

Grevy's Zebra Conservation in Kenya 2016

**Report & funding proposal prepared
for supporters & members
of the Grevy's zebra EEP conservation projects**

Tanya Langenhorst
EEP Coordinator &
International Studbook Keeper for Grevy's zebra

Dr Zeke Davidson
Kenya Project Manager

Marwell Wildlife
September 2016

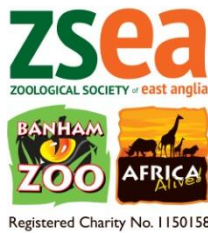


www.marwell.org.uk/conservation

Acknowledgements

We would like to thank the following for their ongoing and very generous support during 2015 and 2016:

Amersfoort Zoo
 Banham Zoo – ZSEA
 Drusillas Park
 Kolmardens Insamlingsstiftelse
 Koninklijke Maatschappij voor Dierkunde van Antwerpen
 Quagga
 Rufford Foundation
 Stichting Wildlife
 Wildlife Worldwide
 Wilhelma Zoologisch-Botanischer Garten Stuttgart
 Zoologischer Garten Berlin



Cover: Grevy foal with mother © Marwell
 This page: Northern Kenya © Marwell

Introduction

The Marwell team in Kenya, together with our partners, have delivered new and interesting work for the conservation of Grevy's zebra in 2015/16. We would like to share all these activities with you, our donors, in this latest Grevy's zebra conservation report & funding proposal as it is thanks to you that we can carry on with these initiatives year after year. For this, we would like to thank you whole heartedly.

We are particularly proud of our work in the far north of Kenya (see Northern Kenya Grevy's zebra Project) which has developed into an innovative conservation project, able to support the livelihoods of 15 local Kenyan households while ensuring a legacy of wildlife based community engagement for regional peace in our study area and its surrounding landscapes.

As you will see in the text below, the project also provides some very interesting results of monitoring the Grevy's zebra in this understudied and remote landscape.

As usual you will find updates on long-standing national projects such as collaring, stripe ID database, building conservation capacity within Kenya, and new methods to monitor this species.

We would like to thank all our long-standing and loyal donors as well as welcome new organisations that are joining our efforts for conserve this beautiful and endangered species. We could not do this work to protect the Grevy's zebra without you.

Section A of this document contains a report of the activities of Marwell Wildlife and its partners regarding Grevy's zebra conservation in the past year. At the end of this section is a list of these partners and, as ever, please feel free to ask Tanya for any further information you might require.

In **Section B** we are presenting our proposed activities for 2015/16 together with their associated costs.

Groups and organisations mentioned in this report are:

EWCA = Ethiopian Wildlife Conservation Authority

GZT = Grevy's zebra Trust www.grevyszebratrust.org

GZTC = Grevy's zebra Technical Committee

KWS = Kenya Wildlife Service www.kws.org

Lewa or LWC = Lewa Wildlife Conservancy www.lewa.org

MW / Marwell = Marwell Wildlife www.marwell.org.uk/conservation

NRT = Northern Rangelands Trust www.nrt-kenya.org

Princeton/PU = University of Princeton www.princeton.edu/~equids/people.html

STE = Save the Elephants www.savetheelephants.org

The Status of Grevy's Zebra (*Equus grevyi*)

An international team of assessors (Dr Dan Rubenstein, IUCN Grevy's zebra Coordinator, Princeton University; Belinda Low-Mackey (GZT); Dr Zeke Davidson (Marwell); Dr Fanuel Kebede (EWCO) and Sarah King (IUCN)) reviewed the status and distribution of the species last year for the IUCN Red List, and publication of the result is imminent.

International Studbook

In the latest international studbook for Grevy's zebra 2015 (Langenhorst, 2016) 118 institutions in 28 countries reported a total of 204.318.0 (522) Grevy's zebra. This can be broken down into three managed populations: 90.169.0 (259) animals in 53 institutions are in the EEP; 64.111.0 (175) are managed by the North American SSP in 37 institutions (US and Canada), and Japan coordinates 8.10.0 (18) animals in seven zoos. All other Grevy's zebra are kept in private hands or non-associated institutions. Together, these populations provide a genetically and demographically healthy back up to their wild counterparts.

The studbook can be downloaded as a PDF from our website:

<https://www.marwell.org.uk/conservation/achievements/studbooks>

Section A. Summary of Activities in 2015/16

In this section we provide a detailed overview of the work we have carried towards Grevy's zebra conservation over the last year. Together with our partners from the Grevy's Zebra Technical Committee and with your financial support we have extended the area in which we operate and provided crucial monitoring, cooperation with communities, support for the Kenya Wildlife Service. We would like to thank you for your support, which makes our work in this area possible.

Grevy's zebra Liaison Office Support

The Grevy's Zebra Liaison Officer (GZLO) is responsible to ensure that all the stakeholders and partners involved in the conservation of Grevy's zebra in Kenya complete and achieve the Grevy's zebra conservation activities as stipulated in the Grevy's zebra conservation strategy and as agreed during the GZTC meetings.

Once again the EEP has provided funds to enable the current officer, George Anyona, to travel to meetings and fully participate in all Grevy's zebra work that needed KWS support.



He was fully involved in the planning and implementation of the Great Grevy's Rally in January this year, when he was also in charge of one of the survey teams based in Samburu (Fig 01). You can read more on this further down in the report.

George was part of the team that planned and implemented the Great Grevy's Ball that was held at the beginning of September to celebrate the release of the Rally results by Mr. Kitili Mbathi, KWS Director General.

Fig.01: George (far right) and his team during the GGR © Marwell

On a day to day basis, George is responsible for planning and organising the meetings of the Grevy's Zebra Technical Committee.

Some of the issues addressed in this year's meetings were are listed below and you will find more details on some of the points in this report:

- 1) The post briefing / discussions of the Great Grevy's Rally (GGR)
- 2) The review of the National Grevy's Zebra Conservation and Management Strategy; 2012 - 2016
- 3) Appointment with the new KWS Director General during which the GZTC was represented by Belinda Low, GZT, Zeke Davidson, Marwell Wildlife, and the GZLO.
- 4) Disease Response Committee (DRC), Disease workshop Recommendations update and the way forward.
- 5) Assessment report for Oserian Sanctuary.
- 6) Update from Prof Dan Rubenstein, Princeton, on the status of the GGR results.
- 7) Review of the strategic framework for the national strategy. Already the successes and gaps have been reviewed meetings with the stakeholders of this strategy will begin soon.
- 8) Review of plans for the Annual Conference.
- 9) Update from Prof. Dan Rubenstein on IBEIS/WildBook development.
- 10) Collaring plans and potential of ear tags.
- 11) GZ Disease Research.
- 12) Review any upcoming research projects planned by the members.

Monitoring of Grevy's zebra

Digital Stripe Pattern Identification Project

The project has constructed a database of field based identifications of all individuals sighted, and re-sighted, for purposes of obtaining data on the distribution, abundance and connectivity of Grevy's zebra populations throughout its Kenyan range, and ultimately in Ethiopia as well.

The national database currently holds 27,135 images up from 22,739 images in the previous year. We regularly add Grevy's zebra images into the database with contributing partners from Marwell Wildlife, Lewa Wildlife Conservancy, Mpala Research Centre, Grevy's Zebra Trust, Olpejeta Conservancy, Oserian Conservancy and newly added Kenya Wildlife Services in conjunction with Tsavo Trust. These last two organisations have been collecting Grevy's zebra data from the Tsavo East area, where the only data available until now have been from anecdotal reports. However, a joint operation with a KWS aerial survey in 2014 sighted 26 individuals that were located from the air. It was not possible to gather photographic evidence at that time owing to the very timid nature of these animals. In the intervening two years field personnel have developed protocols for monitoring the population and the result has been a continuous supply of photographs, allowing the team to identify 22 Grevy's zebra in recent months.

