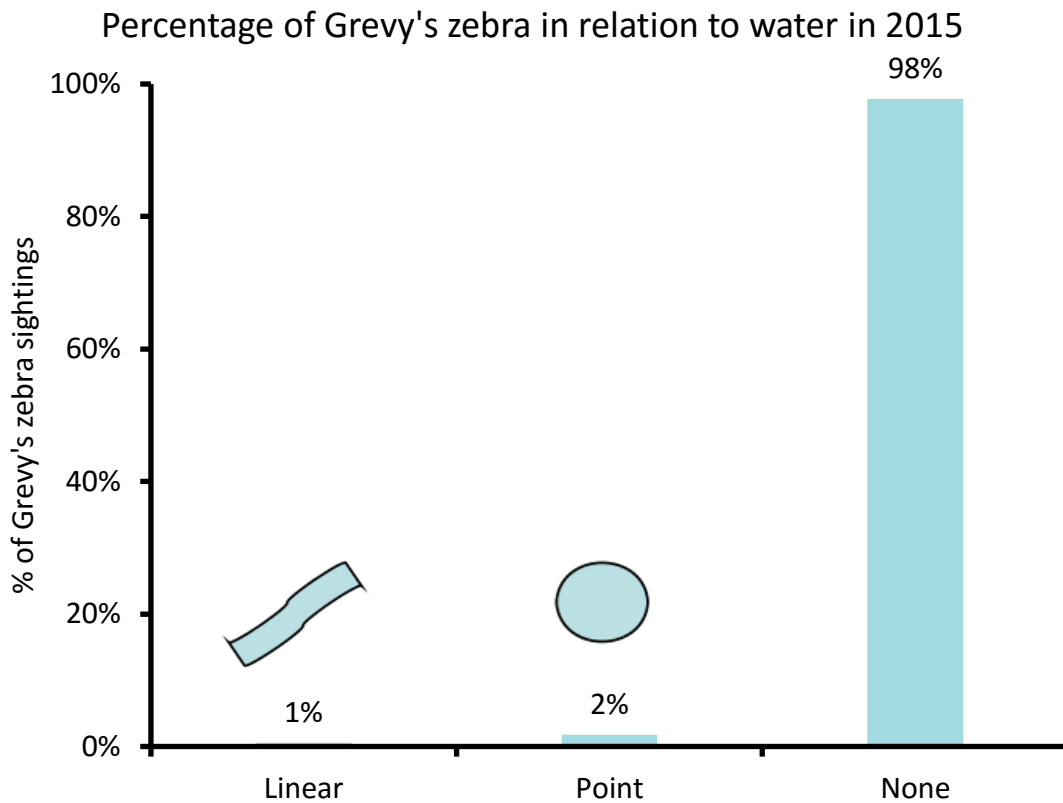
Habitat	Territorial Males 	Bachelor Males 	Non-lactating Females 	Pregnant Females 	Lactating Females 	Juveniles 
Closed	3%	5%	3%	5%	5%	7%
Medium	75%	30%	31%	36%	58%	68%
Open	22%	64%	66%	58%	37%	25%

Previous research (e.g. Sundaresan *et al*, 2007) has found that open habitats offer increased forage quantity, rather than forage quality, and may be used by territorial males and non-lactating females as a tactic for gaining weight. However, Sundaresan's study was done in Laikipia, which has significantly higher rainfall than Laisamis. While the distribution of non-lactating females in Laisamis supports these findings, the association of territorial males with more closed habitat is probably explained by the fact that they do not move even during severe dry seasons and therefore do not take advantage of grass productivity in open grasslands outside their territory following rainfall.

The proportion of lactating females using the medium habitat type was higher than other female classes (58% compared to 36% of pregnant females and 31% of non-lactating females). These findings are further supported by Sundaresan *et al*, 2007, who found that lactating females seek out better forage quality at the cost of forage quantity that is found in medium habitat types compared to the open habitat type. Thus, reproductive status shapes associations and movements, and a range of vegetation characteristics are required to support the different reproductive classes.

### Grevy's Zebra and Water

Previous research has suggested that the various reproductive classes of Grevy's zebra utilise and require water resources at varying levels. Past studies have shown that the degree of the lactation burden strongly influences water and energy needs of females. Lactating females can only tolerate one to two days away from water. Grevy's zebra range in northern Kenya falls in arid to semi-arid habitat with limited permanent water sources. People and livestock also share these same resources and during times of environmental stress, such as droughts, the pressure on the available water increases. One of the main threats to Grevy's zebra is limited access to water. Understanding how and when Grevy's zebra use water sources plays a key role in informing management actions as the resource is vital for their survival.

