WILDCRU
Wildlife Conservation Research Unit

Ruaha Carnivore Project

Report to TAWIRI on activities during 2014

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1. Summary of progress during the reporting period (1st December 2013 – 30th November 2014)

During 2014, the Ruaha Carnivore Project had five main objectives, namely researching carnivore ecology, disseminating information about Ruaha's carnivores and their ecology; investigating and mitigating human-carnivore conflict, improving local knowledge of carnivores and conservation, and improving local capacity in carnivore research and conservation. A summary of the progress made with each of these objectives during the reporting period is given below.

(i) Collecting baseline data on carnivore ecology

- Extended our camera-trapping efforts, with one permanent camera-trapping grid maintained in the Msembe area of Ruaha National Park throughout 2014. This work was a collaboration between the Ruaha Carnivore Project (RCP), Trevor Jones from the Southern Tanzania Elephant Project (STEP) and Jeremy Cusack, a PhD student from the University of Oxford
- Detected a total of 49 mammal species from 12,476 camera-trap days, and collaborated with Jeremy Cusack to examine the relative efficacy of placing cameras on trails compared to at random for carnivore detection
- Worked with Park guides and tourists to collect 2981 sightings on large carnivores in and around Ruaha National Park, bringing the total number of sightings to 7578
- Developed the first African wild dog distribution map and presented it to at a conference on wild dog conservation in Chicago

(ii) Disseminating information

- Tanzanian staff gave presentations on the project work and results both locally and internationally, at the Ruaha Round Table, the Cheetah Conservation Fund in Namibia, and at the Lion Guardians headquarters in Kenya
- The PI presented information about Ruaha and data from the project to many international audiences in the UK and US, through talks, online interviews, radio and TV interviews – these included the BBC World Service Radio, National Geographic radio, Islam Channel TV, and a personal talk with Prince William at the 2014 Tusk Awards
- Published three scientific articles on the work done in Ruaha, with one book chapter and one more journal article submitted

(iii) Investigating and reducing conflict

- Collected data on monthly stock loss and patterns of depredation at over 460 households
- Had conflict monitors employed and working in 12 local villages, with 2 more currently being trained

- Used data on conflict incidents to develop and publish predictive risk maps of carnivore conflict, which will help inform where to focus conflict mitigation efforts across the study area
- Conducted over 200 new and follow-up surveys with local villagers in the study area, in order to provide more information on trends in human-carnivore conflict over time, and used this long-term data set to publish a peer-reviewed article
- Predator-proofed 21 of the local livestock bomas across 7 villages, which collectively protect over 3300 livestock daily – no attacks have been occurred within these bomas, so they have proved very successful. This brings the total number of fortified bomas in the study area to 86 by the end of the reporting period
- Expanded the Lion Guardians programme, so we have 12 Lion Guardians covering over 600km^2 of the study area
- Lion Guardians strengthened an additional 75 bomas using traditional methods
- Placed four specialised Anatolian Shepherd livestock guarding puppies with pastoralists to examine if they reduce attacks in the bush, and were importing six more at the end of the reporting period
- Continued to provide medicines to Kitisi village clinic in the heart of the study area
- Extended the school twinning programme, so that nine local village schools are now twinned with schools in the US or UK
- Provided an additional 5 'Simba Scholarships' to pastoralist students, which will enable them to complete all four years of secondary school, bringing the total number of Scholars selected so far to 11
- Worked with veterinary authorities to help local villagers gain access to high-quality veterinary medicines
- Worked with Panthera and Lion Guardians in Kenya to develop and expand the 'Lion Guardians' programme in Ruaha, which is now employing 12 young men to help monitor lion presence on village land, and help villagers protect their livestock

<u>(iv) Improving local knowledge of carnivores, conservation and the Ruaha landscape</u>

- Provided outreach and education for local villagers on carnivore ecology, conservation, the most effective local means of livestock protection, the role of Ruaha National Park and the actions of the Ruaha Carnivore Project
- Provided educational DVD nights to 6413 local villagers and students across 11 villages, bringing the total number of attendees over time to 17,530
- Took 99 villagers into the Park on educational visits, bringing the total number of participants over time to over 500

<u>(v) Building local capacity</u>

- Helped one of our Tanzanian research assistants apply for Oxford University's International Diploma in Conservation Practice
- Conducted ongoing training with all staff in computer skills, driving, data analysis, grant writing, presentations and other professional skills

- Built new capacity amongst our Tanzanian staff through training visits to international conservation projects in Kenya and Namibia
- Enabled 5 interns from Tanzanian universities to gain practical experience at the project
- Provided training to improve numeracy, literacy and data collection skills to Lion Guardians and other villagers

2. Introduction and background

Tanzania's Ruaha landscape holds some of the most valuable large carnivore populations left in the world. However, it has been extremely understudied – as recently as 2009, there had never been any scientific research efforts focused on these globally important populations. The lack of data on Ruaha's carnivore populations hinders the development of effective conservation plans, and providing such data has been highlighted as a priority in Tanzania's national Action Plans for large carnivores. Moreover, there is intense conflict between local people and large carnivores around Ruaha National Park, which has serious conservation impacts. The PI, Dr Amy Dickman, conducted her MSc (2005) and PhD (2006-2008) fieldwork in the Ruaha landscape, and became aware of the pressing need for more focused research on carnivore ecology and conflict in this important area. In 2009, under the guidance of Dr Sarah Durant, Dr Dickman began carnivore research and conservation activities in the Ruaha landscape as part of the Tanzania Carnivore Monitoring Project. In 2011, the work had expanded sufficiently for Dr Dickman and her team to apply for a separate research permit, a move which was supported by Dr Durant, and this permit was granted in February 2012 and renewed in February 2013 and February 2014.

