



MPALA

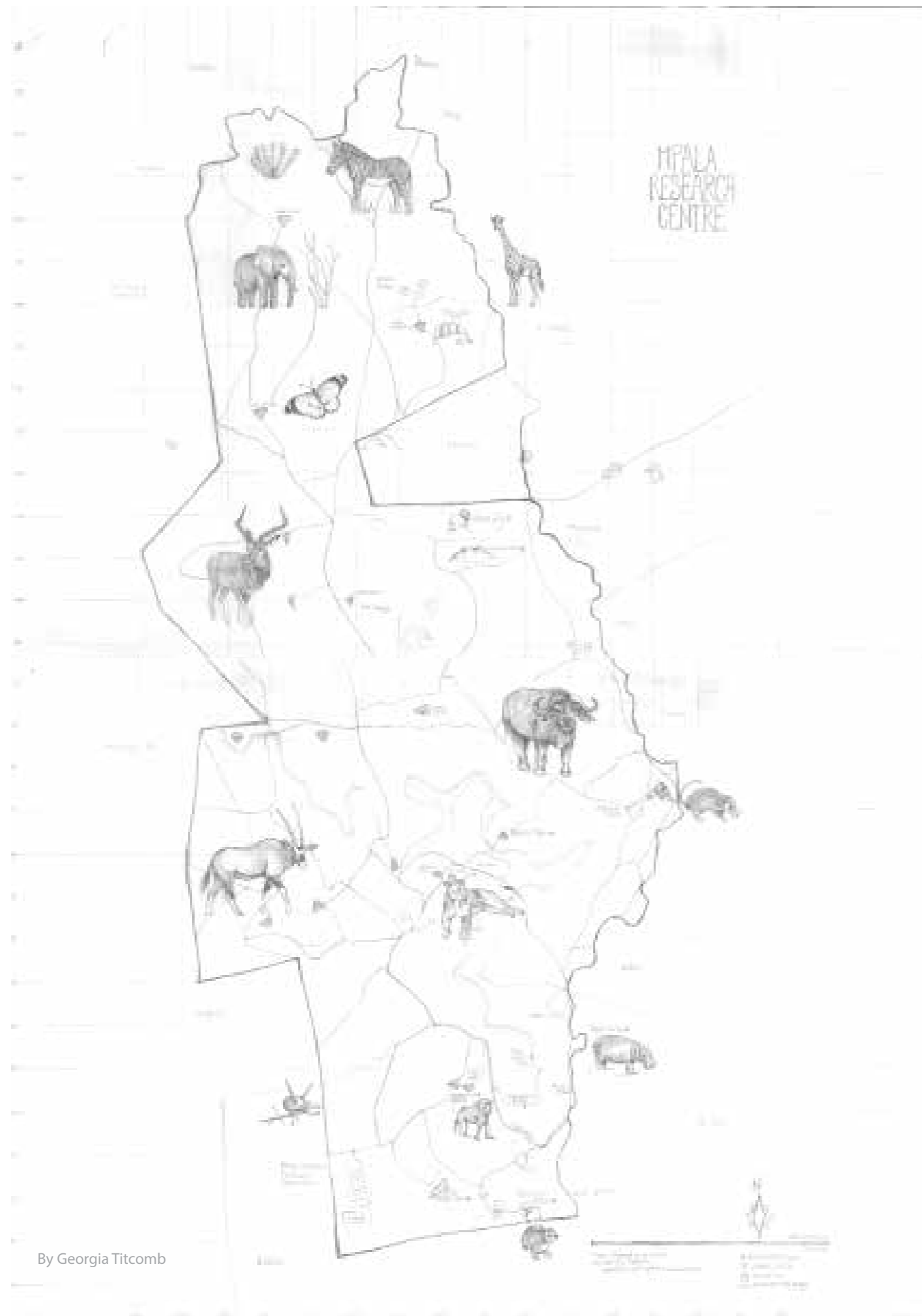
**Science & Outreach
2019**



SCIENCE | EDUCATION | CONSERVATION



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By Georgia Titcomb

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DIRECTOR'S LETTER

Dear Friends and Supporters of Mpala,

Many greetings and it is my great pleasure to share our 2019 Science and Outreach report with you as a small token of our thanks for your continued support for Mpala. As we continue celebrating our 25th Anniversary year into 2020, I am especially pleased to share the many discoveries and wonders that Mpala provides for students and scientists from Kenya and around the world.

The team at Mpala has worked tirelessly over the past year to ensure that our students and scientists have been able to continue doing research, learning, teaching, sharing and making discoveries. Our amazing team of dedicated staff, neighbouring communities and fellow conservancies and ranches in Laikipia enable our students and scientists to work across the landscape, ask bigger and broader questions and connect their science with real people and challenges.

There are many milestones to celebrate. I am especially pleased that in terms of scientific output, for the first time in Mpala's history, Kenyan authorship/co-authorship of scientific publications has passed 50 %. This is an accomplishment that is to be especially cherished as it means the knowledge being created through and at Mpala is more inclusive and relevant.

Mpala continues leading in both science and evidence-based best practices to improve the well-being of people, livestock and wildlife in Laikipia. One of our most successful projects this past year has been the latest round of the Laikipia Rabies Vaccination Campaign with over 15000 dogs and cats vaccinated in the neighbouring communities. This project is growing with exciting new partnerships, including with the Laikipia County Government and many others, and we look forward to celebrating the eradication of rabies in the near future in Laikipia.

And January 2020 sees the third Great Grevy's Rally that will be a large-scale count of this endangered species through citizen scientists: www.greatgrevysrally.com This year's count will include young citizen scientists from across Kenya. Sign up now if you're around and available!

One of the most inspiring parts of working at Mpala is seeing young minds sharing in making discoveries. I would like to mention the Vulturine Guineafowl Project, whose work has just been published in *Current Biology*, and featured on the cover, while making headline news across the world. This project includes our own Brendah Nyawguthii, and scientists from the Max Planck Institute of Animal Behavior, and has given us a remarkable insight into the complex social world of these beautiful birds.

All of these successful projects and discoveries are thanks to your generosity. Your donations help us keep working to explore, celebrate and engage with people and nature.

On behalf of the students, scientists, staff and Mpala family,

Asante!

Dino J. Martins



I finally got my first children's book published with National Geographic earlier this year - Yes, we can ALL be entomologists!

ABOUT MPALA

The Mpala Research Centre was opened in November 1994 at the core of the Ewaso Ecosystem, a large, geographically diverse region of central Kenya, defined by the Ewaso Ng'iro River and its tributaries. The region is characterised by arid and semi-arid savannas and woodlands and has an estimated 550 bird species and 100 mammal species, including large populations of elephants and rare species like the Grevy's Zebra, reticulated giraffe, African wild dog and black rhino. The region is unique in that little of it is formally protected, yet wildlife abundance rivals the renowned Maasai Mara and Serengeti ecosystems. The Mpala property is located on the Laikipia Plateau and has grown to be over 48,000 acres. It is a hub for experimental and manipulative research by visiting scientists and students. Mpala provides a 'living laboratory' without the restrictions of a national park, allowing scientists to manipulate the environment and conduct landscape-level, controlled experiments to explore basic science, address real-world problems, and ensure that sustainable livelihoods and economic advancement are synonymous with wildlife conservation.

Mpala's Institutional Mission is to support research that improves ecosystem functions, conserves biodiversity, and enhances the livelihoods of employees and their families who are predominantly traditional pastoralists. In conjunction with this mission, Mpala works to advance the understanding and conservation of natural and human-occupied ecosystems through basic research, education, outreach, and by creating new scientific knowledge and developing science-based solutions to guide conservation actions for the benefit of nature and human welfare.

MPALA'S MISSION

- Operate an enduring facility for research and education in environmental, biological, and conservation sciences at local, national, and international levels.
- Sustain a long-term environmental monitoring program to measure changes in climate, land-use, vegetation, and livestock and wildlife numbers, to understand biotic processes at the landscape level, and to identify mechanisms for maintaining the integrity of an expansive savanna ecosystem.
- Develop an informed approach to conserving the natural resources of the greater Ewaso ecosystem, and, by example, other 'non-protected' areas of Kenya.
- Promote human and wildlife co-existence in the greater Ewaso ecosystem and provide information to help resolve conflicts.
- Provide educational opportunities via experiential learning in research and monitoring skills for students and professionals from Kenya and around the world.