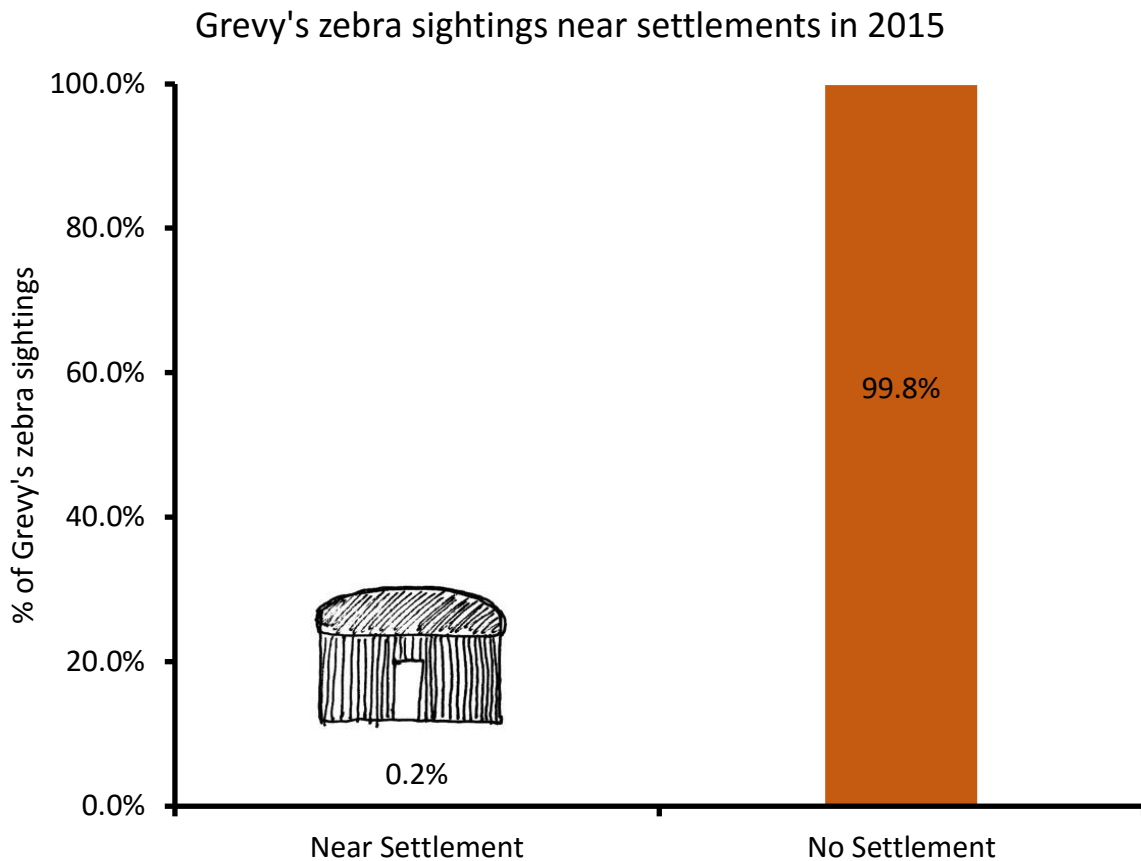


*Figure 8. Percentage of Grevy's zebra sightings within 100 m of water*

As shown by previous years, the majority of Grevy's zebra (98%) were seen away from water sources with only 1% and 2% observed near linear and point water sources respectively. A key reason for this is because Grevy's zebra visit water sources at night and therefore are rarely seen by the Warriors near water during the day. Accessing water sources at night is contrary to Grevy's zebra normal behavioural patterns and is likely to be a response resulting from human and livestock disturbance and competition during day time hours. These findings were confirmed by the Warriors as being a true representation of their observations on the ground.

#### Grevy's Zebra and Settlements

Human activities have been found to be an important factor affecting Grevy's zebra distribution and space use. Grevy's zebra inhabit regions in northern Kenya that are populated by pastoralist tribes. Grevy's zebra compete for critical resources with pastoral people and their livestock (Williams 2002). Relatively high densities of domestic livestock species that compete with Grevy's zebra for resources such as pasture and water alters Grevy's zebra space use in that Grevy's zebra may avoid these areas due to potential competition with livestock and disturbance from humans.



*Figure 9. The percentage of Grevy's zebra observed within 100 m of settlements in 2015*

Sightings near settlements only occurred around Naimarei and included only territorial males. Grevy's zebra may require areas free from competition or disturbance from livestock (Sundaresan *et al*, 2007) and humans (Williams, 2002), supporting the results found herein. The number of Grevy's zebra sightings near settlements represent a negligible percent of the total number of sightings. Thus, disturbance and competition posed by humans and domestic livestock may be a deterrent for Grevy's zebra in areas they would normally inhabit. Furthermore, areas around settlement are more likely to be degraded with little forage available.

#### Grevy's Zebra and Livestock

The majority of Grevy's zebra sightings did not occur near or with livestock (Figure 10). In cases where they were observed near livestock, the majority of sightings were with cattle (35%). Small stock also represented a comparatively high percentage of livestock observed with Grevy's zebra. The composition of livestock observed near Grevy's zebra in 2014 was different with 30% of sightings seen near small stock. This is likely to be because 2014 was a drier year forcing cattle to migrate in search of better pasture.