We also draw a considerable number of photos for identification and analysis from the camera trap network that is deployed as part of our Northern Kenya Grevy's zebra Project (NKGZP) and maintained by a growing team of scouts (Fig. 02). Please read the chapter on the NKGZP that follows below.



Bushnell (M) MARWELL -6966 62°F16°C ●

08-09-2013 06:45:39

Fig. 02: camera trap photo for Stripe ID © Marwell

Last year we reported on an innovation in pattern recognition software, developed by our partners at Princeton University under Professor Daniel Rubenstein and his "Image-Based Ecological Information System (IBEIS)" team in the USA. The IBEIS team was in Lewa Wildlife Conservancy in June 2016 to upgrade the prototype and further train all users on the new developments. They also addressed some technical issues that had arisen in the past year. The software under development is now called WILDBOOK (www.wildbook.org) and the team intends to further develop it so that each contributing organisation can have a secure account. This is an enormous

task and while it is ongoing, we continue to use the original Extract Compare program (Hiby, 2010) in our stripe identification.

Over the years, the identification of Grevy's zebra has helped to determine the health of the population and inform conservation decisions. We have identified movement corridors and contributed to national planning and development projects, ensuring that wildlife and Grevy's zebra in particular are considered. The Stripe ID project continues to advance in its usefulness given its role in the first ever photographic national census (see below). We expect the power of our analysis and conservation capacity to increase significantly with the introduction of IBEIS tools. This project has become a significant contributor in the efforts of conserving this endangered species. With improvements to identification programs, rigorous data collection, identification and analysis, community involvement and citizen science are all adding weight to the effort. As a multi-stakeholder tool with many contributing partners it is a strong collaborative catalyst for conservation and one of our most important tools across all projects.



Fig 03: Small group of Grevy's zebra during GGR photo collection © Marwell

National Survey of Grevy's zebra (summarised from Berger-Wolf et al., 2016)

As mentioned in the 2015 report (Langenhorst and Davidson 2015), the Grevy's Zebra Technical Committee conceived the 'Great Grevy's Rally' (GGR), the first ever national census of Grevy's zebra through citizen science. The Rally took place on the 30th and 31st January 2016 and brought together over 350 people; conservancy managers, national reserve wardens, tourism partners, conservation organisations, county government officers, research scientists and interested members of the public from many parts of Kenya. In total we were able to sample 45 counting blocks covering over 25,000 km². The ground teams drove through designated areas while photographing the right side of each individual Grevy's zebra observed with a GPS enabled digital camera, taking in excess of 40,000 images (Fig.03).

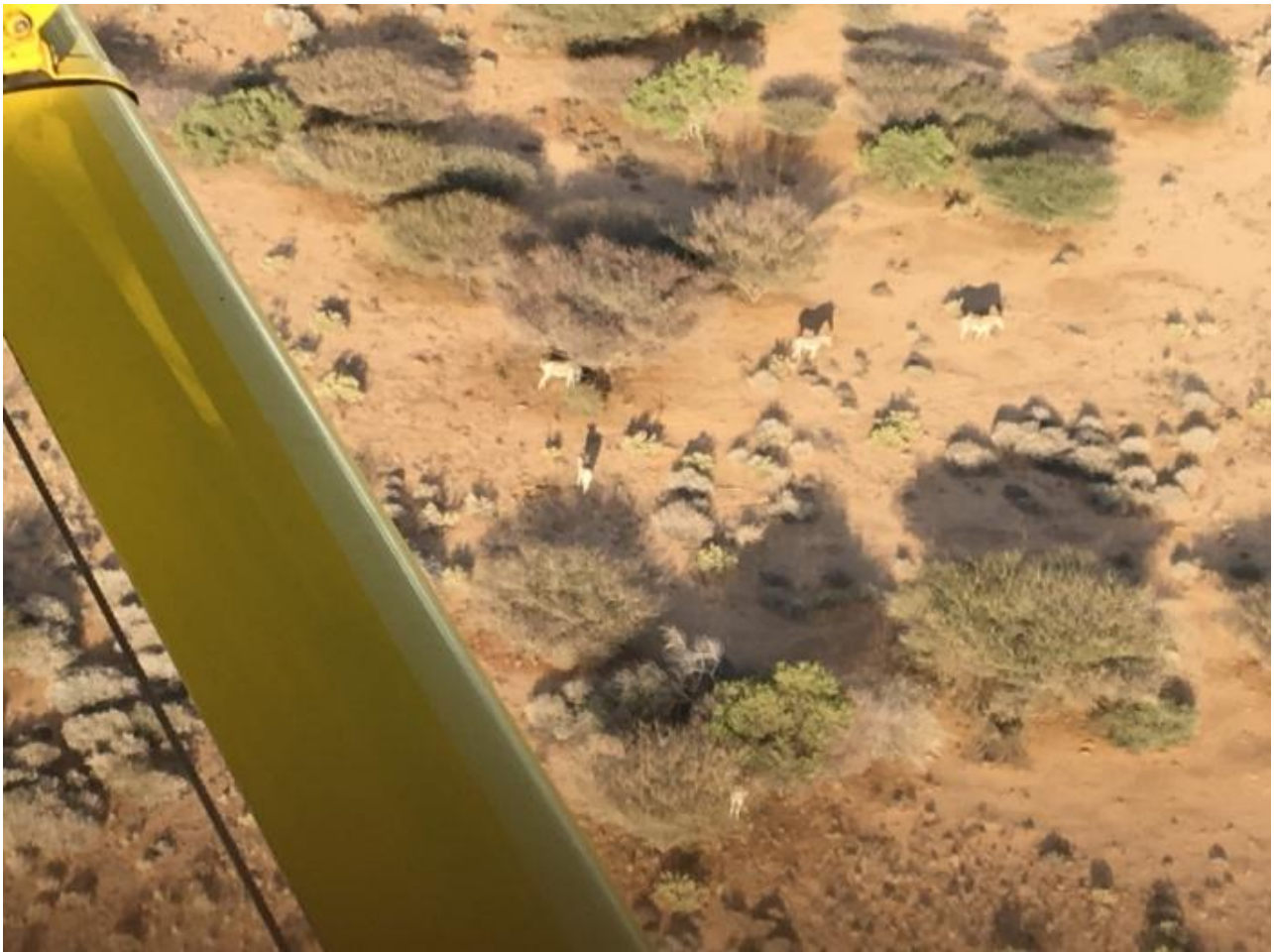


Fig. 04: Small aircraft spotting Grevy's zebra during the Great Grevy's Rally © Marwell

These photos have been processed by the IBEIS team in the USA; individuals were being identified and mapped using their GPS locations, recorded by GPS enabled cameras, and have been processed in a similar way to our camera trap data using the capture-recapture methodology. In this way the size of Grevy's zebra populations, by region, has been estimated. Furthermore the photos were examined to assign ages (adult, juvenile, foal) to each uniquely identified individual.

The total collection of images generated 16,866 images of individual zebras and the IBEIS analysis yielded 1,942 uniquely identified individuals. 1,387 unique individuals were seen on day 1, another 1,408 unique individuals were seen on day 2, and 868 individuals seen on day 2 were re-sightings of individuals seen on day 1. Using the above values, population sizes for the nation and each county could be estimated using the Lincoln-Peterson formula.

From these data, three major findings emerge:

- 1) This approach estimated that Kenya's total Grevy's zebra population consists of 2250 individuals ranging from a low of 2157 and a high of 2343 individuals. When additional counts from small areas, areas outside of the Grevy's zebra's historical range or areas that were inaccessible or too dangerous to survey during the census period are added to the total, the estimate of the size of the national population rises to 2350.
- 2) The demographic state of the national population and most counties is healthy. When the percentage of infants and juveniles approaches 30% of the total, populations appear stable and tend to sustain themselves because there are sufficient recruits to replace adults that die.
- 3) The fraction of females giving birth per year is high, or its inverse, the inter-birth interval is low. Both also indicate that the reproductive potential of a population is strong and steady.