SCIENCE



EDUCATION



CONSERVATION

PARTNERS

Mpala is a joint venture of the Mpala Wildlife Foundation, Princeton University, the Smithsonian Institution, the Kenya Wildlife Service, and the National Museums of Kenya. Mpala provides interdisciplinary research and training programs in ecology, evolution, geology, and resource management to scientists from Kenya and around the world. Researchers representing all our partners are drawn to Mpala to study the centre's remarkable ecosystems, making Mpala a hub for collaborative research.



In 1989 George Small created the **Mpala Wildlife Foundation** to fund the activities necessary to achieve his vision. It supports the wildlife conservancy, a primary school for employees' children, community outreach, including a Mobile Clinic, as well as the working cattle ranch that successfully coexists with an abundance of wildlife.



Princeton University serves as the managing partner for Mpala. Through Princeton University, Mpala has been awarded several NSF grants to improve facilities and completely rebuild the campsite, and most recently to construct a cutting-edge genomics and stable isotope laboratory. Throughout the year, Princeton faculty, researchers, and graduate and undergraduate students visit the property to expand their knowledge of the African landscape and to undertake research.



Smithsonian

The **Smithsonian Institution** is a Trust Instrumentality of the United States that administers a group of Museums and Research Centres. Mpala is the Smithsonian Institution's first permanent research facility in Africa. The Smithsonian Institution offers multiple fellowship opportunities with Mpala to promote the study of biology, anthropology, geology, hydrology, material science, social science, soil science, and related areas. The Smithsonian also collaborates with Mpala on long-term research and monitoring on the greater Ewaso ecosystem.

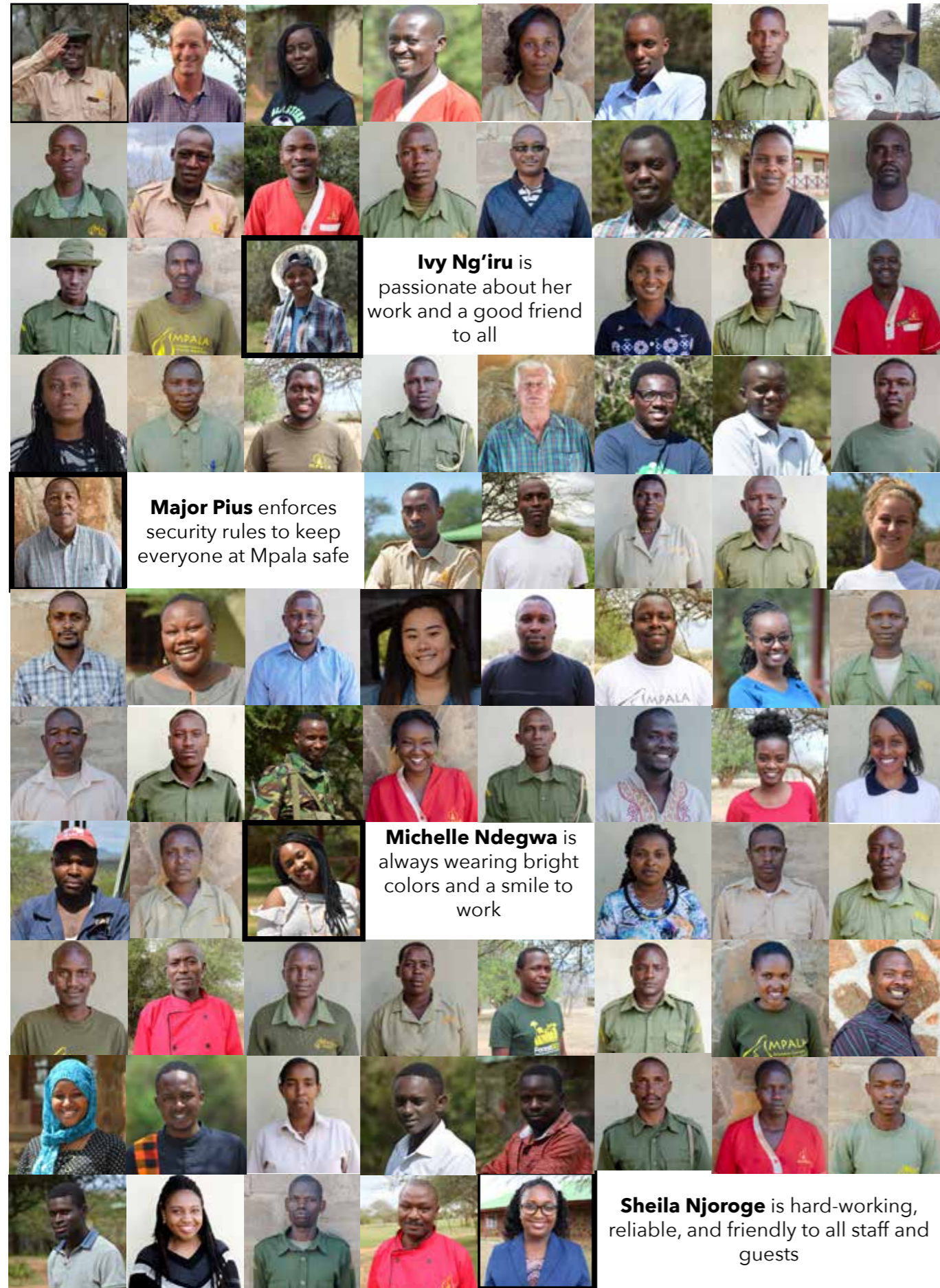


The **Kenya Wildlife Service** is the government agency tasked to protect and manage the fauna, flora, and ecosystems of Kenya. KWS undertakes and coordinates biodiversity research and monitoring. Multiple research projects collaborate with the KWS when collaring wildlife. More recently, the Smithsonian-Mpala Veterinary Fellow has been working with KWS veterinarians to treat injured or sick wildlife on Mpala and surrounding conservancies.



The **National Museums of Kenya** is a state organisation that manages museums, sites, and monuments in Kenya. It carries out heritage research and has expertise in subjects ranging from paleontology, ethnography, and biodiversity research and conservation. Multiple researchers at Mpala are officially affiliated with NMK and collaborate with NMK scientists, making extensive use of their facilities, materials, and expertise.

FACES OF MPALA



WEATHER & CLIMATE

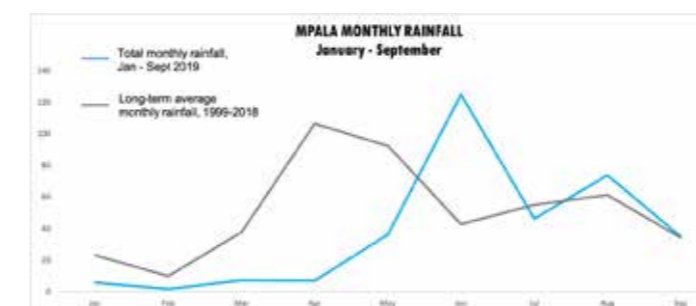


Mpala Research Centre boasts beautiful weather - cool evenings and mild days with plenty of sunshine and occasional rain showers. Behind this, however, are concerning changes in long-term weather patterns. Northern Kenya has been experiencing rapid climate change, and most noticeably affected is rainfall. Once predictable, the rains are now erratic and there has been a 75% decrease in the reliability of the seasonal long rains. When the storms come they are more intense, which leads to flooding and topsoil damage, and the dry periods are longer between rainfall, with increasingly frequent droughts.

At Mpala we are closely monitoring these trends and the impact they have on the wildlife and people of Laikipia, to better inform climate-resilient conservation and land-use decisions as we move into an increasingly uncertain future.

2019 vs 2018

January-September 2019 has been drier than the same period in 2018 - by this time last year, it had rained nearly 200 mm more. The greatest differences were in the months of March and April, where it rained 17 times and 27 times more in 2018, respectively.



2019 vs Long-term Trends

The first half of 2019 was significantly drier compared to long-term averages. The highest rainfall levels in 2019 were in June, which is towards the later end of the seasonal long rains, while in previous years the highest rainfall levels occurred in April,

at the beginning of the seasonal long rains. This shows that much-needed long rains are coming later than they had historically. The total rainfall in the 2019 March-June long rains was 150 mm lower than the long-term average, and the 2019 April-June long rains were 99 mm below average.



Nanja North Weir A: The completion of Weir A will add 7.5 million litres of water to Mpala.