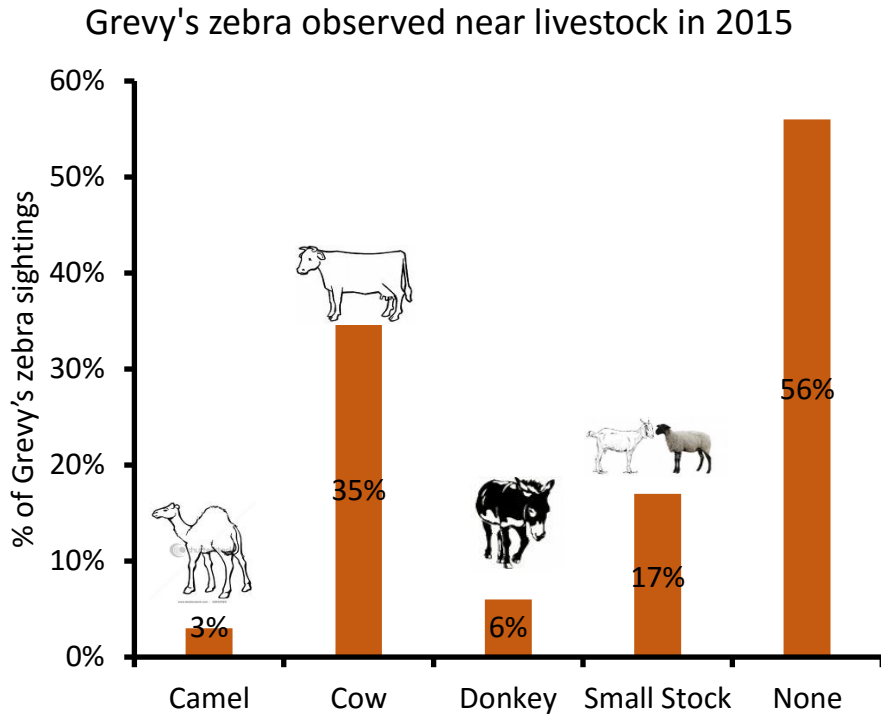


Figure 10. The percentage of Grevy's zebra seen near different categories of domestic livestock in 2015

#### Grevy's Zebra and Other Wildlife

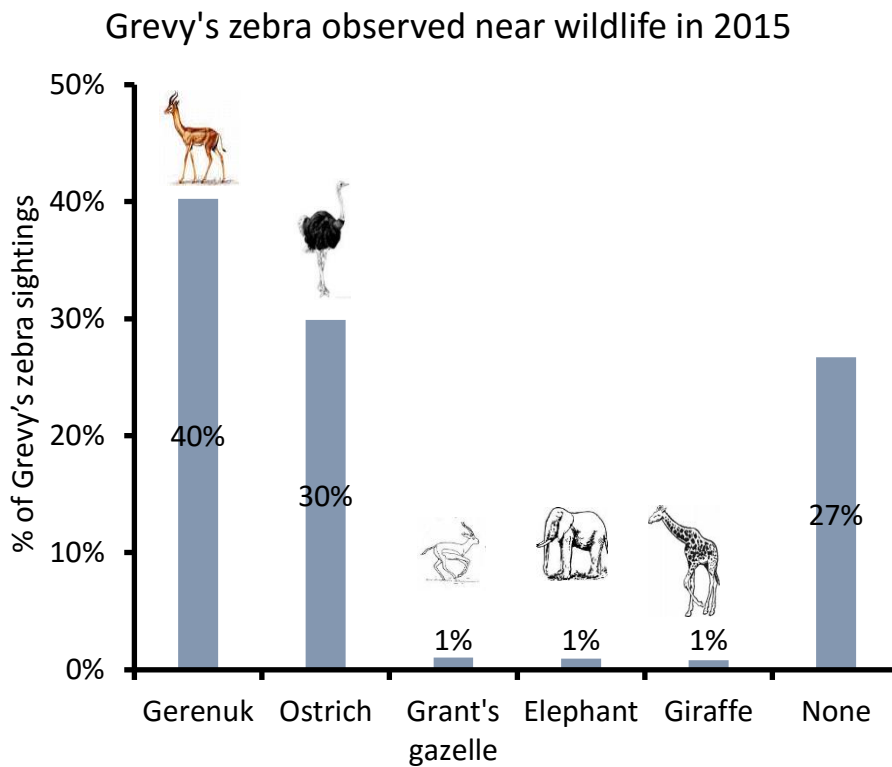


Figure 11. The percentage of Grevy's zebra seen within 100 m of other wildlife in 2015

Gerenuk and ostrich were seen most with Grevy's zebra in the five key locations in Laisamis in 2015. This was the same trend observed in 2014. Although occupying the same habitat, these species occupy different niches thus enabling them to cohabit the same areas. Of interest was that in 2015 Grevy's zebra were not observed near oryx or impala which were recorded in 2014 as 7% and 2% of sightings respectively. No elephants were observed near Grevy's zebra in 2014.