The information gained from the Rally will be used to prioritise conservation actions going forward and to ensure that we are managing for optimal conditions that will allow for growth in the

populations across Kenya. The distribution of where photographs were taken, as well as final numbers can be seen on the maps below (Fig.05a,b&c).

A full report has been produced (Berger-Wolf *et al.*, 2016).

This survey provides the first ever age structured census of the endangered Grevy's zebra at one point in time. Marwell (and the EEP) was a co-founder and key contributor to the census, both logistically, providing three counting teams in remote northern areas, and covering approximately 43% of the remotest areas with light aircraft support (Fig.04). In this way we were able to assist ground crews to locate small groups of zebra in important linkage habitat between larger populations in more densely populated areas.

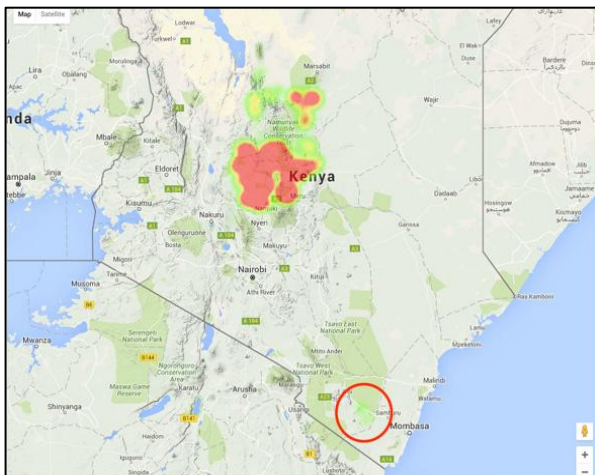


Fig.05a: Map of Kenya showing location and density of photographs taken

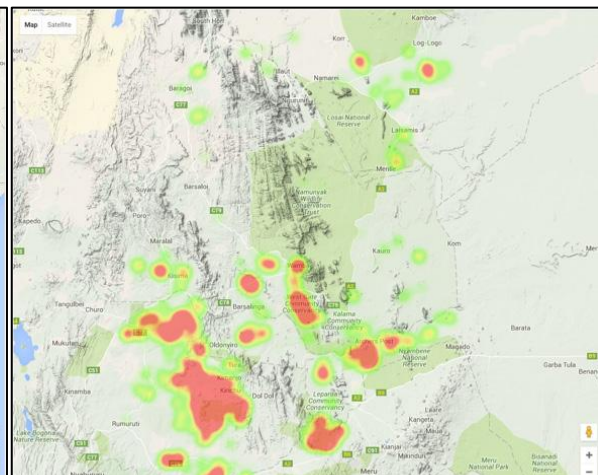
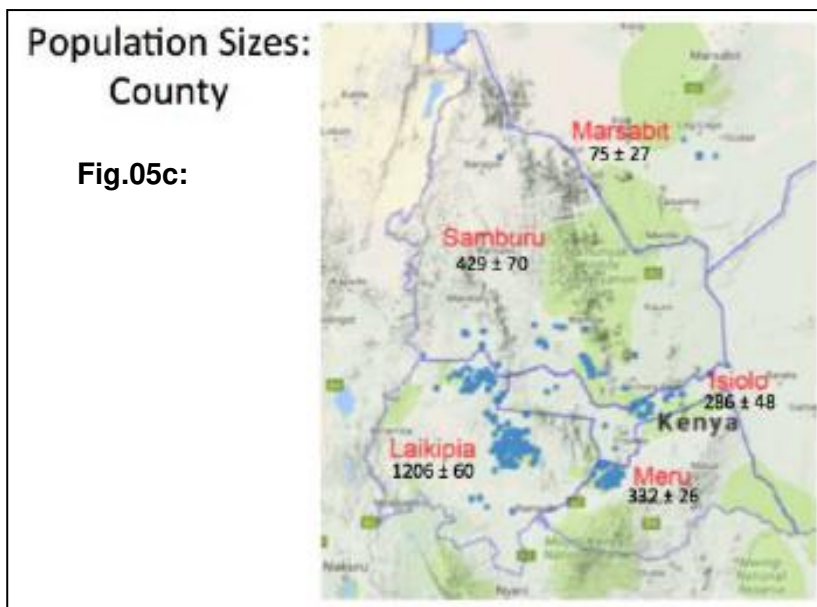


Fig.05b: Map of Laikipia, Samburu, Isiolo and Marsabit Counties showing location and density of photographs taken



We aim to repeat the Rally at regular intervals and are planning the next event for August 2017, when we hope to re-photograph many of the same individuals and foals once again.

Collaring

Collars deployed in March 2015 have provided some initial insights in to the wide-ranging movement of our far northern Grevy's zebra population (see 2015 EAZA report). Unfortunately, they have not reported as regularly as we had hoped due to the poor mobile phone network in the study area. In 2016 we have therefore decided to use satellite collars in this area to improve the data reporting via the Iridium satellite network. The first four collars have been purchased and tested and will be deployed in September/October this year. Apart from providing information for the analysis of Grevy's zebra movement and spatial ecology, currently being reported in an MSc thesis, the collar data have also been used to inform infrastructure developers on the impact of road building in the study area. Development is altering the availability and access of water for wildlife and in some cases is making water less available to Grevy's zebra. This is a threat to the survival of foals as lactating mothers are forced to travel further between grazing areas and water points. In one case we have measured an increase in commuting distance of over 20Km. Foals are unable to commute over long distances and lactating females are forced to drink every day to maintain their milk. Foals will therefore perish as their mother's milk supplies deplete and cannot sustain the weakened animals in these long commutes.

A suite of measurements and biological samples are collected during collaring operations. These provide another source of data for the investigation of population health and prevalence of disease. This year we have undertaken the second disease related analysis using blood samples collected during collaring operations in collaboration with Kolmården Zoo, Sweden. Results reveal that there is a high prevalence of Equine Herpes Virus (EHV 9) in the wild population. Surprisingly, however, no cases of the disease have been detected, suggesting that if animals are healthy and unchallenged by environmental stress, the disease does not manifest. A peer reviewed publication is being prepared by Louise Guevera, veterinarian at Kolmården, and will detail these findings and the potential threat to population health and survival for wild, free ranging Grevy's zebra in Kenya.

These more recent results show again the importance of the collaring data to a wide variety of projects and even national decision making. Together with the stripe identification work, this project has a **top priority** in the long-term conservation of the wild, free ranging populations of the species. We are highly dependent on the EEP contributions for the upkeep of both projects and are very grateful to all the zoos that have enabled this work for several years now.

The Northern Kenya Grevy's Zebra Project (NKGZP)

The third phase of the Northern Kenya Grevy's Zebra Project was completed during the latter half of 2015 and the first half of 2016. Additional camera traps deployed with our teams of community scouts and Ilkirimats resulted in double the number of images of wildlife compared to the previous year and enhanced our understanding of the Grevy's zebra population and ecology. Together with data from previous years, the evidence suggests that this is an important area for migratory connectivity and a dry season refuge for this species. Our ability to map and relate Grevy's zebra presence to human activity was hampered during the last year because of recent and rapid infrastructural developments, including upgrading of a major road to facilitate construction of a large scale wind farm near Loyingelani, at Lake Turkana. As a by-product of this development, new boreholes are being sunk between the natural water sources in the Ntill area and pasture to the north. The presence of large numbers of people and livestock effectively creates a barrier between critical water and grazing resources for wildlife in this location.