So far, the Ruaha Carnivore Project has made significant headway in terms of collecting baseline data on large carnivore populations in Ruaha, training local researchers, disseminating information, mitigating human-carnivore conflict and improving local capacity around Ruaha National Park, and aims to continue this important work. In 2014-15, the project had three main goals: (1) To provide data on large carnivore distribution, relative abundance and ecology across the Ruaha landscape, including both protected and unprotected land; (2) To reduce the costs and improve the benefits associated with living alongside carnivores for local people, thereby reducing human-carnivore conflict in this critically important area; and (3) To improve conservation knowledge amongst local communities, and improve capacity amongst Tanzanian researchers to help them build their careers in wildlife conservation.

In order to achieve this, our specific objectives were:

(i) To collect data on the ecology, distribution, movement and abundance of carnivores in the Ruaha landscape;
(ii) To disseminate information on Ruaha's large carnivore populations and their ecology to other stakeholders, both in Tanzania and elsewhere;
(iii) To investigate the extent of human-carnivore conflict around Ruaha National Park, and implement locally appropriate mitigation strategies;

(iv) To improve local knowledge of carnivore ecology, conservation, best-practice livestock protection and the role of Ruaha National Park;
(v) To improve local capacity in carnivore research and conservation

Progress made towards those goals in 2014 is detailed further below.

3. Project personnel

During 2014, the majority of the project staff were Tanzanian, with two exceptions - Dr Amy Dickman, the Principal Investigator (PI), and Sean McEnery, who was a research assistant helping to manage the Lion Guardians programme. All staff salaries were paid by grants raised by the PI, and all are stationed at the field camp in Kitisi village. At the start of the reporting period we had 2 senior scientists, 8 research assistants, one manager for the Lion Guardians work and two staff to help implement the Lion Guardians programme named on the research permit. In addition, we had six Lion Guardians and 13 enumerators in local villages. During the reporting period, we were joined by six more Lion Guardians, five students gaining work experience from Tanzanian universities, and the Lion Guardian manager changed as planned, so over the reporting period we had a total of 44 people involved with the project, 42 of which were Tanzanian. Two of the research assistants moved on to other research activities during the reporting period, while two others were involved with their own studies so only worked with RCP for very short periods. By the end of the reporting period, we had just started looking for two new full-time Tanzanian research assistants to work with the project from 2015 onwards.

Dr. Amy Dickman
Nationality: British

Amy worked on cheetah conservation in Namibia for six years, before conducting both her MSc (2005) and PhD (2006-2008) fieldwork in the Ruaha ecosystem. She then received the Kaplan Senior Research Fellowship from the University of Oxford, which allowed her to conduct more research and conservation work in Ruaha, initially under the auspices of the Serengeti Cheetah Project. The Ruaha Carnivore Project became an independent research project in 2011, and Amy is the Director of the project.

Dr. Maurus Msuha
Nationality: Tanzanian

Maurus has extensive experience in wildlife and NGOs, and worked as a project manager on a biodiversity action project for the Wildlife Conservation Society of Tanzania for 7 years. He then joined the Tanzania Carnivore Project as a Project Manager in 2002, and completed his PhD on carnivore biodiversity in the Tarangire ecosystem in 2009. Maurus is now a Senior Scientist at the Tanzania Wildlife Research Institute, and also works as part of the Tanzania Carnivore Monitoring Program.

Sean McEnery
Nationality: Irish

As planned, Sean McEnery took over from Victoria Shelley to help manage the Lion Guardians programme in Ruaha. Sean has a Bachelors degree from University College Dublin and an MSc in Conservation Biology from Manchester Metropolitan University, and before he joined RCP he was collecting data for the Tanzania Bird Atlas. In 2013, Sean was trained in the Lion Guardians programme in Kenya, and then joined RCP full-time in 2014. Sean has done very well but is keen to gain more experience in different areas of wildlife conservation, so is likely to leave and be replaced during 2015.

Mr. Montan (Monty) Kalyahe
Nationality: Tanzanian

Monty was a Senior Research Assistant for the Ruaha Carnivore Project since 2012, and had an advanced diploma in Wildlife Management from the College of African Wildlife Management (Mweka) and several years of field experience with WWF before coming to the project. In 2013 he completed his MSc in Conservation Biology at Manchester Metropolitan University, using the camera-trapping data for this thesis. His experience with RCP enabled him to get accepted onto a PhD programme at the University of Leipzig, which we were all thrilled with, although it means that he left RCP to start his study in November 2014.

Ayoub Msago
Nationality: Tanzanian

Ayoub Msago is the field camp manager and Community Liaison Officer for the Ruaha Carnivore Project. His tasks include working with the communities to prevent carnivore attacks, conducting outreach and education in the villages, taking stakeholders on educational Park trips, developing benefit programmes for local communities, maintaining the field camp, running the livestock guarding dog programme, liaising with the Kids 4 Cats and Simba Scholars programmes, and training new staff in these tasks. In 2013, Ayoub was awarded the prestigious Disney Conservation Hero award for his work with the Ruaha Carnivore Project, and he remains an invaluable member of staff.