When the different reproductive classes and their associations with other wildlife are examined, non-lactating females, bachelor males and pregnant females had the highest number of associations at 68%, 64% and 62% respectively. Territorial males had the fewest associations at 19% and this is likely due to the fact that territorial males are proportionally low in Grevy's zebra populations (Figure 5).

## Warrior Camel Patrols Results

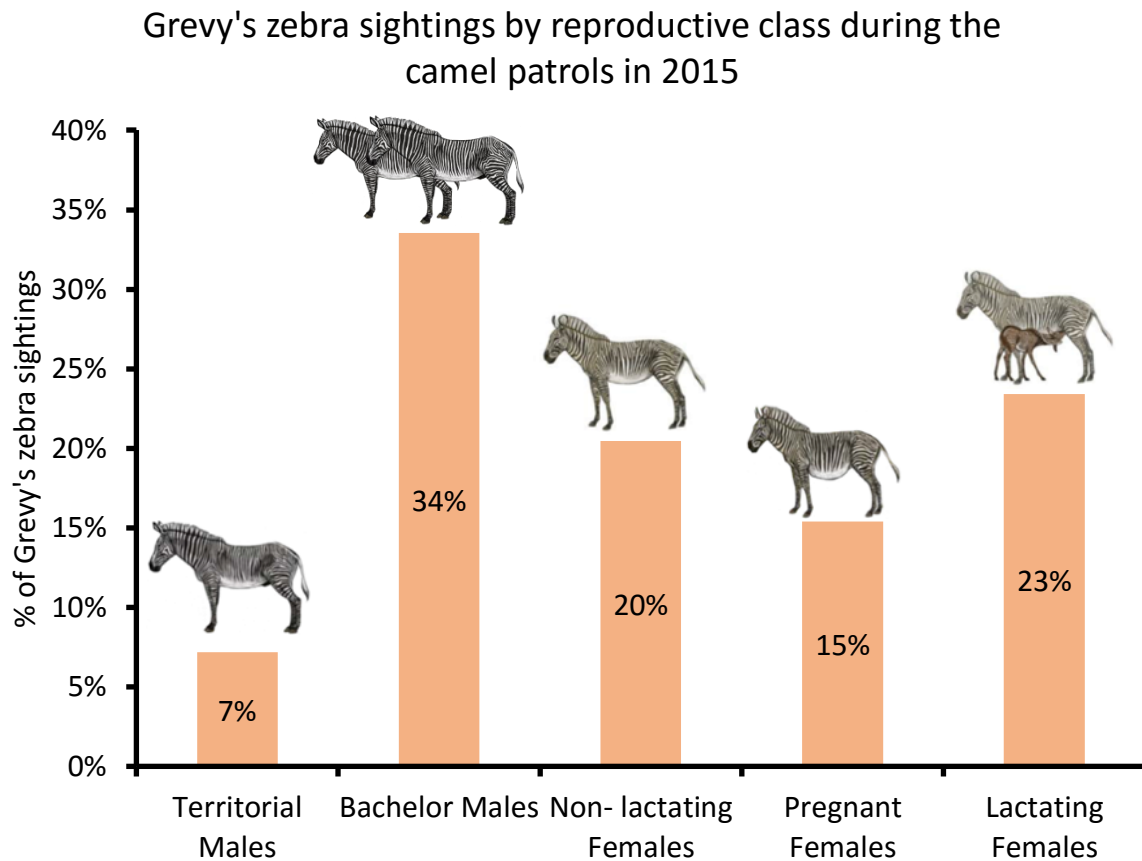


*The Warriors observe a herd of Grevy's zebra on the plateau during the camel patrols*

The dry season data collection using camels to extend the Warriors' potential areas for patrol started in late September 2015. The results presented from the camel patrols cover this period of one month. Within this time frame, a total of 625 Grevy's zebra were recorded within the Sengereruwa and Rusarus plateau. Notably, this number is more than 50% of the total number of sightings that occurred in the other five locations from January to August. This high percentage of sightings supports the need for Grevy's zebra monitoring outside of the five key locations during the dry season and provides valuable data on the population during this time of the year.