Study Site

Our study site remained centred on the open plains between Mt. Nyiru and Mt. Kulal and extending south eastwards along the foothills of the Ndotu Mountains. Key resources for Grevy's zebras such as forage and refuge habitat are found on these plains. During the dry season, water sources retreat far up deep riverine gullies and valleys etched into the sides of the mountains. Much of our work focussed around the communities of Anderi, Loltepes and Ntill, but data emerged to suggest wider coverage was necessary as we detected wildlife concentrations utilising plains to the north and east of the mountain foothills (Fig.06).

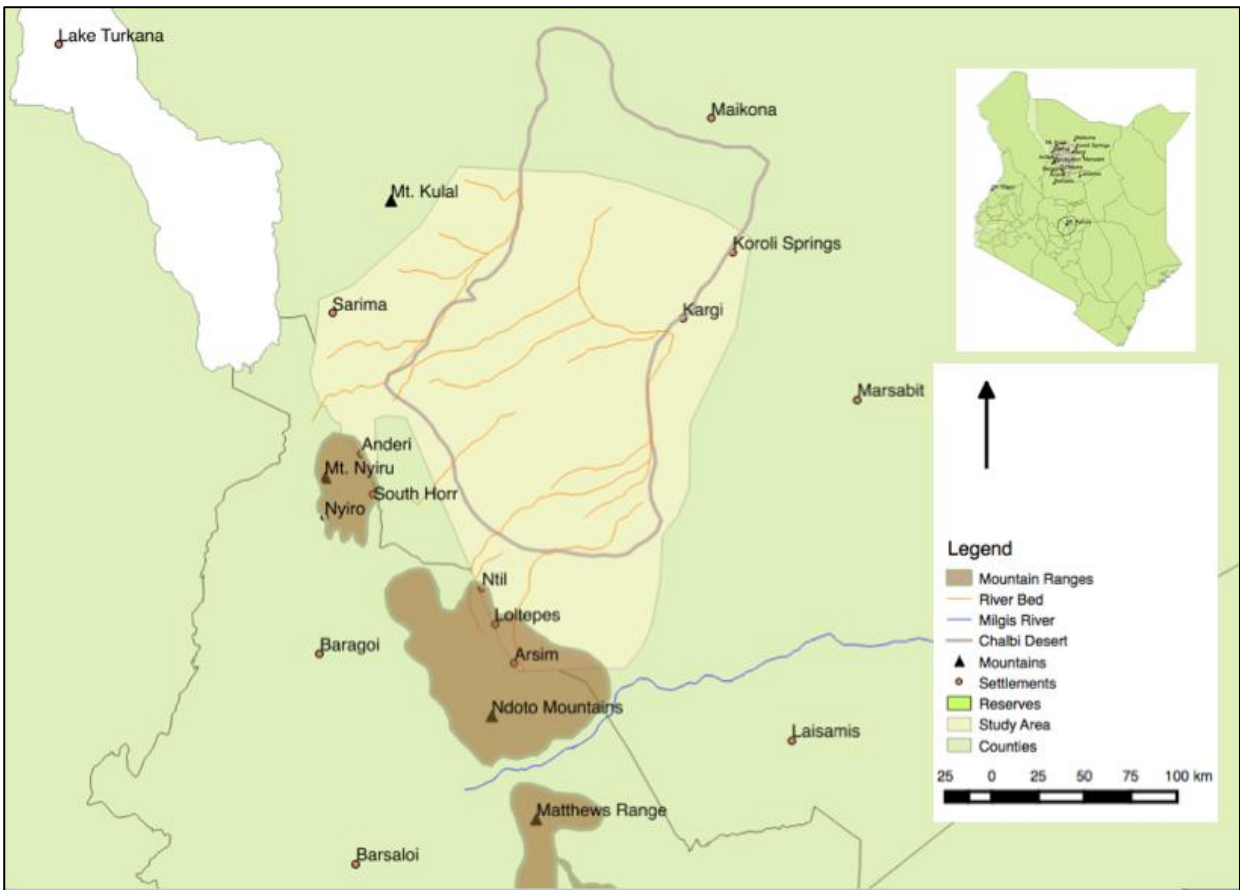


Fig.06: Map of the Northern Kenya Grevy's Zebra Project study area, expanded in 2015/16.

Findings

The additional camera traps purchased for this phase of the project contributed to a significant increase in images (Fig. 07) captured across our study site (over 44,000 in 2015/16 compared to 17,000 in 2014/15). During the past year, this represented 3,377 days of camera-trapping effort and resulted in 20,112 images of Grevy's zebra with additional records of other species. Using the camera trap images, we have now identified 141 individual Grevy's zebra across the study sites over three years. The total number of Grevy's zebra detected in Loltepes and Ntil remained constant, while there was an apparent 70% increase in numbers seen around Anderi in 2015/16 compared to the previous year. Based on mark-recapture methodology (Lincoln Index), the estimated population of Grevy's zebras for this 350 km² study area is around 200 animals.



Fig 07: A male Grevy's zebra sighted at Ntil in 2013 and re-sighted a year later at Anderi Springs.

Grevy's zebra group sizes were consistent between 2014/15 and 2015/16, with a minimum of one and a maximum of ten individuals. During 2015/16, two male Grevy's zebra were seen for every female, confirming the skewed sex ratio, albeit less pronounced than in the previous year. Six Grevy's zebra foals have been tracked through to maturity during this study, and the number of current foals doubled from five to 11 in the last two years. Nevertheless, in the last year adult Grevy's zebra made up 89% of all sightings with few juveniles (4%) and foals (7%).

The variability in numbers of uniquely identified Grevy's zebra detected and small number of young animals suggests that the animals are part of a highly mobile population and that the study area acts as a dry season refuge for animals moving to more northerly wet season grazing grounds. Animals are now known to move widely across this environment (Figure 08) and it seems that those not retreating early enough with the onset of the dry season remain near the mountain foothills until the rains return.