Msafiri Mgumba
Nationality: Tanzanian

Msafiri Mgumba worked with an antelope research team from the University of Berkeley and had a BSc from Sokoine University of Agriculture before joining the project in 2011. In 2012, with recommendations from RCP, he completed a Postgraduate Diploma in International Conservation Practice at Oxford University, and returned to continue fieldwork with the project. However, he wanted to gain experience in other projects, so ended his employment with RCP in 2014, although he remains a close colleague.

Alphonce Msigwa
Nationality: Tanzanian

Alphonce has worked with Amy since 2006 on her PhD fieldwork, and worked as the Senior Research Assistant for the carnivore work being done in the Ruaha region in 2009. Alphonce

has completed his BSc degree in Wildlife Management at Sokoine University of Agriculture in 2013, and returned to RCP for 3 months to assist with household mapping and surveying, as he was particularly skilled in those areas.

Justin Chambulila
Nationality: Tanzanian

Justin joined the project in 2012, with a BA in Geography and Environmental Studies from the University of Dodoma. He has proved himself as an extremely valuable part of the team, and has been working closely with Ayoub on community programmes, particularly the predator-proofing of local livestock enclosures. He is very dedicated to that programme and now manages and plans all aspects of boma construction and data entry. He is also involved with the camera-trapping and carnivore sightings research.

Meshack Saigilu
Nationality: Tanzanian

Meshack completed a BSc in Wildlife Management at Sokoine University of Agriculture before joining the Ruaha Carnivore Project in 2012. He was an excellent addition to the team, working on livestock protection initiatives, community outreach, camera-trapping and carnivore sightings research. He was awarded a scholarship to enroll in an MSc in Biodiversity and Ecosystems Management at the Nelson Mandela African Institute of Science and Technology in 2013, and stayed in contact with RCP, but as he was studying through the reporting period, he was not a full-time employee of the project during that time.

Michael Kimaro
Nationality: Tanzanian

Michael has a BSc in Wildlife Science and Conservation from the University of Dar es Salaam. He has very useful skills in terms of data entry, GIS etc, and has been very valuable at training other staff members since he joined the project in 2013. Michael started working on the data entry for the carnivore sightings, but proved so proficient that he now manages that entire programme, and is extremely well-organised and efficient. He has also represented RCP at the CUT meetings in Arusha, has learned to drive through the project, and has proved himself an extremely important part of the team.

Uchungu Mgogo
Nationality: Tanzanian

Uchungu is from the project's local area (Pawaga Division) and is one of the very few people there to have attended university. He has always had a very strong passion for wildlife conservation, so attended the University of Dar es Salaam and completed his BSc in Wildlife Science and Conservation. Uchungu was willing to learn all aspects of the project, and started working on the depredation data, but he was so good that during the reporting period he went to Namibia to become trained in the use of guarding dogs, and is now a key staff member for that programme.

Stephano Asecheka
Nationality: Tanzanian

Stephano is a respected Barabaig community leader, so joined the project in 2013 to help implement the Lion Guardians programme and act as the key community liaison person for that aspect of the work. He is very good at working with and helping manage the young Lion Guardians, and explaining the programme to the wider community. Over the reporting period, he was very involved in the expansion of the programme into neighbouring villages, and continues to be a key member of the team.

George Sedoyeka
Nationality: Tanzanian

George is an extremely keen young Barabaig man, and has worked with the project since 2013 in order to help implement and manage the Lion Guardians programme. He does a lot of the day-to-day liaison work with the Guardians, and also helps Stephano with community meetings. He is very keen and enthusiastic, and has proved extremely very valuable in helping expand the programme over the past year.

4. Project activity reports

<u>Objective 1 - To collect data on the ecology, distribution, movement and abundance of carnivores in the Ruaha landscape</u>

To investigate carnivore ecology and distribution, we have been using two main approaches – camera-trapping and direct sightings – while the Lion Guardians also collect some additional information by recording carnivore signs that they see while out working. During this reporting period, we conducted the camera-trapping work in close collaboration with Trevor Jones from the Southern Tanzania Elephant Project (STEP) and Jeremy Cusack, a PhD student from the University of Oxford. A grid of 50 camera traps focusing on the Msembe area of Ruaha National park was established and kept active throughout the reporting period, with the aim of capturing seasonal fluctuations in the relative abundances of mammal species within the Park. During this period, a total of 49 mammal species were detected from 12,476 camera trap days. These data are currently being analysed and will provide very valuable insights into the seasonal dynamics of Ruaha's mammalian community, as well as possible interactions between species. In addition, RCP, in collaboration with Jeremy Cusack, has expanded its sampling of the Ruaha ecosystem by setting up additional one-month camera trapping surveys within Ruaha National Park (Jongomero, Mwagusi river, Lunda, Mackinde Springs and Mdonya areas), the neighbouring Wildlife Management Area (Madogoro and Kinyangesi areas) and the village land (Isele, Kitisi and Mahuninga areas). These surveys revealed the presence of lion, spotted hyena, leopard and cheetah on village land; leopard and spotted hyena within the WMA; and all 5 species within the Park. These data are currently being analysed.

One of the key aims during this period was to examine the relative efficacy of placing

camera-traps on trails compared to random placement within grid cells, as understanding that would help inform future camera-trapping surveys. We collaborated with Jeremy on this, and the data revealed that although placement strategy did not seem to affect the detection of herbivore species, camera traps positioned on trails were significantly more likely to detect large carnivore species. These findings have important implications for future camera trap surveys in Ruaha, but also more generally across East Africa, and a manuscript based on these results has been submitted to a distinguished open access journal. The camera-trapping has provided excellent information on the diversity and distribution of mammals in the Ruaha ecosystem, and we hope that the data from the period (which Jeremy is collating at present) will help provide valuable information for future conservation management plans in this landscape.