Source:

Caylor, K. K., Gitonga, J., & Martins, D. J. (2019). Mpala Research Centre Meteorological and Hydrological Dataset. Laikipia, Kenya: Mpala Research Centre.

EDUCATION

Mpala is not only a well-known institution for research; it also provides unique educational opportunities for both scholars from Kenya as well as students and researchers from around the world. Mpala offers a varied array of internships and fellowships throughout the year that allow students and recent graduates to gain hands-on experience in new ideas and research topics. The fellowship programs at Mpala allow for recent graduates, masters, doctoral students, and postdoctoral researchers to dive into ground-breaking research. Over the years, the capacity for fellowships and funding for fellows to conduct their own research projects has increased, allowing for more resources for the fellows.

In addition to the internships and fellowships offered, Mpala also hosts numerous school groups and workshops throughout the year. A few of the many topics covered in these rigorous courses and workshops include ecology, anthropology, and livestock and wildlife health.

Mpala also facilitates education locally by offering scholarships for students from Mpala Academy and from nearby communities. In the past few years, Mpala has supported several students pursuing both high school and college-level education. Mpala helps promote educational opportunities by assisting students financially as well as providing mentorship from researchers and administrative staff. Students and professionals that come through Mpala for these opportunities come out having gained a unique insight into human-wildlife interactions, rare experiences with wildlife, a greater knowledge of the savanna ecosystem, and much more.

Mpala takes pride in supporting and encouraging educational opportunities for students on a global scale. It is a fundamental part of our mission and will be expanded in the coming years, offering more scholarships, hosting more fellowships, and facilitating more courses.



FELLOWSHIPS

Dr. Maureen Kamau is a veterinary research fellow hosted at Mpala under One Health in conjunction with the Smithsonian Conservation Biology Institute's Global Health Program and Mpala Research Centre, in collaboration with Kenya Wildlife Services and Ol Jogi Wildlife Conservancy. The fellowship allows for the vets to participate in wildlife clinical interventions as well as conduct research with a One Health focus, which looks at human, wildlife, and domestic animal health under one lens. The fellowship is offered to two research fellows, one Kenyan fellow and one foreign fellow, in order to facilitate an exchange of experiences and perspectives from vets with different backgrounds. Dr. Kamau works closely with the other veterinary research fellow, Dr. Ellie Milnes, on various wildlife interventions. Part of Dr. Kamau's work also includes working closely with researchers at Mpala to help enrich their studies from a vet's perspective. In addition, she is also highly involved with projects at Mpala that require animal immobilization, such as collaring projects, as well as projects that require collecting animal samples. Currently Dr. Kamau is working on a rhino reproductive hormone study at Ol Jogi conservancy where rhino monitoring rangers and conservation managers help to collect fecal samples from the female eastern black rhinos in order to further understand their population growth levels in hopes of conserving the endangered species.



Dr. Kamau and Dr. Milnes working with baboon ecologists to take samples and monitor the health of a young baboon immobilized to fit collars. Photo by Ken Gitau.

Dr. Ellie Milnes is a wildlife veterinarian at Ol Jogi Wildlife Conservancy and a veterinary research fellow under with the Smithsonian Conservation Biology Institute's Global Health Program and Mpala Research Centre, in collaboration with Kenya Wildlife Services and Ol Jogi Wildlife Conservancy. The One Health focus of the fellowship aims to merge environmental, human, wildlife, and domestic animal health under one overarching umbrella. This two-year fellowship allows for vets to be engaged in wildlife clinical interventions as well as conduct research through a One Health lens. The Smithsonian and One Health fellowship accepts two fellows, one Kenyan veterinarian and one foreign veterinarian. Dr. Milnes works alongside Dr. Maureen Kamau, the other veterinary research fellow, in order to exchange knowledge and experiences and gain a different perspective on research and veterinary practice.



Dr. Duncan Kimuyu is a lecturer at Karatina University and received the Smithsonian Institution and Mpala Postdoctoral Fellowship. Dr. Kimuyu's research focuses on processes that have strong impacts on vegetation dynamics in savanna ecosystems. For his fellowship he is specifically exploring the role of herbivory as a driver in woody vegetation structure and composition. His project also looks at the interactions between fire and herbivory by both domestic and wild ungulates in the Kenya Long-term Exclosure Experiment (KLEE) at Mpala Research Centre. His research has opened up new ways of thinking and approaching livestock, wildlife, and fire management in savannas. In addition to his own research, Dr. Kimuyu also participates in the science community at Mpala by having research open days for students, lecturing in field courses, and facilitating outreach programs to stay connected in the science community.

Dr. Duncan Kimuyu checking a camera trap in the field.

PRINCETON IN AFRICA FELLOWSHIPS

Princeton in Africa matches college graduates with organizations working across Africa for year-long service placements in sectors ranging from agricultural development and education to public health and conservation. The Princeton in Africa Fellows at Mpala have a variety of roles. The fellows function as liaisons between researchers and the administration and help coordinate Mpala's outreach programs, which include our Laikipia Rabies Vaccination Campaign, the Northern Kenya Conservation Clubs program, training workshops and research open days.

Megan McDaniels is the Science Coordinator Fellow at Mpala through Princeton in Africa. Megan works to link researchers with communities by creating convenient venues for science-based outreach while also connecting the management with researchers by coordinating institutional data maintenance as well as sharing and managing laboratory facilities. Megan also contributes to science communication throughout the Mpala community of scientists, educators, students, staff, and the public, and spearheads new initiatives documenting and communicating science at Mpala to the Mpala network, particularly potential donors.



Elaina Gu is the Education Coordinator Fellow at Mpala through Princeton in Africa. Elaina works to link the management with students by coordinating programmes and facilitating educational experiences, from internships to university field courses to Conservation Club visits. In addition, she also contributes to communications throughout the Mpala community of scientists, educators, students, staff, and the public. Elaina works closely with Mpala to increase educational outreach by facilitating conservation and science education in local as well as international communities and students.

INTERNSHIPS, FIELD COURSES, AND WORKSHOPS



Mpala hosts interns from around the world and each have the opportunity to explore various unique projects and develop professional skills through their experience at Mpala

**30
INTERNS**

Workshops at Mpala are a great opportunity for participants to further explore their field and gain some hands-on experience through practicals in the field or at Mpala's labs. Workshops covered topics such as livestock health, insects, and rhino health.



**6
WORKSHOPS**



Workshop participants come from Kenya and around the world to gain hands-on research experience in their respective fields. Mpala is a perfect place for both field work and lab work with our location and state of the art lab equipment.

**200
PARTICIPANTS**

Mpala partners with many universities and school groups to host various field and educational courses at the research centre. These courses range from ecology courses to community health to anthropology. Students have the opportunity to gain field experience in the African savanna and attend lectures from Mpala's researchers.



**24
FIELD
COURSES**

PRINCETON INTERNS



Mpala hosts interns from Princeton University every year. In 2019 there were 12 interns working on various projects at Mpala. Four students were doing projects under the Princeton Environmental Institute specifically on cattle, Grevy's zebra, and Buffel grass. There were two Princeton rising seniors that were doing thesis projects and research at Mpala. Two Princeton students and one student from the nearby community of Lekiji worked with Nancy Rubenstein on projects relating to the Northern Kenya Conservation Clubs. Finally, four interns worked with local schools through Princeton's Office of Religious Life. All students and interns stayed at Mpala for eight weeks and were able to also visit Ngare Ndare, Mount Kenya, the Animal Orphanage, and a few of the local communities.

SMITHSONIAN PEMBROKE INTERNS

2019 is the second year that Mpala is hosting students from Oxford University as well as veterinarian students from Nairobi as part of an internship program between Smithsonian Institution and Pembroke College at the University of Oxford. The students spent eight weeks at Mpala working on various on-going research projects. The two veterinary students from University of Nairobi worked on projects under the One Health initiative, mentored by the Mpala Smithsonian veterinary fellow, Dr. Maureen Kamau. The University of Oxford students were able to each experience unique projects during their time here supervised by the ForestGeo team, Sandy Odur, and Dr. Duncan Kimuyu.



PIIRS GLOBAL SEMINAR



This summer, Mpala hosted a Princeton film course with 20 Princeton students and five Kenyan students from Nairobi. The course returned to Mpala after about a decade when the course was last offered. The students were able to learn and sharpen skills in filmmaking as well as engage in methods of science communication. In several groups, the students were able to create films during their eight weeks here that were screened at our Science, Education, and Conservation Film Festival in mid-September at Cedar Mall with a VIP appearance by the Governor of Laikipia.