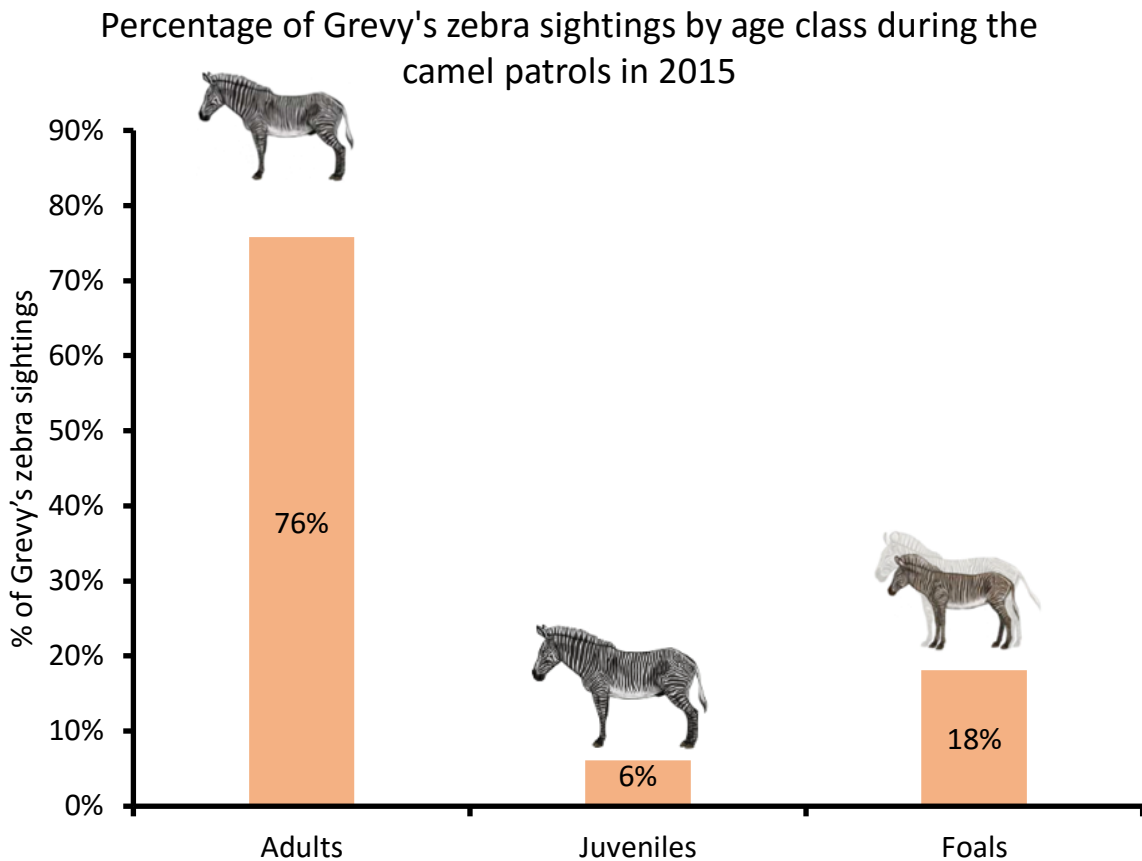


## Grevy's Zebra Age Structure in the Sengereruwa and Rusarus plateaus



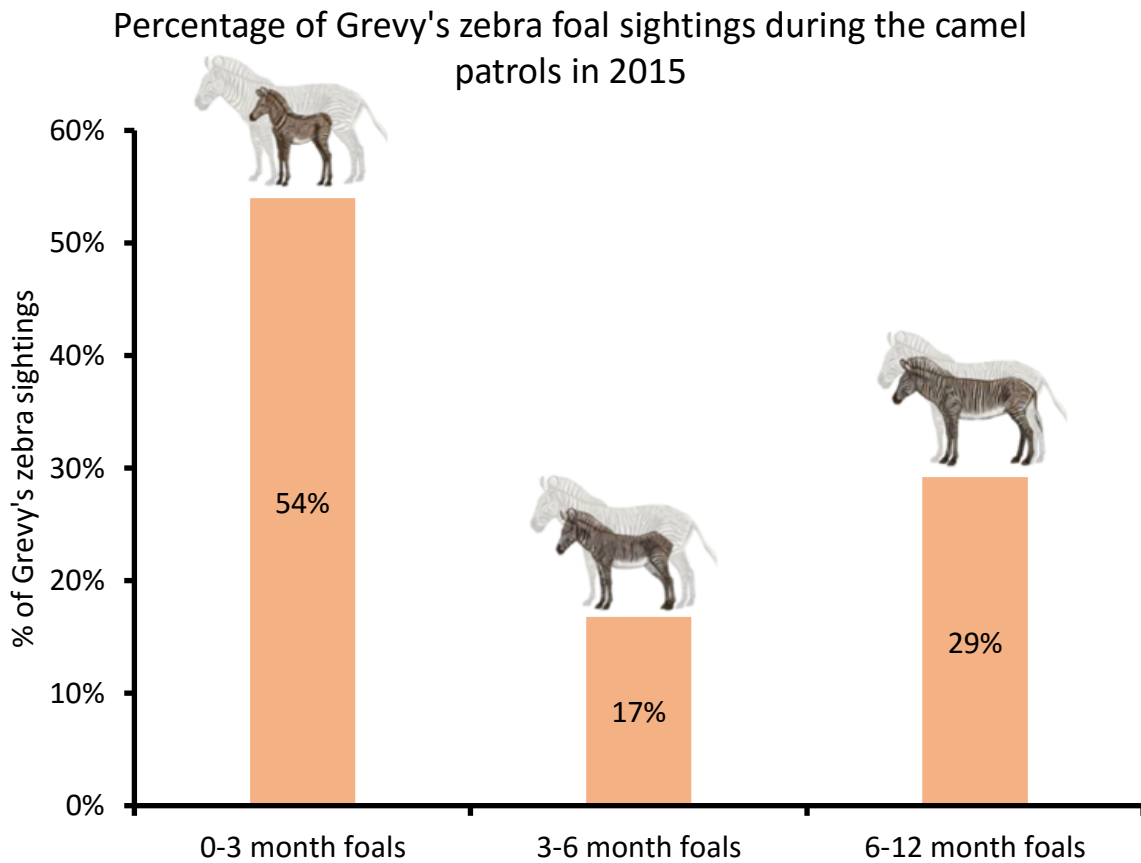
*Figure 12. The percentage of Grevy's zebra sightings by reproductive class in the Sengereruwa and Rusarus plateaus in 2015*