The camera-traps provided excellent images and data on the relative abundance and distribution of large carnivores, smaller carnivores and prey species

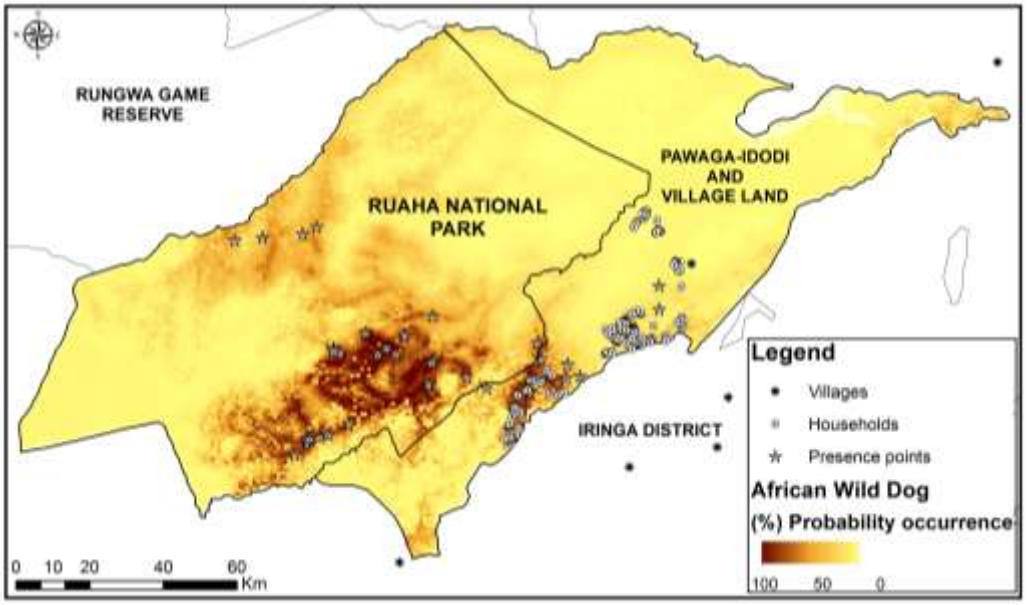
During the reported period, we had 2981 large carnivore sightings events reported to us, bringing the total reported overall to 7587, but many of the sightings will represent the same individual or groups being reported repeatedly. Nearly three-quarters of those (n = 2442, 81.9%) were of lions, with group size ranging from 1 – 42 individuals. Despite Ruaha being known to have particularly large lion prides, the average lion sighting comprised only 6.3 individuals, with over half the lion sightings (56.6%, n = 1382) involving 5 or fewer animals. In contrast, African wild dogs were the rarest carnivore sighted, with only 16 reported sightings in this period, making up only 0.54% of total reported sightings. The group size for African wild dog sightings ranging from 1 – 30, but 75% of all African wild dog sightings involved 8 or

fewer animals, giving a mean group size overall of 7.9. Cheetahs were reported 201 times, representing 6.7% of all sightings – 55% of the time they were seen alone, with a maximum group size observed of 5 animals, and an average group size of 1.8 animals. Leopards were reported to us slightly more than cheetahs, with 288 reports. The vast majority of these sightings (n = 273, 94.8%) involving lone animals, with an average group size of 1.1 and a maximum of 3 leopards observed together. Spotted hyaenas were observed relatively rarely, with only 33 reported sightings, representing 1.1% of all reports. Group size ranged from 1 – 8, with around half the sightings (51.5%, n = 17) of lone animals, and an overall average group size of 2.2 animals.


The sightings programme allows data to be gathered on carnivore presence, distribution, movement and behaviour, and produces some wonderful photos

The camera-trapping and sightings data contributed towards a scientific paper on large carnivore distribution in Ruaha during this reporting period. The paper is co-authored by members of RCP and colleagues – it is entitled '*Using Landscape and Bioclimatic Features to Predict the Distribution of Lions, Leopards and Spotted Hyaenas in Tanzania's Ruaha Landscape'* and has been published in the journal PLOS One.

The Ruaha landscape is particularly important for the endangered African wild dog, and during this reporting period, we managed to develop the first predictive distribution map for this species in Ruaha, in collaboration with Leandro Abade. The data and map was presented at an international conference on African wild dogs in Chicago, and will be written into a paper over the coming year.