PRINCETON & COLUMBIA FIELD SEMESTER

Every year Mpala hosts students from Princeton University and Columbia University for a semester-long field course. The course dives into various topics such as the ecology of savannas, conservation in Africa, the natural history of mammals, vector biology, tropical agriculture, engineering and hydrology, and paleoecology. The semester program consists of four separate courses that are taught in three week increments. While at Mpala, students were able to visit different parts of Kenya and conservancies such as Kakamega, Turkana, Watamu, and Lewa.



TURKANA BASIN INSTITUTE FIELD SCHOOL



The students of the Turkana Basin Institute visit Mpala a few times a year before travelling to Turkana to continue their Anthropology and Ecology course. The course is typically composed of both students from the US along with several Kenyan students. The Introduction to Ecology course runs for two weeks at Mpala and is taught by Dr. Dino Martins. The students were able to visit local communities, Mount Kenya, the Animal Orphanage, and had the opportunity to hike and enjoy various kopjeys at Mpala.



ONE HEALTH COURSE



By Nashipai Seketeti (Pembroke-Smithsonian Veterinary Intern)

The third livestock health and disease training was held at Mpala Research Centre from 11th to 13th of September 2019. The workshop was facilitated by the Mpala Research Centre staff and the Coopers (Prof John Cooper and Margaret Cooper). The workshop was inclusive, as the group was made up of international participants from diverse areas of expertise. The workshop started with a series of lectures with the main topics being: signs of health in domestic livestock (cattle, camels, and goat), signs of disease in domestic livestock, common zoonotic infectious and non-infectious livestock diseases, and the role of wildlife in livestock diseases. These lectures highlighted the need for a multi-disciplinary approach to solving conflicts emanating from livestock, human, and wildlife interactions. With a One Health approach, sustainable conservation can be achieved at the human-animal interface to reach low to no conflict.

After the lectures, there were practical sessions and field technique demonstrations on approaches to clinical cases, disease diagnosis based on clinical observations, live animal sampling, and post-mortem examination of carcasses. Safe sample collection, packaging,

labeling, transport of samples, and storage and processing in the laboratory were emphasized throughout the workshop. We were also trained on parasite detection and identification using field microscopes, which will greatly facilitate early disease detection in a herd of animals, thus creating better herd management and productivity.

There was also a community outreach session at Lekiji Village, where community members were taught how to identify and report any signs of sick animals. We collected various samples from different species of domestic animals in the village and processed the samples in the laboratory. To conclude the workshop there was a lecture on wildlife forensics and crime scene investigation and the various steps taken during a wildlife crime scene investigation.

In conclusion, the workshop was a total success as all the objectives were met. It was very exciting interacting and sharing knowledge with so many professionals from different educational backgrounds and with the community members.

RHINO VETERINARY AND CONSERVATION WORKSHOP

VISIT TO OL JOGI: the workshop visited Ol Jogi Conservancy for a day to visit their rhinos and learn more about care for orphaned rhinos.



ZEBRA IMMOBILIZATION: the participants of the rhino workshop had immobilized a zebra as part of their practical in order to learn more about the process of treating wildlife in the field.

HORSE NECROPSY:

a horse necropsy was performed as part of a practical for participants to learn more about how a necropsy is carried out and what to look for and sample.



OUTREACH

WILDLIFE WARRIORS

By Elaina Gu (2019-2020 PiAf Fellow)



Over the past several years Mpala has worked closely with WildlifeDirect as a partner organization. WildlifeDirect is a non-profit organisation in Kenya that works to provide support to conservationists in Africa through educational blogs which allows anyone, anywhere, to learn and play a direct and interactive role in the conservation of various species in Kenya. Their mission to connect people to wildlife and nature in order to inspire them to treasure and act to conserve the ecosystem around them is supported through their various blogs, TV series, and expeditions. Their signature education and outreach program, Wildlife Warriors, serves as an educational outlet that introduces and exposes Kenyan children to endangered wildlife through a nationwide program targeting public primary schools. While the project is still fairly new and is in its first few years of implementation, it is already working with 34 schools across Kenya.

This year WildlifeDirect held its second ever five-day Wildlife Warriors Kids Expedition in August, which was hosted at Mpala. The expedition

included 115 students, ranging in age from 10 to 17, chosen from the 34 schools located in remote and isolated areas across Kenya that are involved with the Wildlife Warrior program. Students came from all across Kenya including Kilifi and Kwale Counties, the coast, and Busia and Siaya in the western regions of the country. Some students travelled for two days before even reaching Mpala Research Centre, while other students from the north, including Wamba, Marsabit, and Isiolo, spent up to 15 hours on the road to reach Mpala. Some students had never been in vehicles before and some had never even left their villages prior to coming to Mpala. Most students had not been exposed to any wildlife before, so the journey to Mpala itself served as an educational experience. Some students saw the Great Rift valley for the first time while other students stopped to learn about farming along the way.

The 115 students stayed at the River Camp and learned how to pitch their own tents. Through various sponsors, students were provided with a backpack, a water bottle, an expedition T-shirt,



stationary, and collection jars for their four full days of field visits. The expedition was designed to encompass the themes of endangered species, their habitats, threats, and mitigations. Students learned about the various habitat types found at Mpala and what types of animals were found in each. They had the opportunity to see rare and endangered animals such as Grevy's zebras, reticulated giraffes, hippos, and elephants while driving through Mpala. The students also learned how to track wild animals, and to top it all off saw lions, cheetahs, and wild dogs. They collected samples from the field such as feathers, bones, grasses, and other specimens in order to create their own museums. In addition to the field visits and game drives at Mpala, the students were able to visit Ol Jogi Conservancy where they saw the critically endangered black rhino. Not only were the students able to experience the staple wildlife of Kenya, they were also able to meet people they

might never have met before, such as ranchers, herders, scientists, laboratory technicians, and wildlife rangers.

Mpala was proud and happy to facilitate WildlifeDirect as they provide opportunities for citizen scientists to connect with wildlife and nature in order to teach them to value and act to conserve the environment around them. The program aims to help shape and inspire the next generation of young advocates and conservationists who will have a large impact on their communities and contribute to sustainable and responsible solutions to matters affecting the environment, conservation, and human-wildlife conflict.



MPALALIVE!



**45
MILLION
VIEWS**

Lifetime views of the live cameras on all platforms including YouTube, Facebook Live, and Explore.org top 45 million with about 1.5 million hours of viewing on YouTube alone. This past year MpalaLive! has had 270,355 users and 438,811 views in total.

The interactive Field Guide on the MpalaLive! website features 88 different species which is possibly the most complete resource for East African animals available online.

**88
SPECIES**



**26
LIVE CHATS**

MpalaLive! showcases 26 live chats and short videos describing the research and wildlife of Mpala which includes lions, people, and their prey.

50% of visitors check out the Classroom Section which features downloadable lesson plans and classroom activities geared towards both US and Kenyan students from grades 1 through 12.

**50%
VISITORS**

DARAJA ACADEMY

Daraja is a private boarding secondary school that provides quality education to exceptional Kenyan girls from across Kenya who have top academic scores and exceptional leadership skills but lack the financial means to continue their education. The academy provides students with full scholarships and resources to grow into critical thinkers, progressive leaders, and architects of their futures. The school's mission offers holistic education for spiritual, social, physical, and intellectual growth, with counselling, peer support, and meditation. In addition, Daraja allows students access to the Kenyan Secondary Education curriculum and an opportunity to sit for the K.C.S.E. National Exams, includes a strategic student selection, a weekly empowerment course entitled WISH (Women of Integrity, Strength, and Hope) taught over the course of four years, and a Transition Program unique to Daraja which prepares graduates for life after secondary school.



Every year Mpala hosts girls from Daraja Academy for internships and mentorship programs. The programs aim to expose girls who recently completed high school to the job market. The goal of the experience is to help them make more informed choices on their career goals and select the most suitable courses when they join college. In addition, the Daraja Transition Programme is a life skills training program that seeks to develop self reliance and career readiness in promising female high school graduates. This year, Mpala hosted two Daraja interns, Lucy Rimbaiz and Linet Lokwei, from March to May 2019. The two interns were mentored by UHURU senior research assistants and were able to gain experience and skills performing field data collection, entry, and analysis. Lucy and Linet celebrated their graduation from Daraja Academy in May 2019, and began University in September 2019. Additionally, Mpala donated \$1,000 to the academy to help fund their work and mission.