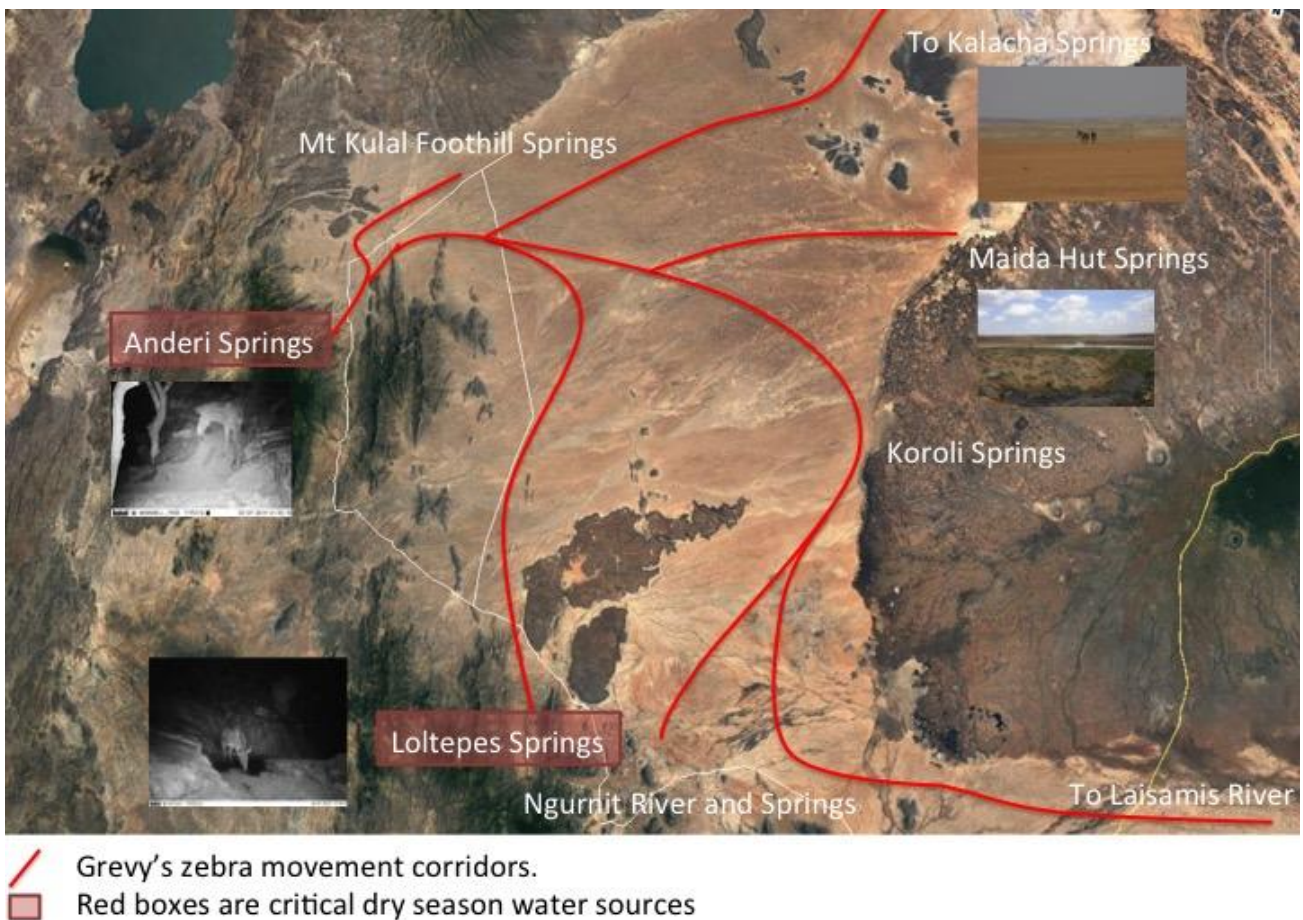


Figure 08: Grevy's zebra movement routes as detected by GPS collar, camera trap and scout patrol data.

Disturbance of Grevy's zebra because of human activity is apparent across the area. Timing of camera trap images as a proxy for Grevy's zebra activity reveals these animals move more at night when they avoid people (Fig.09), while they can also be found grazing pasture inaccessible to livestock 30km or more away from water points. Moreover, only four individually recognised Grevy's zebras (all adult males) were recorded around Ntill, the most populated community, in 2015/16.

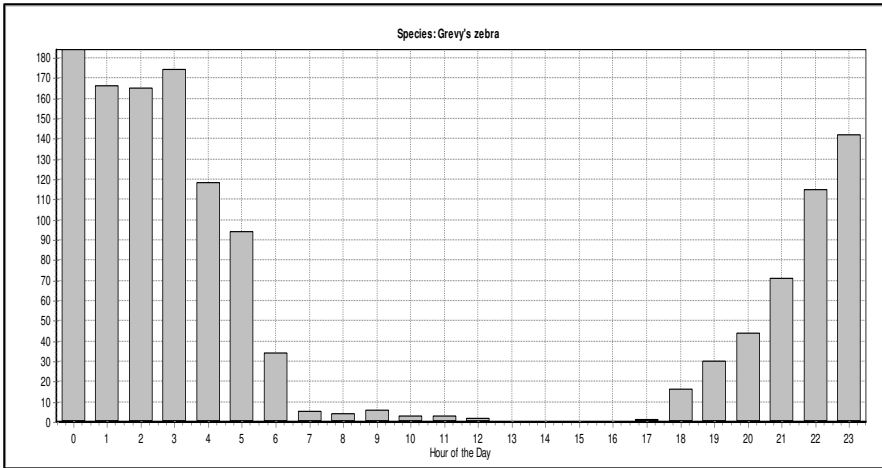


Fig.09: Frequency of Grevy’s zebra camera trap images recorded according to time of day. Grevy’s zebra are most frequently photographed at night when people and livestock are inactive.

Other than their presence (e.g. Woodfine *et al.*, 2005) little was previously known about Grevy’s zebras inhabiting the mountain foothills and arid plains of this remote part of northern Kenya. However, during the course of this project we have established that, while the species has adjusted its behaviour in response to human presence and activity, the open plains between Mt. Nyiru and Mt. Kulal and the foothills of the Ndotto Mountains to the south east provide refuge and key resources for Grevy’s zebra. Moreover, we have now identified key movement corridors for this highly mobile population demonstrating the value of the area for migratory connectivity. The cultural significance of Grevy’s zebra to local Samburu and Turkana communities coupled with a lack of negative perceptions of living alongside this species combine to provide a fitting flagship for wildlife conservation and wider natural resource management (Parker, Davidson *et al.*, 2016). We have drawn on this affiliation to promote this participatory conservation initiative. The recruitment, training and deployment of a team of Ilkirimats, brings a traditional role to the forefront of conservation efforts and paves the way for a more expansive programme of engagement. We now see the Northern Kenya Grevy’s Zebra Project evolving to support the locally identified goal of promoting peaceful coexistence between communities, with a history of tension, by focussing on the shared interests of sustainable management of scarce and valuable natural resources.

As a result of the work carried out by Enrita, George and our wider team, we expect to see greater recognition of the value of our study area for the conservation of Grevy’s zebra in Kenya.



Fig. 10: Grevy’s zebra sighting during GGR © Marwell

Disease Response Committee (DRC)

The Disease Response Committee is no longer a standalone sub-committee of the Grevy's Zebra Technical Committee. During the two years it was operational the committee established strategies and guidelines for the detection, prevention and early response to disease outbreaks. These documents form a standard operating procedure for use by the KWS vet department and partners in the GZTC to put into practise as and when required. The members of the DRC are represented on the GZTC and so it has been decided to reintegrate the committee into the general GZTC operations in future.

Drought Relief

Luckily, supplementary feeding during the drought was not needed over the last year, so all funds for this have been ring fenced for future efforts. Supplementary feeding keeps mothers from moving large distances by providing food when it is most needed and foals are most vulnerable. This is showing signs of being a very important intervention that needs to be continued and the ability to act swiftly by having funds available, has there become an important conservation tool.

Field Laboratory

An additional laboratory fridge was purchased for the Lewa Disease Response Laboratory, supported and developed by contributions from the EEP, Grevy's zebra Trust and private donors on Lewa Wildlife Conservancy. The fridge expands the storage space for biological samples in this important facility, which represents the first line of defence against disease outbreaks in Northern Kenya and specifically for the endangered Grevy's zebra. Marwell and Lewa are partnering with the Smithsonian Conservation Biology Institute in an effort to raise funds for the expansion of the Laboratory facility. This will include dedicated sterile laboratory space for the analysis of samples, enhanced analysis techniques and improved cold and dry storage facilities. We hope to have the new laboratory building completed in 2017.

Professional Development

George Anyona concluded his fieldwork this year and will submit his thesis in November 2016. He had been seconded from Kenya Wildlife Service where he will continue in his role as the Grevy's Zebra Liaison Officer. In this he is financially supported by the EEP. A support without which KWS would struggle to provide this position.

Lizbeth Njeri Mate, continues to manage the stripe ID project. She is working closely with our partners to advance the ID database in its usefulness given its role in the first ever photographic national census (see information on Great Grevy's Rally). We expect the power of our analysis and conservation capacity to increase significantly with the introduction of Image Based Ecological Information System (IBEIS) tools. This project has become a significant contributor in the efforts of conserving this endangered species. With improvements to identification programs, rigorous data collection, identification and analysis, community involvement and citizen science are all adding weight to the effort. As a multi-stakeholder tool with many contributing partners it is a strong collaborative catalyst for conservation



Fig. 11: the four new female Ilkirimats © Marwell

Enrita Naanyu Lesoloyia completed her Masters in Community Development in August 2015 with distinguished merit. We now employ her full time as project manager to run the day to day activities of our field based Ilkirimat teams. In addition, Enrita is responsible for developing a comprehensive peace programme in which she is engaging local communities in Samburu and Turkana settlements to work together for conservation of their shared resources.