The reproductive structure of the Grevy's zebra in the Sengereruwa and Rusarus plateaus varies only slightly when compared to the reproductive structure in the five key locations. The most significant variation occurred with lactating females where a higher percentage, relative to the total adult population, were observed in the plateaus compared to the five key locations. The discrepancy may occur as a result of the camel patrols taking place in September, after the rainy season when most foal births occur. As lactating females have specific dietary requirements that need to be fulfilled to ensure both their own survival and that of their foals, it appears that the plateaus provide vital resources for the species during the dry season that would not be available elsewhere.



*Figure 13. The percentage of Grevy's zebra sightings by age class in the Sengereruwa plateau in 2015*

The percentage of Grevy's zebra sightings by age class in the Sengereruwa and Rusarus plateaus is similar to that observed during the normal Warrior patrols in the five key locations. The main variation occurs in the number of foals observed as a proportion of the total population. Foal sightings during the camel patrols are higher than those in the five key locations (18% compared to 13%). This pattern follows that of the lactating females seen in Figure 12 and the time of the year the camel patrols took place most likely accounts for this variation as October marks the start of the rainy season which is when a peak in births would be expected.



*Figure 14. The percentage of Grevy's zebra foal sightings by age class in the Sengereruwa plateau in 2015*

The number of sightings of 0-3 month foals increased during the camel patrols from 42% during the normal patrols to 54%. As with the results seen in Figures 11 and 12, this is probably as a result of the time of year the camel patrols took place which coincided with a peak in births. A reduction in the 3-6 month foal category occurred between the normal patrols and camel patrols from approximately 43% to 17%. The 6-12 month foal observations increased during the camel patrols from 17% during the normal patrols to 29%.

### Warrior Photography Results

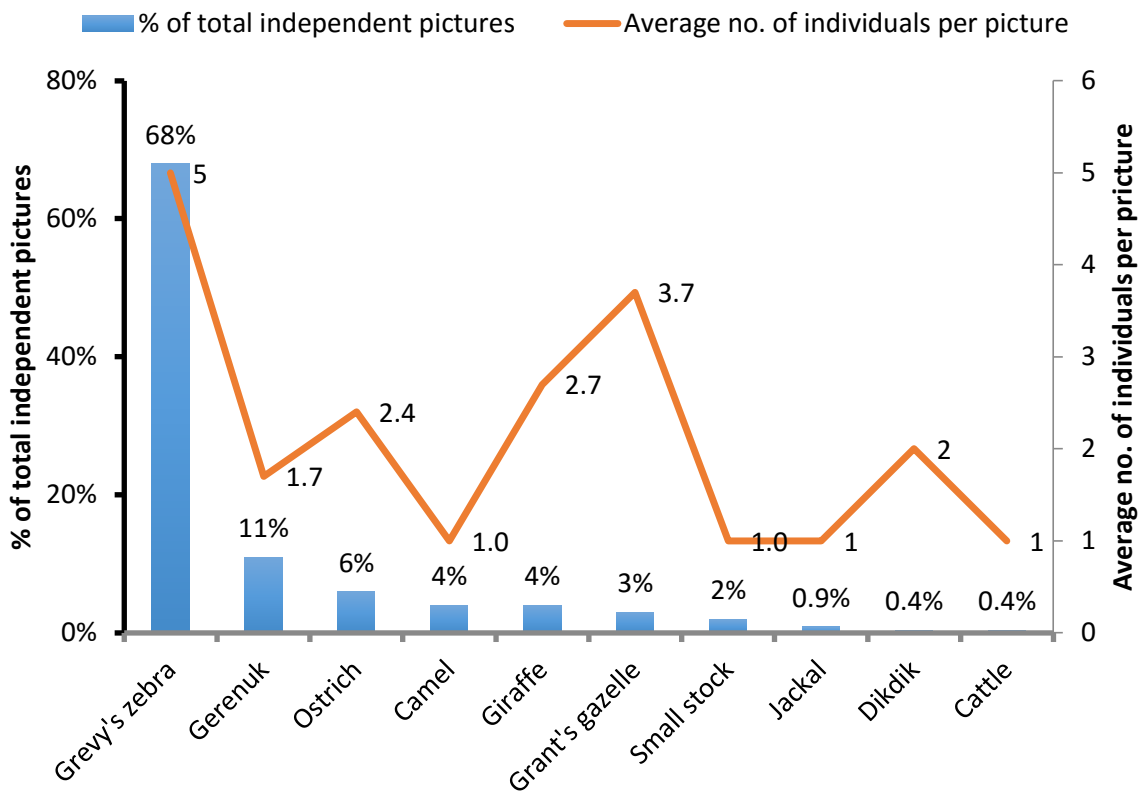
During their patrols, the Warriors photographed Grevy's zebra, other wildlife, livestock, the landscape, and glimpses of their daily life on patrol. The documentation not only provides an avenue to verify their Grevy's zebra sightings, but also offers insight into their lives when monitoring this endangered species.