ONE MORE DAY FOR CHILDREN

The One More Day for Children Foundation has been working within communities to prevent childhood marriage for the past nine years to change the narrative through both curative and reactive programs. It has established a safe House for Girls who are the survivors of these practices in Laikipia North Constituency and Doldol Township on 13 acres of land donated by the Kenyan government. Teenage girls who fall pregnant as a result of childhood marriage may face threats of crude abortion and have found shelter in the Safe House for themselves as well as their babies. The organisation has many babies and girls at risk, yet they are financially willing to reach and rescue them, admit them into the Safe House, and enroll them in school.

The Girls' Safe House in Laikipia North and Doldol is completely reliant on charitable donations and financial help from supporters and partners who share their vision in order to provide these services. This past year, Princeton students helped to raise \$9,854 for OMDC and their mission to give adequate opportunity to children and young persons to realize their full potential by securing, protecting, and promoting their fundamental rights.



LAIKIPIA RABIES VACCINATION CAMPAIGN

Mission to Eradicate Rabies



Rabies is a deadly viral disease that can infect all mammals, including humans. It kills 2,000 people annually in Kenya - nearly six people every day. Many of these victims live in rural areas that have low access to post exposure rabies treatment. Since domestic dogs are the main reservoir for the virus, children under the age of 15 years are particularly at risk as they frequently come in contact with dogs. Rabies not only threatens human wellbeing, but can also be a crisis for wildlife conservation. It can easily be spread from domestic dogs to endangered wildlife like African wild dogs, cheetahs, and lions, decimating their already fragile populations. With its high level of interaction between humans, domestic dogs, and wildlife, Laikipia County sits in an environment where rabies outbreaks are frequent and devastating.

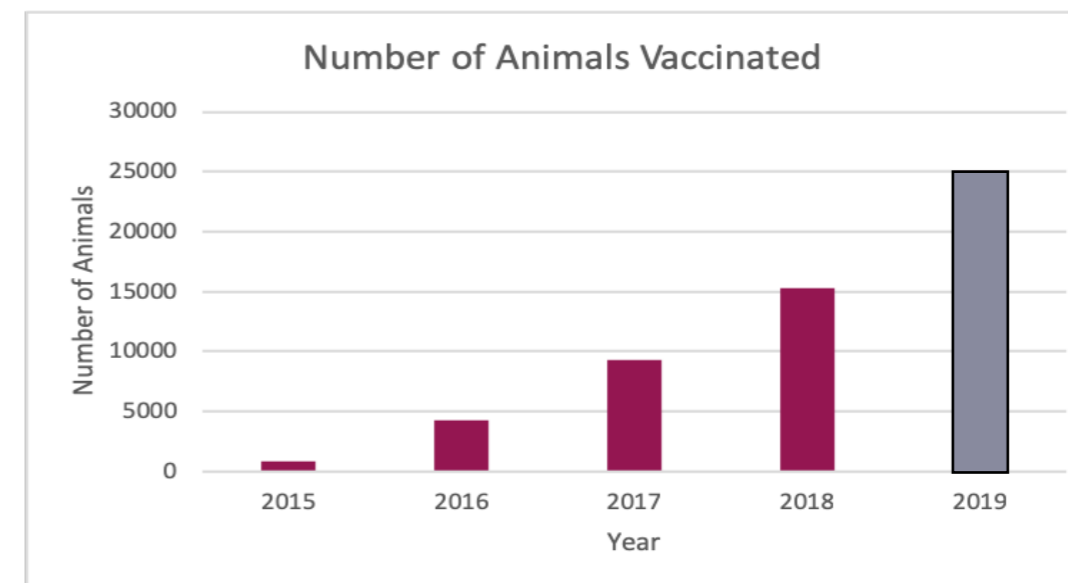


The Laikipia Rabies Vaccination Campaign (LRVC) is an ambitious program aimed at eradicating rabies in Laikipia County and serving as a model for rabies eradication in rural communities throughout Kenya and beyond. Research shows that in order to fully eradicate rabies from an area, 70% of the domestic dog population must be vaccinated for three consecutive years (WHO, 2005).

This year's vaccination campaign was pre-launched by H.E Governor Ndiritu Murrthi and Dr. Dino Martins during the Science, Education, and Conservation Film Festival on September 15th, while the campaign officially kicked off the weekend of September 27th in time to celebrate World Rabies Day. This year LRVC has a goal to vaccinate 25,000 dogs, which will help us



The Governor of Laikipia County, H.E Ndiritu Muriithi and the Director of Mpala Research Centre, Dr. Dino Martins, pre-launching LRVC at the Film Festival.



LRVC has come far since the pilot year in 2015. This year we are striving to reach our goal of 25,000 dogs in order to hit the 70% mark of the total dog population.

complete our first year of reaching the 70% vaccination threshold. During our LRVC launch weekend Mpala, hosted the Founding President of Veterinarians International, Dr. Scarlett Magda, and her team of vets to further discuss a long-term partnership between Vets International and the campaign. Mpala also hosted, Frederic Lohr, a representative from Mission Rabies, to help train volunteers on using a new mobile app in order to better track the number of dogs vaccinated and communities visited. In addition to a successful first weekend of vaccinating and training, LRVC co-founder and researcher, Dedan Ngatia, was nominated for the short list for the World Rabies Day Awards by the Global Alliance for Rabies Control. If Dedan wins the award Global Alliance for Rabies



Control will donate \$1,200 towards the campaign while also helping to promote the campaign in order to facilitate fundraising.



THE NEXT GENERATION OF CONSERVATIONISTS

The Northern Kenya Conservation Clubs were started as an outgrowth of Dan Rubenstein's research on Grevy's zebra in Samburu. Dan and his team hired three scouts in each community to collect data. Every year Dan and his colleagues would go to the communities to share what was learned from the data, going afterwards into the local primary schools to teach a lesson on conservation biology. One of the head teachers wanted to know how the lessons could continue when Dan wasn't there. Thus the idea of the conservation clubs was conceived. Dan and his wife Nancy, a teacher, along with educators from Saint Louis and San Diego zoos held a workshop with local teachers and members of each group ranch to develop a curriculum for the clubs. In 2009, the first year, there were clubs in four of the primary schools where Dan was conducting his research: Mpala, Il Motiok, Naiperere, and Ewaso.



Since 2009, the Northern Kenya Conservation Clubs have expanded to 16 clubs ranging from young Kenyan students to two secondary schools, which were added this past year. These clubs meet one day a week after school, during the school terms with the goal to raise students' awareness of the natural world around them and the need to take care of the land and wildlife. To keep lessons interesting, memorable, and unique from the rest of the school day, the activities are very much hands-on. Some activities include games that teach concepts, original drawings and writing by students, exploration of the natural world, as well as reading stories about concepts included in the curriculum. The learning is designed to be fun and distinct, to facilitate sharing the information with family and friends.

With the recently-added secondary schools and a wide range of school levels, Dan and Nancy Rubenstein are currently developing new and varying curriculum for the different levels. Since the style of teaching is quite different from what the club teachers are accustomed to, a

teacher workshop is held every January to help teachers understand what experiential, hands on learning is and how they can carry out the pre-designed curriculum. During these workshops teachers will take on the role of students in order to experience the activities from the students' perspective and are able to give feedback on what makes the activities more fun and engaging. We are looking forward to hosting the workshop this coming January.



Every year, on a Saturday in July, a Community Conservation Day is held at the most centrally located school. All clubs attend, and the community is also invited. It is designed to be a day of learning and sharing where students from each club have the opportunity to present a display about a conservation project at their school or an interesting topic they have been learning about throughout the year. In addition, each club creates a performance - a poem, play or activity - that they have worked on to demonstrate topics they have learned about in the past year. In July 2019 the Community Conservation Day was combined with Northern Rangelands Trust, who gave three vehicles to the Naibunga Conservancy for security. The donation of the vehicles increased the attendance of the event, including the Governor of Laikipia County and the Member of Parliament, as well as elected officials from the Naibunga Conservancy. In addition, over 400 club members were in attendance, presenting a very informative environmental fair and presentations from each of the clubs. While Dan and Nancy are the co-founders of NKCC, club staff members also include Mpala's Wilson Nderitu as club coordinator, and Ayub Kingori and Mpala's Everlyn Ndinda as club supervisors. Ayub and Everlyn get out to the clubs regularly to help keep the lessons and activities going.