The first predictive distribution map developed for the African wild dog in Ruaha

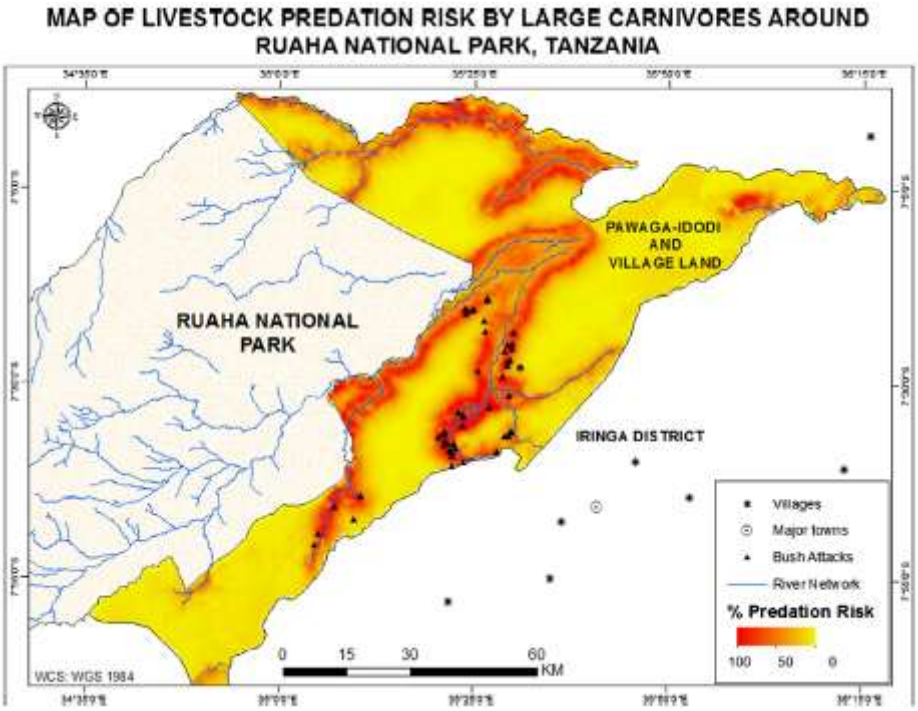
We intend to focus more in the coming year on building a database of individual carnivores spotted, so that we can eventually understand more about carnivore movement and demography in this landscape. This kind of work requires a very large sample size, and we are very grateful to all the Park lodges, authorities, drivers and other people who have assisted with this work. In addition to the camera-trapping and sightings programmes, the project has now secured 10 satellite-collars, and will work with the authorities to place the first collars on lions and/or spotted hyaenas outside Ruaha National Park in this next reporting period.

<u>Objective 2 - To disseminate information on Ruaha's large carnivore populations and their ecology to other stakeholders, both in Tanzania and elsewhere</u>

Disseminating the results of the work so far has been an important activity over the last year. Amy has given talks about Ruaha and its carnivores at Cleveland Metroparks Zoo, Dallas Zoo, Houston Zoo, National Geographic, Phoenix Zoo, the Dallas Safari Club and Oxford University. In addition, Mgogo shared information about the project to colleagues at the Cheetah Conservation Fund in Namibia, while George and Stephano disseminated information about the project while visiting the Lion Guardians project in Kenya. The project's work has also been highlighted in the Telegraph newspaper, Getaway magazine, Hello magazine and National Geographic, while Amy has given interviews on BBC World Service radio and Islam Channel TV. In addition, project staff have published three peer-reviewed articles on RCP's work during the reporting period, and have submitted another paper and a book chapter for publication. The project results are also highlighted in the project's monthly reports, and more regularly on the project's Facebook page and website. Most importantly, within the study area, the results are shared and discussed with local villagers at community meetings and DVD nights, and they have also been shared with colleagues across Tanzania – in Ruaha through the Ruaha Round Table meetings, and at a wider level at the regional CUT conflict workshops in Arusha, arranged by Dr Sarah Durant.

Objective 3 - To investigate the extent of human-carnivore conflict around Ruaha National Park, and implement locally appropriate mitigation strategies

Mitigating human-carnivore conflict is a core aim of the project, and in order to achieve that we focus upon reducing the costs and improving the local benefits of carnivore presence. As planned, we have retained the 'conflict monitors' in the 12 local villages, and they are very important in terms of responding rapidly to depredation events, so that we can better understand carnivore attacks and how best to prevent them. The monitors employed in the 12 villages collectively monitor over 460 households every month, and we are training monitors in additional villages in order to expand this further. We have trained the monitors to collect information themselves using Swahili forms, and this investment has improved their literacy, numeracy and scientific skills. In addition, the data on depredation events was used to develop the first predictive presence and risk maps for the village land, and the maps for lion, leopard and spotted hyaena have been published in a scientific paper during this period, as mentioned above. In addition, data from the depredation events allowed us to examine the risk associated with certain habitat features, such as dense vegetation, and how effective local husbandry was at preventing attacks even in risk habitat. The results showed that current, traditional methods were not very effective at preventing attacks, and this was published in another peer-reviewed article, entitled: '*Assessing the relative importance of landscape and husbandry factors in determining large carnivore depredation risk in Tanzania's Ruaha landscape'.* This paper highlights the need for improved conflict mitigation strategies, so RCP has been focusing on those over the past year.



Predictive risk map of all carnivore attacks on grazing livestock on village land around Ruaha National Park (c) Leandro Abade 2014

Data gathered collected by the conflict monitors revealed that approximately 65% of attacks

occur in livestock enclosures (bomas), so we have focused this year on continuing to predator-proof those, using strong diamond-mesh wire. We used to use wooden poles for the bomas, but increasingly now we use metal poles, as they are longer-lasting and are cheaper for the householder in the long term, as there is very little need for any replacement over time. In addition, we have started building the new bomas in a square or rectangular shape, rather than a circle, as it is easier for the livestock keeper to construct shade over it, and is easier for them to maintain well. During the reporting period, we reinforced 21 bomas, bringing the total predator-proofed to 86 by the end of November 2014. The 21 new bomas were placed across 7 villages and 6 ethnic groups, as shown below.