Based out of the small town of Baragoi (Fig. 06), she now leads our team of 12 Ilkirimats (see below), including four new women Ilkirimats (Fig. 11). Every month she undertakes a schedule of tasks and activities designed to engage communities in participatory conservation exercises across our 350 Km² study area. These Conservation Workshops are designed to increase outreach to communities within our study area. At each location, a one-day workshop with women, elders or warriors is carried out separately for each group. Independent engagement avoids risk of offence inherent in mixing of social groups in Samburu and Turkana cultures and allows them to be more open and frank in responding to the material presented. Detailed information on Grevy's zebra, their role as drivers of ecosystem structure, diversity, and function and the important link between animals like Grevy's zebra and ecosystem resilience is discussed in a structured way. The groups also look at sustainable natural resource management and how this is best achieved through cooperative peaceful coexistence. In time we hope that these workshops will evolve into forums for community based conservation action. Enrita's work often includes joint patrols and exercises with partner organisations which expand the impact and influence of our activities over a much wider landscape.

Ilkirimats: Promoting sustainable natural resource management and peaceful coexistence.

A team of Ilkirimats (caretakers) (Fig.12) were drawn from the local community following extensive consultation with elders who suggest individuals from families with good standing in the community and with reputations for a high degree of integrity. Those caretakers were then trained to collect data and engage people from communities in the project area.

The use of Care Takers in carrying out conservation monitoring and community engagement activities has four main goals: 1) To provide a platform for regional peace through spreading a message of understanding of the biodiversity surrounding people, and their reliance on shared and scarce resources, 2) To sensitise the communities sharing their environment to the concept of coexistence with wildlife, 3) To collect data on Grevy's zebra and other wildlife they encounter in order to develop conservation activities and community engagement opportunities, 4) To raise awareness for Grevy's zebra and other wildlife in an effort to protect it from illegal hunting, logging, burning and other environmentally damaging activities.

During their patrols, the Ilkirimats collect geo-referenced data of their movements and all wildlife sightings, including Grevy's zebra, using SMART enabled handheld devices. For Grevy's zebras, specific population parameters such as herd size, age and sex class of each individual are noted. Habitat type, and distance to the nearest water sources, settlements, and whether other wildlife or livestock were present as well, are all recorded or inferred in later analyses using Global Information Systems (GIS). Ilkirimats carry a set of ten camera traps per team of four members, and deploy these each evening to record the incidence of Grevy's zebra and other wildlife at key locations, such as water points, or in movement corridors and grazing areas. These photographs allow us to identify the zebras by their unique stripe patterns and generate the population estimates and parameters reported here.



Fig.12 : Enrita (middle) with her team of Ilkirimats

Lewa Research Department

We reported previously (Langenhorst & Davidson, 2015) that some of the community conservancies have begun using the SMART tool (a spatial monitoring and reporting tool developed by the Zoological Society of London) and Cybertracker (www.cybertracker.org) for digital data capture. Lewa officers are carrying this out and incorporating the data in to their reports – so effectively treating the conservancies as one landscape from a monitoring & evaluating perspective. A number of closely related organisations and landscapes will follow suit in 2016. These include the Ngare Ndare Forest Trust which manages the forest on Lewa's southern boundary with Mount Kenya, and the Mount Kenya Trust working closely with KWS to conserve the Mount Kenya National Park and the elephant corridor between Lewa and the National Park. All of these organisations have attended SMART training in 2016 and have begun to root out the use of the tool. Mt. Kenya Trust has been most successful so far, and are working with the Ngar Ndare Forest Trust to help implement the same. Lizbeth, our stripe ID database manager, is now a SMART Trainer and is implementing a bespoke database for GZT this month. She will be running training for GZT at the IUCN offices in Nairobi this October. She also participated in delivering a training event for KWS and other Tsavo NP related NGOs in June this year – so we are having a far reaching impact on improving the use of the tool and getting systematic monitoring and data collection, and reporting, implemented in Kenya. But our focus is still Northern Kenya.

Ethiopia

Dr. Fanuel Kebede, who works full time for the Ethiopian Wildlife Conservation Authority (EWCA) as advisor to the director, will convene a Species Strategic Conservation Planning workshop in December 2016 for all the Ethiopian wild equids (African wild ass, Grevy's zebra, and Plains zebra).

Please also read the funding proposal (Appendix B) which will give you a lot more details on our plans.

References and further reading

Berger-Wolf, T., Crall, J., Holberg, J., Parham, J., Stewart, C., Low Mackey, B., Kahumbu, P. and D. Rubenstein (2016). The Great Grevy's Rally: The Need, Methods, Findings, Implications and Next Steps. Unpublished Report.

Hiby, L. (2010) *Extract Compare Software for Zebra*. <http://www.conservationresearch.co.uk> accessed 17 July 2015.

Langenhorst, T. (2016). International studbook for Grevy's zebra (*Equus grevyi*) 2015, current until 31.12.2015. Marwell Wildlife, UK.

Langenhorst, T. & Z. Davidson (2015). Grevy's Zebra Conservation 2015 Report & funding proposal prepared for supporters & members of the Grevy's zebra EEP conservation projects. Marwell Wildlife, UK.

Parker, G.E., Davidson, Z., Low, B., Lalampaa, P.R., Sundaresan, S. and M. Fischer. (2016) Can pastoral communities offer solutions for conserving the endangered Grevy's zebra *Equus grevyi* at the periphery of its range? *Oryx*, available on CJO2016. doi:10.1017/S0030605315001325.

Woodfine, T., Chege, G., Langenhorst, T., Lumbasi, J. and Low, B., 2009. *Persistence of lesser known sub-populations of Grevy's zebra *Equus grevyi* in the far north of Kenya – a survey report*. Marwell Wildlife, UK. ISBN 978-0-9521397-4-4

Our Grevy's zebra conservation colleagues and partners

Marwell Wildlife works closely with Kenyan conservation partners with whom it develops joint conservation programmes. Our key partners – listed alphabetically – are described briefly below:

Disease Response Committee (DRC)

The Disease Response Committee which began as a standalone sub-committee of the GZT has established strategies and guidelines for the detection, prevention and early response to disease outbreaks over the first two years of its existence. These documents now form a standard operating procedure for use by the KWS vet department and partners in the GZTC to put into practise as and when required. The members of the DRC are represented on the GZTC and so it has been decided to reintegrate the committee into the general GZTC operations in future.

Grevy's Zebra Technical Committee (GZTC)

The Grevy's Zebra Technical Committee is a technical and steering committee with a mandate from KWS to evaluate implications of technical recommendations for Grevy conservation before implementation, develop intervention protocols, set monitoring standards and procedures, and evaluate their implementation and effectiveness, reviewing all Grevy's zebra conservation, management and research proposals.

The GZTC is a collaboration among seven organisations all committed to conserving Grevy's zebra, including: Grevy's Zebra Trust (GZT), Lewa Wildlife Conservancy, Marwell Wildlife, University of Princeton (DZ), Northern Rangelands Trust (NRT), and Kenya Wildlife Service (KWS). Marwell continues to play a key role in the coordination of this group and its activities.

Grevy's Zebra Trust (GZT)

The Grevy's Zebra Trust (GZT) has been established to address the urgent need to conserve Grevy's zebra in the community rangelands of Ethiopia and Kenya. GZT has become an integral part of the GZTC.