RESEARCH & CONSERVATION

RISE OF THE PHOENIX PACK

By Megan McDaniels (2019-2020 PiAf Fellow)

SCIENCE IN ACTION



Top Left: Dr. Mutinda from KWS preparing to immobilize a zebra for the Rhino Workshop.
Top Right: Researcher, Evan Hoki, and Princeton Fellow, Elaina Gu, working at Mpala's bushhouse.
Center: Researcher, Ivy Ng'iru, collecting data in the field.
Bottom Right: Researchers from the Turkana Genome Project meeting with community members.
Bottom Left: Researcher, Brenda Nyaguthii, tracking Guineafowl in the field.



The African wild dog embodies the best of untamed nature in Kenya. They are clever, tireless hunters devoted to their familial packs. They are also one of the world's most endangered mammals, with just 3,000 to 5,500 individuals remaining. Wild dogs had nearly disappeared from Laikipia County in the 1990s due to infectious diseases like rabies and conflict with pastoralists, but focused conservation efforts helped the canines grow to over 300-strong. This made them the largest population of wild dogs in Kenya. But in 2017, severe droughts drove herders -and their domestic dogs - down from the north into Laikipia. The mixing of these domestic dogs with wild dogs led to an outbreak of the deadly canine distemper disease that spread rampantly through the population - and the wild dogs of Laikipia were thought to be entirely wiped out.



the ashes - and they were dubbed the "Phoenix Pack".

Almost a year passed without any wild dog sightings. Then in 2018, a lone female was spotted wandering Mpala. Despite being a pack animal, she had somehow survived on her own. Her survival also suggested that she may be naturally immune or resistant to canine distemper. As researchers debated the next steps, she was joined by two wandering males who seemed to come from out of nowhere. The three wild dogs linked up to form a small group, and then beyond conservationists' wildest hopes, the female denned and had five pups. From this, a new pack rose from

Now a year later, wild dog numbers have continued to slowly climb. Currently one pack of nearly 20 animals lives at Mpala. This summer the alpha female denned again and had a litter of pups, bringing greater hope to their continued presence in the landscape.

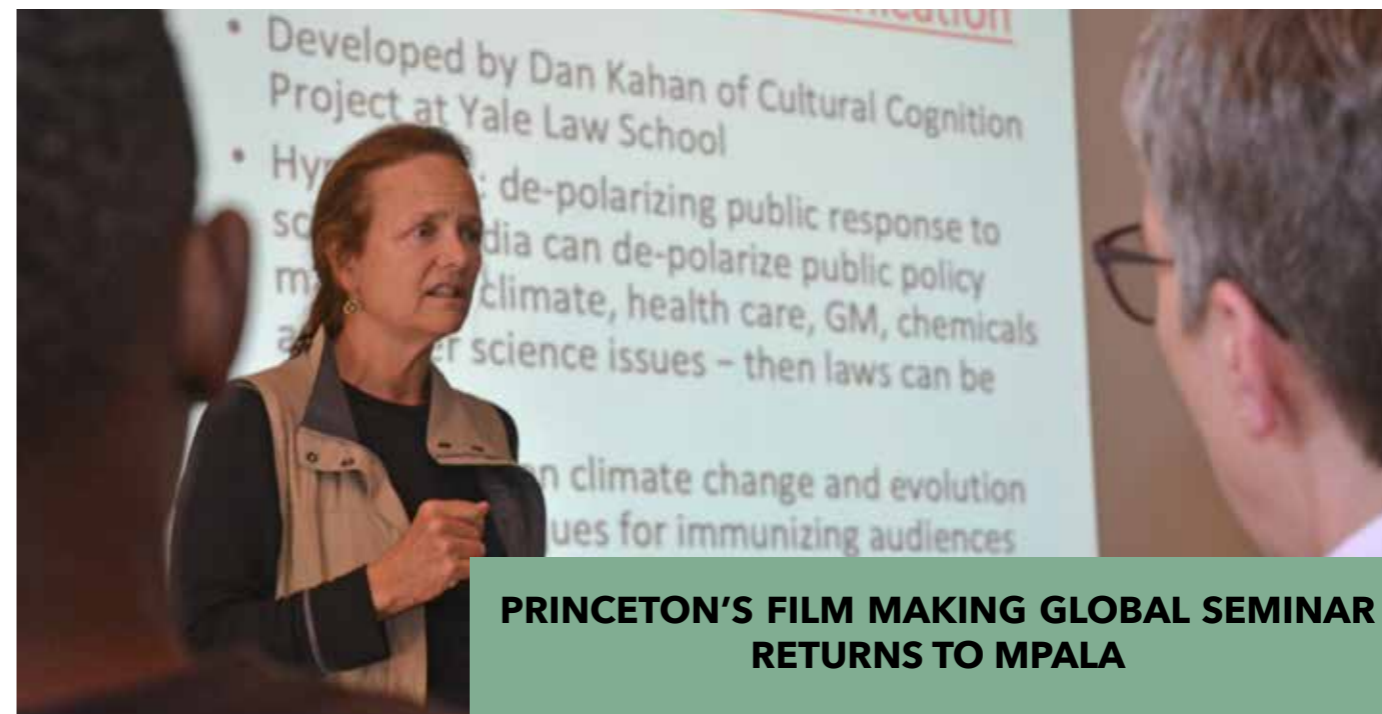
Researchers at Mpala have been studying wild dogs since 2001 through the Samburu-Laikipia Wild Dog Project, led by Dr. Rosie Woodroffe and Dedan Ngatia. They are focused on developing sustainable solutions for pastoral people to coexist with the wild dogs and are also studying the impacts of climate change and future resource needs for the species. They are involved in the Laikipia Rabies Campaign with a goal of eradicating rabies throughout the county, for the health of wildlife and people.



HIGHLIGHTS FROM 2019



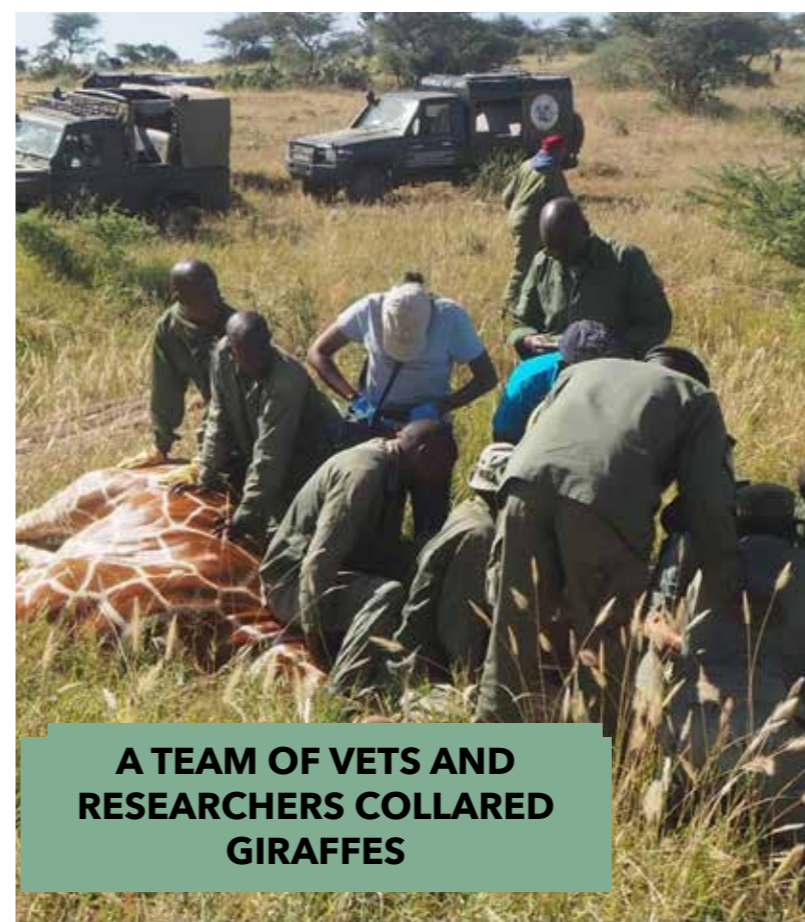
A BLACK LEOPARD AND CUBS SPOTTED AT MPALA