Village	**Maasai**	**Hehe**	**Bena**	**Gogo**	**Barabaig**	**Other**
Kimande		1				
Magozi/Luganga	2					
Mafuluto				3		
Makifu	1	1	4			
Malinzanga	1		1	1	2	1
Mapogoro					2	
Nyamahana					1	
Total	**4**	**2**	**5**	**4**	**5**	**1**

The 21 new bomas collectively protect 3304 livestock (1494 cattle, 1797 smallstock and 13 donkeys), while in total, all the predator-proofed bomas protect 12,245 livestock (5658 cattle, 6472 smallstock and 115 donkeys). During the reporting period, we started collecting data on monthly stock losses at all the 21 newly improved bomas, plus an additional 50 neighbouring bomas, so in total, we are now monitoring 237 households under this programme.

The boma programme appears to be very successful – amongst the bomas improved during the reporting period, there were 8 carnivore attacks resulting in 16 livestock deaths during the 3 months before predator-proofing. After fortification, there have been no attacks to date in any of those improved bomas. This is a very important method for reducing depredation, local hostility towards carnivores and carnivore killing, so we intend to continue and expand this work over the next year.

One of RCP's staff, Justin Chambulila, attaching the diamond mesh wire to the new boma poles – this boma is in the square shape increasingly favoured by households

However, there is a risk that as attacks in the boma decline, carnivores may increasingly try to attack livestock grazing in the bush. Therefore, the Ruaha Carnivore Project worked with the Cheetah Conservation Fund (CCF) over the project period to place specialised Anatolian Shepherd livestock guarding dogs with local pastoralists in order to reduce carnivore attacks in the bush. During the initial phase, we placed four puppies, which all did very well until 7 months old, when one of them was sadly speared in an inter-family conflict. Despite that incident, the initial phase showed that the dogs could thrive and work well in Tanzania, so during November 2014, we sent one of our research assistants, Uchungu Mgogo to CCF in Namibia to be trained further in this method. Uchungu brought back six more Anatolian puppies – five to be placed with local farmers, and one intact female to be kept at RCP in case the project is successful enough to breed more puppies. The initial four puppies were placed across two villages, while the new five will be placed in three villages, including two new ones, so we will have dogs in four villages in total. We intend to also trial the use of both village dogs and cross-bred Anatolians and village dogs, to examine whether breed or care is most important in determining success.

The dogs do require considerable investment in terms of time (as they are frequently monitored by RCP staff), money (as they require high-protein food during the first year) and veterinary treatment. They are unlikely to be highly protective during their first year of life, but despite that, they have been extremely well received by local pastoralists, and there is a growing list of people who are interested in receiving one of the project's dogs. We monitor losses at all the recipient households, as well as other households without specialized dogs, so over time we should be able to assess the success and cost-efficiency of this programme compared to other methods of conflict mitigation.

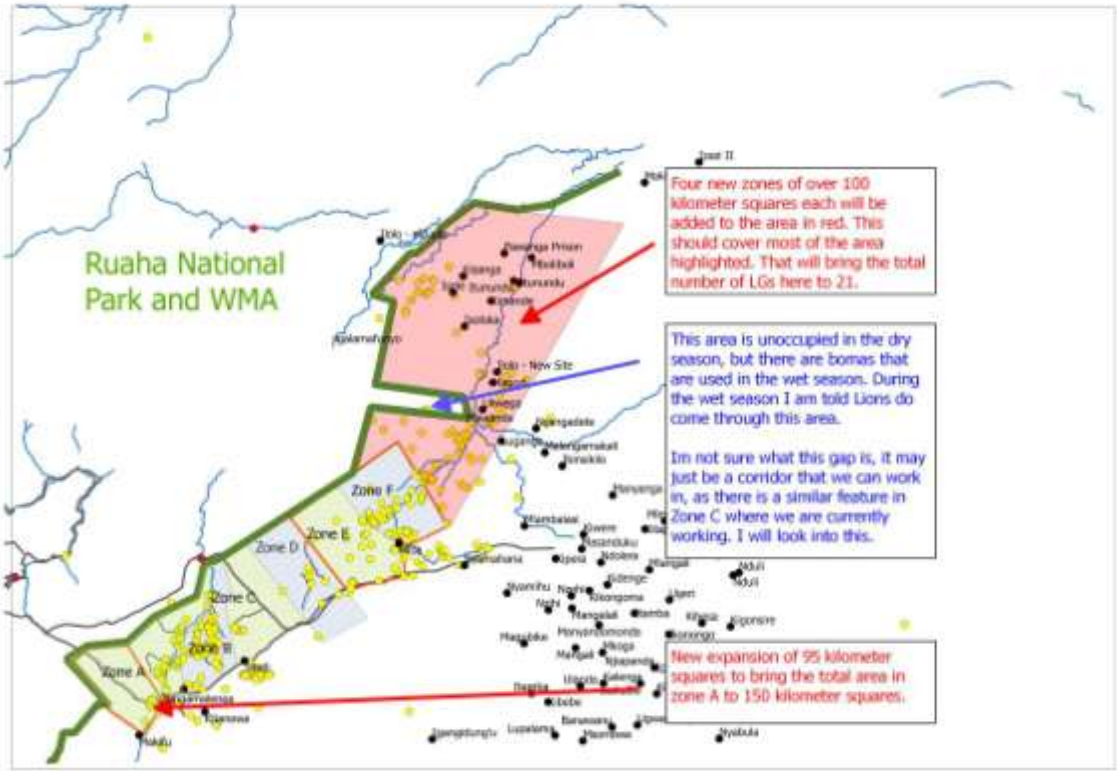
Uchungu Mgogo (second from left) with CCF Director Laurie Marker (far left) and CCF staff in Namibia with all six of RCP's new puppies