*Lolmongoi, a Grevy's Zebra Warrior captures the moment that Lekureya, another Warrior, took a picture of a herd of Grevy's zebra in Laisamis*

The Warriors photographed Grevy's zebra, other wildlife, interesting landscapes and scenes from their daily life. Figure 14 illustrates the relative abundance and the average number of individuals by species. In relation to the other species of wildlife and livestock, Grevy's zebra represent 64% of the independent pictures captured. An independent picture is defined as an image that captured one species during a period of 40 minutes. Gerenuk and ostrich were the next most abundant species photographed by the Warriors.

## Wildlife and livestock species captured during camel patrols



*Figure 15. The number and percentage of wildlife and livestock species observed during the camel patrols in 2015*

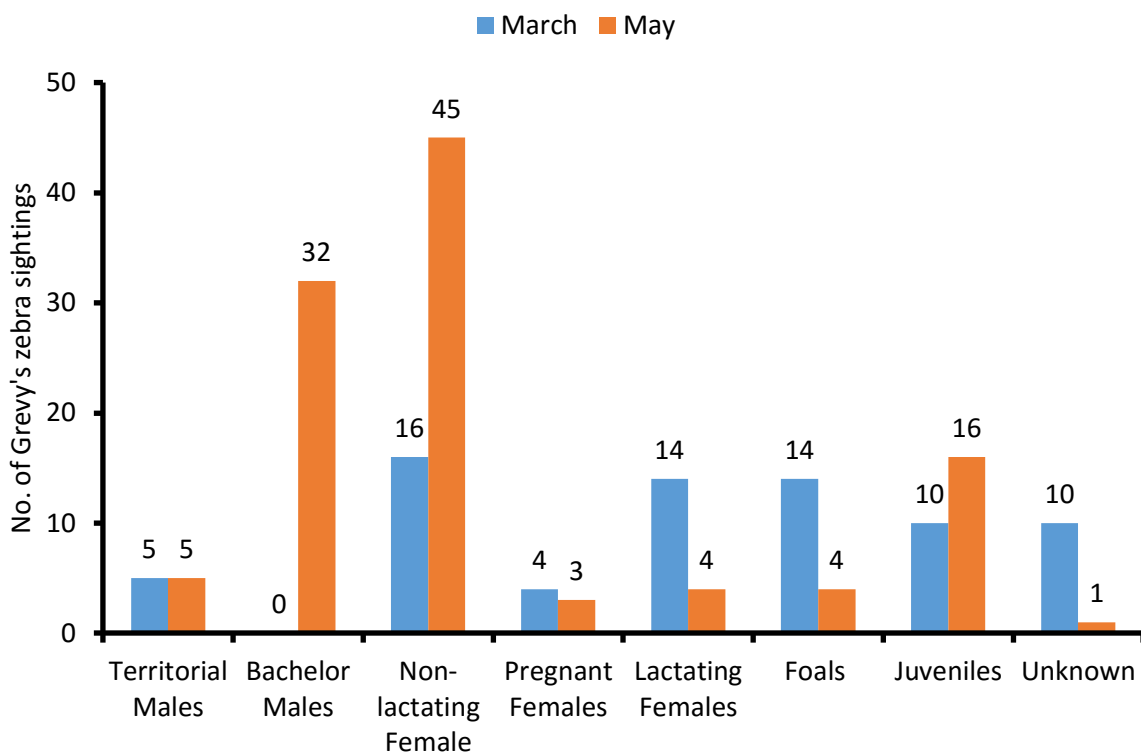
On average each image captured approximately 5 Grevy's zebra. The most Grevy's zebra in one image was captured on 16 October of 28 individuals, however the Warriors' monitoring data illustrates much larger herds. For the large herds, it is difficult to capture all the individuals in one moment. As a result, it is likely this average is lower than the actual average herd size observed in the plateaus in Laisamis. We will be upgrading the Warriors' cameras with ones that have better zoom capability and anticipate that through their photographs we will also be able to capture the unique stripe patterns of individual zebras.