PRINCETON'S FILM MAKING GLOBAL SEMINAR RETURNS TO MPALA



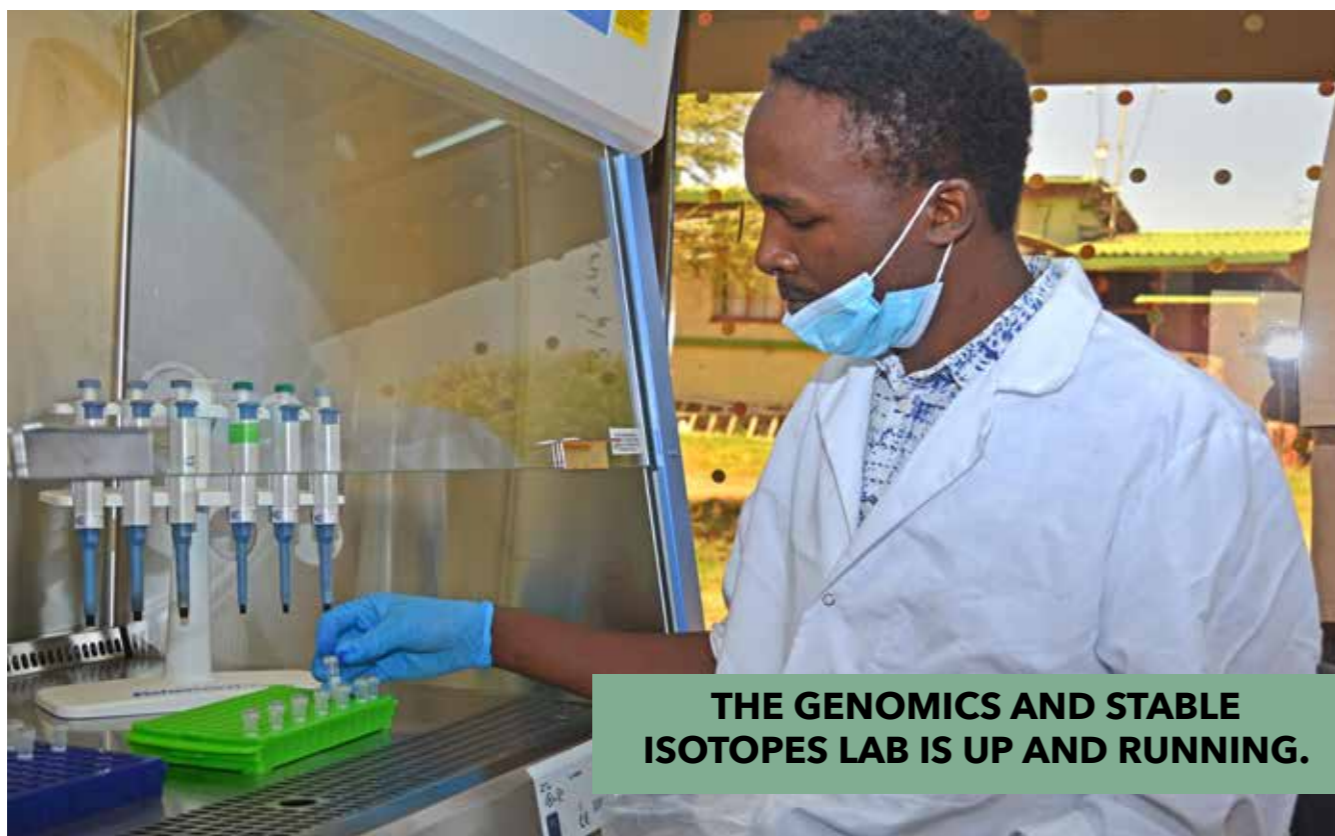
SCIENCE DAY IN JUNE 2019



A TEAM OF VETS AND RESEARCHERS COLLARED GIRAFFES



BABOON COLLARING FOR PRIMATE/BABOON BEHAVIOR PROJECT



THE GENOMICS AND STABLE ISOTOPES LAB IS UP AND RUNNING.



A NEW WEIR COMPLETED IN SEPTEMBER 2019

BIRDS OF A FEATHER



The Complex Social Lives of Vulturine Guineafowl

By Damien Farine (PI) and James Klarevas (PhD Student)

For most visitors to Mpala, the first few animals they'll encounter are hyraxes and maybe a zebra or giraffe on the road. What they won't fail to see are the omnipresent vulturine guineafowl that live in and around the research center. This group of birds have become habituated to humans and act as a welcoming committee of sorts. With their pinstripe-and-polkadot plumage, bright blue breast, and monk-like bald head, the guineafowl are the court jesters of Mpala. It is not surprising that they always garner immediate attention. Most people's introductory routines are interspersed with brief asides of "what are those birds?" and "what's that shiny thing on its back?", referring to the project's GPS backpacks on the birds. While it's easy to see why these birds are so attention-grabbing, revealing just how strange and fascinating they really are has taken years of careful study by a dedicated and passionate team. In late 2019, the Vulturine Guineafowl (VGF) Project's first findings were published, and these promise much more exciting science to come.

In 2019, Danai Papageorgiou, a PhD student on Dr. Damien Farine's VGF Project, assembled the first pieces of the puzzle that is the biology of these charismatic, group-living birds. Using a combination of daily censuses—where a team of researchers drive the roads of Mpala looking for groups of color-banded birds—and high-resolution

GPS data, the VGF team have shown that vulturine guineafowl live in a multilevel society. Multilevel societies occur where individuals of a species are organized into distinct, hierarchical tiers. These are thought to represent one of the most complex forms of social organization in nature. The classical example of such a society comes from Hamadryas baboons, where individuals group into breeding harems or groups of bachelor males. These groups then come together to form larger clans, and these clans then interact with other clans to form bands. These social structures mean that individuals have to keep track of many different types of relationships at the same time—no small feat!



Prior to this work, multilevel societies were only thought to exist in species of large-brained mammals, such as humans and other primates, elephants, and cetaceans. It has long been thought that the need to manage such complex social information is what drives the evolution of large brains in these species. And yet, vulturine guineafowl have relatively small brains, which only contain a number of neurons comparable to much smaller songbirds. That these small-brained birds are able to track and maintain social relationships challenges the notion that multilevel societies are exclusive to large-brained mammals and may even be more widespread than previously thought.

Looking to the future, researchers with the VGF project are working to unravel what makes the guineafowl's society tick. Current projects aim to understand how the social relationships within groups affect how they reach collective decisions, how young birds come into their societal roles (both within their natal group and by dispersing between groups), and how the ecology of groups are shaped by host-pathogen interactions. In October 2019, the team collaborated with researchers from the Mara Raptor project to fit GPS trackers to the pair of martial eagles that nest



A juvenile martial eagle: Martial eagles are one of the most common predators of vulturine guineafowl. Photo by Dr. Dino Martins.



just outside of the research center. With these birds, they hope to better understand how the environment (in this case predators), play a role in shaping the behaviour of vulturine guineafowl.

The VGF project began in 2016. As well as publishing the first findings, 2019 has also been a successful year for the project in a number of other respects. Dr. Farine was successful in securing a prestigious ERC Starting Grant, which will fund the project for 5 more years (2020-2024). The team also, for the first time, had over 100 individuals fitted with GPS tags at the same time. These, together with tagging the predators and ongoing survey and tagging efforts, promise to cement the VGF project as one of the richest studies, both in terms of the biology and the depth of possible exploration.

Source
Papageorgiou, D., Christensen, C., Gall, G.E.C., Klarevas-Irby, J.A., Nyaguthii, B., Couzin, I.D., Farine, D.R. (2019) The multilevel society of a small-brained bird. *Current Biology*, November 4th 2019 issue.

CURRENT LONG-TERM RESEARCH

KENYA LONG-TERM EXCLOSURE EXPERIMENT (KLEE)

DR TRUMAN YOUNG (U.C. DAVIS), DR DUNCAN KIMUYU (KARATINA UNIVERSITY), DR WILFRED ODADI (EGERTON UNIVERSITY), DR CORINNA RIGINOS (THE NATURE CONSERVANCY), DR KARI VEBLER (UTAH STATE UNIVERSITY)

The Kenya Long-term Exclosure Experiment (KLEE) was established in 1995 to determine the separate and combined effects on savanna ecology of herbivory by cattle, elephants, and other wildlife species, as well as fire. KLEE consists of 18 large (ten acre) experimental plots that can be viewed as representing a) different land uses (management for cattle, wildlife, or both) or b) the sequential loss of large wild herbivores. In addition to the plots themselves, the KLEE project has engaged in research on pastoral boma footprints and an audacious tree-thinning experiment. The overall project has thus far generated nearly 120 peer-reviewed publications, with over 80 from the exclosures, making KLEE the most scientifically productive field experiment ever carried out on the African continent. The KLEE plots have promoted collaborations among scientists from across the globe, producing cutting edge research and additional embedded experiments. These studies have been highly influential identifying the myriad ways that ecological communities are structured and function, and in particular how such insights can inform management and conservation actions.