Carnivore conflict around Ruaha is not only driven by depredation, but by cultural issues as well, with young men traditionally proving their bravery as warriors by killing lions and other wildlife. During 2014, we worked closely with the Lion Guardians project in Kenya and Panthera in order to develop and extend the Lion Guardians programme in Ruaha. By the end of the reporting period, we had 12 Lion Guardians (LGs), who came from the Barabaig, Mburu, and Maasai tribes in the Tungamalenga, Kitisi, Idodi and Malinzanga areas. The Lion Guardian responsibilities are based on traditional warrior roles, and include stopping young men from hunting lions in the area, finding lost livestock, fixing damaged bomas, helping the community in any way possible and collecting valuable ecological data that help us to determine the ecological health of the area we are working in.

These 12 individuals are helping to protect lions across an area of 601km^2 adjacent to the Wildlife Management Area (WMA), by continuing to prevent the retaliatory killing of lions following depredation events and the ritualistic killing of lions by young pastoralist men. They are also helping to protect 252 households and an estimated 12,844 head of cattle and 12,873 head of small stock. During the reporting period, at least 1622 head of livestock were reported lost to Lion Guardians, 95.2% (1544) of these have been found by Lion Guardians and successfully re-united with their owners. The Lion Guardians also repaired and/or strengthened 75 bomas (traditional thornbush livestock enclosures) since the start of January this year, further protecting both livestock and families within these local homesteads.

In addition, the project aims to hire eight new LGs in four proposed new zones adjoining Ruaha National Park. This latest expansion is the next step in our continuing northward expansion. The expansion will consist of two phases. Phase one will be the addition of two new 100km^2 zones, which will be complete by early 2015. The second phase will see another

200km^2 added and a further four LGs hired towards the middle of 2015.



Recent expansion to the south and proposed areas of expansion to the north, highlighted in red

In July 2014 the Ruaha LGs went to the Lion Guardian head quarters in the Amboseli ecosystem in Kenya. This annual event assembles all staff from all the Lion Guardian projects around East Africa in one place to share ideas, stories and compete against one another. This year's event was another big success and the Ruaha LGs made a big impression winning multiple events in the competition and providing valuable insights into how the Lion Guardian model has worked in the Ruaha area.

One of the Ruaha Lion Guardians, Daream (middle), storming home to win the 100m final

Through 2015, the project will continue to provide all Lion Guardians with training in numeracy, literacy, basic English and written Swahili, which increases their skills and their status in the community. These skills increase their chances of getting better jobs in the future if they move on from being Lion Guardians. In addition, all the Lion Guardians have been trained to use GPS units and hand-held Nexus devices, as well as the use of Cybertracker software, so that they can better record the presence of lions and other carnivores in their zones. The Lion Guardians also started using camera-traps in January 2014. The results have been of huge interest to everyone involved. The Lion Guardians are now able to see the animals that leave the prints in the sand that they are so familiar with. Many of the Lion Guardians had never seen some of the animals photographed, despite being very familiar with their tracks. Each Lion Guardian is allocated one camera-trap, which they place out in the best areas of their zones for wildlife. This is then used as part of a contest, with the Lion Guardian who gets most photos of carnivores being rewarded with a small prize such as a solar unit that charges their phones. The camera trapping has improved our understanding of the presence of carnivores and other species on village land, helping us to better understand wildlife habitat selection in this important area. In the future these data will help us to advise herders on areas that are safe to bring livestock into and areas to be avoided at different times of year.

To further increase the respect for Lion Guardians in the community, some training sessions in adult literacy were offered in Kitisi village. These sessions were run by Pascal, one of our longest serving Lion Guardians. They have been very successful so far and we have a group of local people who now attend every week as well as people who drop in for one or two sessions a month. Following the success of this initial trial of literacy training, we hope to

continue and extend this during 2015, as it is a valuable community outreach and benefit programme.

Jeremy Cusack, a PhD candidate based at Oxford University, teaches the Lion Guardians how to use camera traps

Furthermore, RCP has been training all Lion Guardians in the use of GPS units and camera-traps, which gives them additional status in the community, as very few local people have access to any kind of advanced technology. This heightened status is important as the project works to replace the status achieved by killing lions with something more conservation-related and longer-term.

Lion Guardian Ruaha adult literacy sessions, led by Pascal (seen here standing up)

The Ruaha Lion Guardians are taught how to use GPS units by a Maasai Lion Guardian from the Lion Guardian project in Kenya

Ruaha Lion Guardians are taught how to use radio telemetry equipment by a Maasai Lion Guardian from the project in Kenya

In addition to reducing carnivore attacks, it is vital that local people receive and recognise tangible benefits from large carnivore presence. The villagers selected education, healthcare and veterinary health as their top priorities, so we have worked on all these aspects. In terms of education, we have now twinned and provided educational materials to nine local village schools with international schools under the 'Kids 4 Cats' programme. These include two secondary schools and seven primary schools, spread across 9 villages in the study area. We are now examining how to expand this programme, and work with partners to provide additional benefits to the village schools, such as improved kitchens and access to meals for the students.