Kenya Wildlife Service (KWS)

The KWS is the country's statutory wildlife body and is ultimately responsible for the conservation of Grevy's zebra. In partnership with KWS, Marwell Wildlife and the EEP have contributed significantly to the development and execution of the national Grevy's Zebra Conservation Strategy.

Lewa Wildlife Conservancy (Lewa or LWC)

The Lewa Wildlife Conservancy holds some 20 percent of the world's remaining free-ranging Grevy's zebra and hosts a dynamic research programme. Marwell continues to support Grevy's zebra monitoring and research within Lewa, and many of the projects planned by the GZTC will be carried out in collaboration with the Lewa Research Department (LRD).

Milgis Trust

The Milgis Trust is a non-profit organisation founded by wildlife conservationist and safari guide Helen Douglas-Dufresne and her partner Peter Ilsley to sustain the wildlife, habitat and the pastoral peoples' way of life in northern Kenya.

In January 2010 the Trust approached Marwell with a request to establish wildlife monitoring within the Milgis ecosystem and has since become a close partner in our NKGZP.

Northern Rangelands Trust (NRT)

NRT supports the development of community conservancies. Marwell has partnered with NRT to implement a programme of training and capacity building to strengthen wildlife management within all member-community conservancies. In addition, it has co-developed a system for wildlife and vegetation monitoring which is being introduced to a selection of conservancies.

University of Princeton (PU)

University of Princeton have collaborated on a number of Grevy's zebra conservation activities, most notably the Great Grevy's Rally and analysis of the photos collected during the survey. They are also heavily involved in the stripe ID project, which is hosted at Mpala Research Centre in Laikipia thanks to Princeton's close association there.

B. Proposed Activities for 2016 - 2017

Marwell has combined several initiatives into focal activities in the period between 2013 and 2016. Our aim is clearly set on protecting vulnerable, small populations of Grevy's zebra in remote and under resourced areas. We have developed programmes with a strong community based approach. This develops local capacity to ensure long-term viability of our efforts in the field. Furthermore, we have fostered fresh Kenyan talent in diverse skills such as social sciences and project management, as well as biodiversity and ecology. We are not only providing "boots on the ground" through our scouts, but have developed a strong management team to lead the work using a development model that promotes Kenyan ownership.

None of this is possible without the support we receive from the EEP and the wider EAZA community. Despite challenging economic times in recent years we are happy to report that the work we are privileged to do Kenya is growing and diversifying, while still remaining focused on our main aim. We hope that the support you have provided in the past is still available to continue this work next year, and in years to come.

Here we present a funding proposal which accounts for maintaining these core activities, plus some new initiatives which build the programme in profile, such as an international conference, and effectiveness, by implementing new technology such as satellite enabled radio collars. Any contribution is helpful and we look forward to you being part of our conservation outreach in Africa in 2017.

1. Grevy's Zebra Collaring

This is a key long term monitoring project supported by Marwell under the auspices of the GZTC. We have begun to move to the use of slightly more expensive satellite collars, which can be used in remote areas where no mobile network coverage is available. The first four collars will be deployed by the end of October and we are hoping to expand the study to the north in 2017 as movement data reveal the animal's habitat use. The collaring study is also providing valuable opportunities to study disease prevalence and risk in the species and a recent analysis of Equine Herpes Virus in collaboration with Kolmarden Zoo is currently being published. Previous studies of tick borne diseases revealed high prevalence of *Babesia caballi*, *Thileria equi*, and the first case of West Nile Virus in a wild equid. Collar data and the additional biological specimen data collected during immobilisation operations are essential tools in ensuring that habitat connectivity and population health are carefully monitored for the conservation of Grevy's zebra.

Outputs

1. Movement corridor mapping
2. Resource mapping
3. Human impact (footprint) mapping
4. Population monitoring and evaluation
5. Development of community based monitoring and conservation in South Hoar area
6. Reports and papers published

Conservation impact

The collection of fine scale movement data for this population will represent the first detailed study of wildlife movement in the area and secure the population as part of the monitored Grevy's zebra population in Kenya, thus providing it with conservation status and protection from governmental standards. Community participation will ensure ownership, scalability and legacy for the conservation of Grevy's zebra in this area.

1. Grevy's Zebra Collaring	£
3 x Satellite radio collars (£2000.00 ea)	6,000.00
Flying time 20 hours @ £220/hour	4,400.00
2 x Zebra capture and immobilisation operations	2,400.00
Biological Sample Storage and Analysis	2,000.00
	14,800.00

2. Great Grevy's Zebra Rally

The Rally was Marwell's brain child born out of discussions which revealed that a more comprehensive ground count of Grevy's zebra was required to support aerial counts. We have been very supportive of the development of both the stripe identification software Image-Based Ecological Information System (IBEIS) and the implementation of the field-work in the far north of Kenya. The huge success of the first rally in 2016 has entrenched the method in the national strategic framework for the conservation and management of Grevy's zebra in Kenya. We plan to conduct another two consecutive rallies in 2017 and 2018 in an effort to calibrate the method and increase the precision of estimates (which are surprisingly precise already!). It is clear that using a ground count approach is far more rigorous and precise than aerial counting – and exponentially cheaper to undertake. It also brings with it the added value of citizen science on a large scale. This helps to build awareness and generate a strong conservation following for the species. We need to ensure that public interest continues to grow so that we can count on future rallies being well attended by our dedicated supporters. The Rally has the potential to change the way wide ranging wildlife is monitored. It provides a tool that not only estimates population size accurately, but delivers population structure, health and status metrics as well. These additional factors are often impossible to detect from other survey methodologies. We need your support to keep the rally going as a regular event, and you should feel welcome to participate in this international effort as well!!

Outputs

1. Rigorous national population estimate
2. Repeatable methodology based on sound science
3. National Population health and status
4. National Population structure

Conservation Impact

The Rally is a strategic tool that will guide conservation planning and management by providing reliable population data. Conservation effort and the mobilization of resources will be more effectively planned resulting in greater effectiveness of conservation activities. Significant public engagement is generated through citizen science and community participation.

The Rally raises the Species Profile to the level of global awareness and allows critical mass to be developed for the conservation of wild populations.

2. Great Grevy Rally (August 2017)	£
Flying Time 20 Hours @ £220 an hour	4,400.00
4000km @ £0.28/km	1,120.00
Field work facilitation	700.00
Contribution to the organisation of the GGR Event	5,000.00
	11,220.00

3. National Stripe Identification Database

Our overarching goal in maintaining this long-term data management effort is the fine-scale monitoring of the highly endangered Grevy's zebra in order to support analyses for the purpose of informing strategies for conserving the species. This wide-scale data collection and coordination requires the resources of a full-time database manager together with a team of community scouts to monitor a network of camera traps in remote areas.

Outputs

1. Maintenance of the individual Stripe ID database
2. Contributions to the National Conservation of Wildlife in Kenya
3. Analysis of movement patterns in conjunction with collar data
4. Population census data
5. Revision of the species range map
6. Publication of reports and peer reviewed papers on species biogeography
7. Development of new tools and capacity building through training

Conservation Impact

The Stripe ID database is a cost-effective means of monitoring movement, distribution and abundance of Grevy's zebra, as evidenced by the recent GGR. Our Database manager is now responsible for general project management of all aspects of stripe ID data gathering and management. In addition, she manages the people and budgets required to achieve these goals, and is a pivotal member of the Marwell Kenya team.