PRINCETON ZEBRA PROJECT

DR DANIEL RUBENSTEIN (PRINCETON)

Before the Mpala Research Centre came into existence, Rubenstein studied both plains and Grevy's zebras in Samburu and plains zebras in Tanzania's Ngorongoro Crater. Those projects revealed much about their social and behavioural intricacies. With the creation of Mpala, long-term data of known individuals of both species enabled the project to construct genetic pedigrees and social networks that are mined to explore the ways in which kinship and social relationships are affected by environmental conditions and shape decision-making. Since its inception, over 65 papers have been published on zebras. Some have been on zebra themselves and their social lives, but others have used insights from this knowledge to inform management and conservation strategy. Initial work on zebra-livestock mutualisms has blossomed into exploring how further rangeland benefits can accrue by tinkering with livestock rearing practices. Similarly, an understanding of movements and needs is required to develop strategies for conserving the endangered Grevy's zebras. This project tracks Grevy's zebra numbers, their movement patterns, and health, while having a large outreach and education component and using research-based solutions to minimise human-wildlife conflict. Over the next 25 years the project will expand to look more closely at diets, disease and interactions with other grazers, especially livestock.

UNGULATE HERBIVORY UNDER RAINFALL UNCERTAINTY (UHURU)

R ROBERT PRINGLE (PRINCETON), DR JACOB GOHEEN (U. WYOMING), DR TODD PALMER (U. FLORIDA)

African savannas and their large mammals are iconic, but many fundamental questions about how the mammals shape the landscape, and vice versa, remain unanswered. These questions are timely because large-mammal populations are also declining worldwide, with major shifts in the balance of many ecosystems expected. Established in 2008, UHURU seeks to address these questions. UHURU, like its predecessor KLEE, uses large-scale plots and electric fences to simulate size-based mammal extinctions but is distributed across a rainfall gradient. It is the combination of these two distinct features that distinguishes UHURU from prior experiments. A decade on, the 36 plots are permanent installations on the Mpala landscape, enabling researchers to tease apart how the strength and direction of herbivores' effects depend on climate; similarly, to assess the impacts of droughts and other environmental fluctuations, and will most likely remain for a decade more. Through the collaboration of multiple studies, we have learned, among other things, that herbivores of different sizes occupy different roles for controlling invasive shrubs and that climatic stress mediates the strength of herbivore impacts on plant populations. To date, 20 papers have been published in peer-reviewed journals.

FORESTGEO

DR DAVID KENFACK (SMITHSONIAN TROPICAL RESEARCH INSTITUTE) & DR PAUL MUSILI (NATIONAL MUSEUMS OF KENYA)

The first Forest Global Earth Observatory (ForestGEO) plot was established in 1980 on Barro Colorado Island, Panama. Over the years, the ForestGEO program has expanded from wet to dry tropics and into temperate areas. In 2009, Mpala became the 41st site chosen to be part of ForestGEO. Currently, ForestGEO spans 26 countries, focused on understanding the development and maintenance of biodiversity and our ability to evaluate and respond to the impacts of global climate change. With the establishment of the Mpala Plot, the ForestGEO program is making its first foray into savanna ecosystems. The Mpala plot is unique in other ways. At 150 ha, it is the largest ForestGEO plot (most are 50 ha or less), and it is floristically simple (only 7 tree species were identified in the first five months whereas other ForestGEO plots can hold up to 450 species). The impacts of land-use and climate change are predicted to have a profound effect on the ecosystem and the biodiversity at Mpala. The plot has already provided both short- and long-term data on the dynamics of the vegetation of an ecosystem which undergoes grazing by both livestock and wildlife. This year began the second survey of the plot!

CURRENT RESEARCH

AFRICAN WILD DOG AND CHEETAH

Dr. Rosie Woodroffe

Developing strategies for sustainable coexistence of African wild dogs and cheetahs with local people and their livestock while disease transmission between domestic and wild animals.

STARLING SOCIALITY

Dr. Dustin Rubenstein

Study of the interactions between environmental variation, dominance, and signaling traits in superb starlings.

PRIMATE/BABOON ECOLOGY

Dr. Akiko Matsumoto-Oda,
Dr. Tanya Berger-Warner

Studying savanna baboon reproductive synchrony and female mating strategy, as well as fine-scale behaviour on group decisions, utilizing machine learning.

VULTURINE GUINEA FOWL

Dr. Damien Farine

Mechanistic studies of individual and group behavior to understand sociality including the ontogeny of social positions to the consequences of living in different types of groups.



TURKANA GENOME PROJECT

Dr. Julien Ayroles

Study of human evolution and genetics focused on the Turkana people of Northern Kenya, while providing vital information to community health practitioners.

BUFFEL GRASS PROJECT

Dr. Rob Plowes
Dr. Dino J. Martins
Dr. Aaron Rhodes

Aimed at understanding the ecology of buffel grass in its native range, and drawing from this understanding, highlight more on its invasive nature in Southern Texas.

BUTTERFLY PROJECT

Dr. Dino J. Martins
Dr. Simon Martin
Dr. Gerard Talavera

Studying the African queen, diadem, and painted lady butterflies to understand their genetics and seasonal migration patterns.

ECOHYDROLOGY

Dr. Kelly Caylor

Collecting hydrologic data at fine spatial and temporal scales to generate critical data needed to better forecast crop yields, improve resilience among subsistence farmers, and inform people of the need to conserve water.

LIVESTOCK FORAGE SHARING ARRANGEMENTS

Dr. Wilfred Odadi

Understanding socio-ecological impacts of forage sharing arrangements between pastoralists and private ranchers, and impacts of grazing intensity on soils, vegetation, cattle, and wildlife.

ANT-ACACIA MUTUALISM

Dr. Naomi Pierce,
Dr. Dino J. Martins

Understanding how ant species and density in the inhabitation of acacia domatia influences the overall fungal communities and microbiome within the tree.

STRESS RESPONSE IN ELEPHANTS

Sandy Odour

Study of impacts of anthropogenic and environmental stress on elephant behaviour and stress hormone levels as an indicator of human-wildlife conflict

SAN DIEGO ZOO GLOBAL LEOPARD PROJECT

Dr. Nicholas Pilford

Aims to understand leopard-livestock interactions and the ecology of leopards to minimize human-wildlife conflict.

VITELLINE WEAVER BIRDS

Dr. Scott Robinson

Study of the elevational migration patterns of vitelline weaver birds under stressors including climate change



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LOOKING AHEAD

GREAT GREVY'S RALLY 2020

When citizen science meets conservation, we can save a species! That's the mission of the Great Grevy's Rally, a biennial census of the endangered Grevy's zebra that invites experts and novices alike to contribute to the understanding of the zebra's population. The Rally returns in January 2020 to five counties in Northern Kenya, including Laikipia. Over the course of two days participants will trek across conservancies and communal land snapping pictures of each and every Grevy's they encounter. Later, these images will be fed into a unique computer program called WildBook that individually identifies zebras through their unique striped patterns and quantifies the change in population from previous censuses. This concerted effort is crucial to monitoring the Grevy's zebra, as they are far-flung across their 25,000 square km range. In the last Rally, 212 volunteers took to the roads and captured close to 50,000 images. Using WildBook, scientists

concluded that the survey found 2,812 zebra, meaning an increase in the population by 300 individuals since 2016!

This year the rally will receive enhanced support from the KWS air wing which will help scope and scout areas where Grevy's zebras roam, but are scattered and defuse. In addition, a reassessment of the deployment of teams based on effort-abundance mismatches from the previous Rallies will be used to ensure that the effort is targeted in ways that enhances contact with Grevy's in areas where they are less abundant and sparsely distributed. The new US Ambassador to Kenya will also be participating for the first time in 2020 as we continue our effort to engage a wide range of local, regional, national, and international audiences. Mpala has been involved in the Rally since it began in 2016, and has been studying Grevy's zebra year-round since 1994.



We are looking forward to the 2020 census and invite you to join us too!



Photo by Dr. Dino Martins

PHOTO CREDITS

Thank you for contributing to this years Science and Outreach Report!

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