RCP's community liaison officer handing out school books to a village school under the Kids 4 Cats programme

We have also continued our 'Simba Scholarships' programme, which was developed to enable children from pastoralist families to go through all four years of secondary school. At the start of the reporting period we had 6 Scholars, and over the course of the year we added another 5, and we hope to continue to expand this every year.

As healthcare was another top local priority, we have been continuing to provide supplies for the healthcare clinic that RCP helped to equip in Kitisi village. The clinic now serves hundreds of local people, so is a key benefit to the local community. In terms of veterinary health, we worked with the regional and local veterinary authorities to help pastoralists gain access to high-quality veterinary medicines. As the demand for these medicines was very high, we developed an initiative where those people who had fortified their enclosures became entitled to subsidized veterinary medicines, with RCP paying half of the cost. This has two significant benefits – it encourages people to fortify their bomas and therefore reduce livestock loss to depredation, but also helps reduce their losses to disease, so further improves household economic security.

In order to assess how these initiatives affect local attitudes towards wildlife conservation, we conducted over 200 semi-structured surveys with villagers over the report period. These surveys have provided very valuable information on conflict in Ruaha over time, and this year we published an article summing up the determinants of conflict in the local area, entitled '*Carnivores, culture and 'contagious conflict': Multiple factors influence perceived problems with carnivores in Tanzania's Ruaha landscape'*, which was published in Biological Conservation.

Objective 4 – To improve local knowledge of carnivore ecology, conservation, best-practice livestock protection and the role of Ruaha National Park

In order to improve local knowledge about carnivores, conservation, livestock protection and the role of the Park, we have been using two main methods – DVD nights in villages around the Park, and educational trips into Ruaha National Park. We had a problem with access to the Park during the reporting period, as it took a long time to get the permission to enter the Park for free under our research permit. However, we have continued to work closely with the Park and other officials, and we are hopeful that these problems have been resolved. In addition, Msago, who is in charge of the Park visitation programmes, was focused upon the livestock guarding dogs this year, so we did not manage to do as much on this as last year. However, both Park visits and DVD nights remain a key part of our work, and we plan to continue and expand both programmes over the coming year.

During the reporting period, we conducted DVD nights in 11 local villages, reaching 6413 local villagers and students (1662 men, 1548 women, 1823 boys and 1380 girls). In total, the RCP DVD nights have now had 17,530 attendees, so they are an extremely important way of reaching large numbers of people, and enabling wide discussions about our work and wildlife conservation in general. In addition, we have secured funding to produce a local-language film specifically about what RCP does, so that is something that will be developed and shown during the coming year.

Villagers watching a DVD night in Kitisi village © Pat Erickson

Despite the problems with the park access, the project managed to take 99 villagers (46 men, 16 women and 37 schoolchildren) into the Park on educational visits during the reporting period, bringing the total number of participants over time to over 500. These trips

are conducted in collaboration with Ruaha National Park's community officers, who (whenever possible) meet with the villagers and explain the role of the Park and its value to the local area. These trips have been extremely valuable – people get to learn about wildlife and its conservation in an interesting, non-threatening environment, and for most people it is their first visit to the Park. The trips have significantly improved peoples' attitudes towards wildlife and the National Park – of the respondents during this reporting period, 64% said the visit made them more positive towards wildlife like lions, 82% said the visit made them more positive towards Ruaha National Park, and 88% said it made them more positive towards the Ruaha Carnivore Project. These changes in attitudes are critically important for reducing conflict, so we are very keen to continue and extend this work.

Students from Idodi Secondary School watching wildlife in Ruaha National Park

Objective 5 – Train Tanzanian research assistants and assist them in professional development

Improving the capacity of Tanzanian staff is one of the most important goals of the project, and we have been very successful in this to date, with many of our staff being helped through further eduction. The Ruaha Carnivore Project worked hard with one of our senior research assistants, Montan Kalyahe, to enable him to get his MSc degree, which has led to Montan being accepted onto a PhD programme during this reporting period. It has been a long-term goal of the project to get Tanzanian staff onto PhD programmes, so we are very pleased that our work helped Montan achieve this great success. In addition, we have helped another senior research assistant apply for Oxford University's International Diploma in Conservation Practice, and hope that one staff member can apply for that each year. In

terms of professional development, our Tanzanian staff have continued to learn now to use Excel, Word, Powerpoint and similar programmes at the field camp, as well as how to enter and analyse data, write reports, develop and manage budgets, write and give presentations, and develop grant proposals. Two staff members were trained how to drive and received their licences this year, while Tanzanian staff members have presented the project's work to national and international audiences, including the Ruaha Round Table, at the Cheetah Conservation Fund in Namibia and at the Lion Guardians project in Kenya. As mentioned above, the Lion Guardians underwent more training during their visit to Kenya, such as how to use radio-telemetry equipment and improve their other professional skills. In addition, we hosted 5 interns from Tanzanian universities, helping them develop skills which will be useful for future careers in wildlife conservation.

5. Additional activities

During this reporting period, Amy Dickman, the Ruaha Carnivore Project's Director, was selected as one of three international finalists for the Tusk Conservation Award. This was extremely prestigious, as the finalists were able to meet Prince William, who is the royal patron of the Awards, and to talk more to him about their work. This nomination reflected the hard work of the entire RCP team, and generated a lot of interest in RCP's work and successes so far.

RCP's Director, Amy Dickman, with Prince William and receiving a certificate at the 2014 Tusk Conservation Awards in London