### Joint Patrols

The joint patrol activity aims to monitor the Grevy's zebra population and distribution in the Laisamis region in areas that the Warriors cannot reach, and the location and number of livestock and other wildlife species. Patrols are carried out with our partners Melako Conservancy (MCC) and the Kenya Wildlife Service (KWS) and are an opportunity to increase wildlife security, raise conservation awareness, and take stripe-identification images of the Grevy's zebra encountered.

During 2015, two joint patrols each lasting 5 days in length were carried out in March and May.

### Grevy's zebra sightings by reproductive class during joint patrols in 2015



*Figure 16. The number of Grevy's zebra by reproductive class observed during two joint patrols in 2015*

A total of 183 Grevy's zebra were observed during the joint patrols in March and May. The majority of sightings occurred in May (110 Grevy's zebra seen) with 40% of the sightings occurring in March (73 Grevy's zebra seen). In March, no bachelor males and only 16 non-lactating females were seen. In contrast, in May, these two reproductive classes accounted for the majority of sightings with 45 and 32 individuals respectively. Observations of lactating females, pregnant females and foals reduced from 14, 4 and 14 to 4, 3 and 4 respectively from March to May. The reduction in sightings of the three reproductive classes may have been due to the increased presence of livestock observed in May (14,570) compared to March (8,615) within these areas.

During each survey, the teams aimed to capture clear images of each Grevy's zebra's right side flank for stripe identification. These images will be analysed along with the camera trap images in 2016 when the stripe-id database becomes available to GZT.

#### To build our knowledge of the Laisamis Grevy's zebra population through stripe-identification surveys

Laisamis River is a wide, rocky and seasonal riverbed with multiple pools of surface water, with camera traps deployed at various locations along the river to monitor water use by Grevy's zebra and other wildlife. At Laisamis River in 2015, we monitored Grevy's zebra during two periods: from 13 February to 7 April and 13 July to 17 September.

Grevy's zebra were the most prevalent visitors to Laisamis river during both study periods and represented 70% of the independent pictures taken by the camera traps. A total of 80,097 pictures were taken by the camera traps over two study periods in 2015. Out of these, a minimum of 1,500 pictures are good quality stripe-id images. It is likely that the number of stripe-id images surpasses this figure due to the time delay in analysing the large amount of data. The current stripe identification database is shared between four organizations and is only available on a limited basis. All the images will be inserted into the national database for Grevy's zebra providing detailed individual and population distribution and behavioural data.



*Ten Grevy's zebra drink at Nchoro water pan.*

The high abundance of Grevy's zebra at Laisamis River indicates that management of this water point is crucial for their conservation. Continued management and monitoring not only preserves water access for Grevy's zebra, but also increases awareness of wildlife water needs amongst community members and visitors to the water points.

## Mortality

In 2015, 49 Grevy's zebra mortalities were reported in all of the regions GZT operates in. Laisamis accounted for approximately 10% of these mortalities, composed of two adults (one male and one female), one juvenile and two foals. Disease, predation and injury accounted for at least three of these mortalities with two unknown causes of death. Notably, causes of death due to poaching did not occur in Laisamis and this is in contrast to at least 11 deaths occurring due to poaching in other areas that GZT operates in.



*The Warriors captured this image of two Grevy's Zebra Scouts recording details of a Grevy's zebra mortality case during their patrols*

## Publication and Dissemination of Results

The results from Laisamis have been shared through the following platforms:

- Wildlife Conservation Network Spring presentation – 6<sup>th</sup> June 2015
- Presentation to Zebra Pen, New Jersey – 8<sup>th</sup> June 2015
- Wildlife Conservation Network Expo presentation – 10<sup>th</sup> October 2015 in San Francisco
- Grevy's Zebra Technical Committee – 3<sup>rd</sup> November 2015 at Lewa Wildlife Conservancy
- Annual Grevy's Zebra Warrior Workshop – 11-12<sup>th</sup> November 2015 at the GZT Field Camp



## Next Steps

A multi-year analysis will be conducted to identify trends in population structure and distribution within the five key areas monitored by the Grevy's Zebra Warriors, and to identify Grevy's zebra resource hotspots and breeding areas. This will be used as a baseline for informing Melako Conservancy's grazing plans going forward. In addition, a review of key dry season water sources will be undertaken to ensure that Grevy's zebra have continued access to water throughout the Laisamis region. Stripe-identification analysis is pending and will give further insight into the numbers of Grevy's zebra using the three key water points that were managed by GZT during 2015.

In 2016 the Grevy's Zebra Warriors will have their cameras replaced with ones that have greater zoom capability that were used in a recent census of Grevy's zebra in Kenya. This will enable us to get more stripe-identification data from their patrols and thus assess individuals' grazing and water preferences, again helping us to determine future management interventions for water and habitat.

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