3. National Stripe Identification Database	£
Employment of database manager @ £900/month, over 12 months	10,800
5000km for vehicles @ £ 0.28/km to cover travel to, from and within field sites	1,400.00
10 additional community scouts (men and women) £38/scout/month, over 12 months	3,800.00
10 x additional camera traps£ 150/camera	1,500.00
	17,500.00

4. Grevy's Zebra Liaison Office facilitation per annum.

The success of the GZTC is grounded in the direct collaboration with the Kenya Wildlife Service as its parent organisation. Supporting the Liaison Officer, a KWS employee, is key to maintaining this structure and providing effective national coordination for conservation activities. The officer needs to be facilitated in their duties only, as salary is covered by KWS. This includes mobilising them around the country with a transport budget and ensuring that there is sufficient funding to maintain their activities. Without this support the office would most likely be closed by the authority owing to budget limitations and this would diminish the effective coordination of Grevy's zebra conservation in general. We need your support to ensure that the GZTC and its partners can continue to operate as successfully as we have for the past 9 years.

Outputs

1. Centralised collaborative conservation effort
2. Nationally owned structure and direction of conservation activity
3. National Strategy for conservation and Management of Grevy's Zebra

Conservation Impact

Centralised liaison prevents much loss of resource through duplication and wasted effort. By appointing a chief whip through the Liaison office the GZTC's mandates are monitored and stewarded from inception to implementation. This ensures high productivity.

4. Grevy's Zebra Liaison Office facilitation per annum	£
Local Travel & Accommodation	1,680.00
Purchase of Stationery	240.00
Vehicle Running Expenses	1,260.00
Workshops, meetings & Conference	560.00
Mobile Phone airtime	120.00
	3,860.00

5. Peace and Conservation for Grevy's Zebra in Northern Kenya – NKGZP

Our Northern Kenya Grevy's Zebra Project (NKGZP) has completed three successful years of identifying and documenting this important remote population and the resources it depends upon. We are rapidly seeking significant funding to continue this work and have an expansive plan for developing its scope and impact. It is through this effort that we are entrenching social peace in communities across the study area (some 600 km²), between Samburu and Turkana communities. Poaching for bush meat is a looming threat and we have detected more than 12 cases of this illegal commercial activity in 2016 already. We need your support to intensify our efforts and expand the project scope so that we can tackle these emerging threats and mitigate the conflict surrounding them. Particularly in the coming year as we seek additional sources of grant funding.

Outputs

1. Grevy's zebra population data
2. Biodiversity Data
3. Movement and spatial ecology data
4. Schools engagement
5. Community engagement
6. Employment
7. Peace through common resource conservation

Conservation Impact

Through community engagement we have sensitized a large and remote population of pastoral people to the relevance of conservation and the importance of wildlife to their health and welfare. Improved social security and an understanding of the role of wildlife and environment provide clear grounds for coexistence of regional communities. This in turn secures habitat and resources that wildlife also depend on for survival.

5. Peace and Conservation for Grevy's Zebra in Northern Kenya, NKGZP	£
Kenyan Project Manager (Enrita Lesoloyia) £600 per month	7,200.00
Field expenses and transport (£ 550/month)	6,600.00
Camera/video camera	320.00
Projector	250.00
Stationary for school visits & community meetings	530.00
100 x printed shukas (African blankets worn by warriors)	630.00
100 x printed T shirts (for community training and discussion workshops)	630.00
200 x printed caps (for community training and discussion workshops)	600.00
Honda generator	350.00
	17,110.00

6. Drought Emergency Fund

The emergency fund has demonstrated its value several times already when critical supplementary feeding is required to stave off starvation and keep lactating mares alive in the harshest seasons. We have demonstrated that this activity alone can prevent the loss of foals and ensure recruitment to the next generation. With the increasing variability in climate conditions and unpredictability of rainfall we need to ensure that we are ready to react immediately and at short notice when feed is required. Any contribution, large or small, to this fund will back-stop our efforts in times of need.

Outputs

1. Critically affected lactating females are supported with food during times of need
2. Foal survival is ensured so that breeding success is guaranteed
3. Community participation provides an opportunity for coexistence with wildlife to be integrated to pastoral lives.
4. Depending of severity of drought, many tens to hundreds of individuals may be saved.

Conservation Impact

By preventing the loss of foals the loss of entire year class cohorts are saved from starvation during harsh droughts. This would otherwise interrupt the recruitment cycle and increase the overall decline in the population. Drought preparedness is a key part of the strategy to conserve the National Grevy's zebra herd.

6. Drought Emergency Fund	£
Provision of supplementary feed -hay & monitoring (pot. annually)	2,000.00
	2,000.00

7. International Grevy's Zebra Research & Conservation Conference

Each year the GZTC invites all researchers and conservationists in Kenya to participate in a one-day workshop to review the year's progress on Grevy's zebra conservation and research activities. In 2016 the decision was taken to "up-grade" this workshop into an international conference with an open call for participation. We anticipate this now being a two-day event with the second day devoted to working group discussions and the production of proceedings, which can be published for our peer community to review. In this way we hope to take advantage of a wider audience and contribution to the species conservation in Kenya – the last viable landscape for its preservation. We need your contributions to help organise the conference and ensure its success as an international event. We welcome your participation at the event, as partners in conservation who have supported our work here for many years now.

Outputs

1. Proceedings of the conference published in general academic literature.
2. Shared knowledge and increased participation between conservation professionals.
3. Improved conservation effort through a vigorous and networked
4. Strategic planning through collective and synergistic processes such as working groups.

Conservation Impact

The conference will generate interest and awareness in Grevy's zebra conservation and research. It will invite new thinking and diverse people with integrated skill sets that can ensure the growth and momentum of Grevy's zebra conservation effort. Such a meeting synthesizes large bodies of knowledge in themed focal areas. This will stimulate new research into areas where there are knowledge gaps.

7. International Grevy's Zebra Research & Conservation Conference	£
Transport, catering and accommodation for community delegates (20 Community delegates plus transport from their locations to the venue)	3,000.00
	3,000.00

Summary of funding proposal Grevy's zebra conservation 2016/17

1. Grevy's Zebra Collaring	£
3 x Satellite radio collars (£2000.00 ea)	6,000.00
Flying time 20 hours @ £220/hour	4,400.00
2 x Zebra capture and immobilisation operations	2,400.00
Biological Sample Storage and Analysis	2,000.00
	14,800.00
2. Great Grevy Rally (August 2017)	£
Flying Time 20 Hours @ £220 an hour	4,400.00
4000km @ £0.28/km	1,120.00
Field work facilitation	700.00
Contribution to the organisation of the GGR Event	5,000.00
	11,220.00
3. National Stripe Identification Database	£
Employment of database manager @ £900/month, over 12 months	10,800
5000km for vehicles @ £ 0.28/km to cover travel to, from and within field sites	1,400.00
10 additional community scouts (men and women) £38/scout/month, over 12 months	3,800.00
10 x additional camera traps£ 150/camera	1,500.00
	17,500.00
4. Grevy's Zebra Liaison Office facilitation per annum	£
Local Travel & Accommodation	1,680.00
Purchase of Stationery	240.00
Vehicle Running Expenses	1,260.00
Workshops, meetings & Conference	560.00
Mobile Phone airtime	120.00
	3,860.00
5. Peace and Conservation for Grevy's Zebra in Northern Kenya, NKGZP	£
Kenyan Project Manager (Enrita Lesoloyia) £600 per month	7,200.00
Field expenses and transport (£ 550/month)	6,600.00
Camera/video camera	320.00
Projector	250.00
Stationary for school visits & community meetings	530.00
100 x printed shukas (African blankets worn by warriors)	630.00
100 x printed T shirts (for community training and discussion workshops)	630.00
200 x printed caps (for community training and discussion workshops)	600.00
Honda generator	350.00
	17,110.00
6. Drought Emergency Fund	£
Provision of supplementary feed -hay & monitoring (pot. annually)	2,000.00
	2,000.00
7. International Grevy's Zebra Research & Conservation Conference	£
Transport, catering and accommodation for community delegates	3,000.00
	3,000.00
Overall Total	69,490.00



Grevy's zebra female with newborn foal, following male © Marwell