

Institution: University College London		
Unit of Assessment: 5 - Biological Sciences		
Title of case study: Range wide conservation for cheetahs and African wild dogs		
Period when the underpinning research was undertaken: 2000 - 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Sarah Durant	Professor and Director of Science (Acting)	1991 - present
Rosie Woodroffe	Professor	2007 - present
Period when the claimed impact occurred: 1 August 2013 - 31 December 2020		
Is this case study continued from a case study submitted in 2014? No		
<p>1. Summary of Impact</p> <p>Between August 2013 and December 2020, African governments developed conservation action plans for cheetahs and African wild dogs covering 1.6 million km², appointed 14 national coordinators to oversee the plans' implementation, and enabled new, on-the-ground cheetah and wild dog conservation across 645,000km². This impact builds upon research by Institute of Zoology (IoZ) Professors Sarah Durant and Rosie Woodroffe conducted between 2000 and 2020, showing that cheetahs and African wild dogs require conservation at vast spatial scales, achievable only through sustainable co-existence with people and domestic animals. The same research also underpins a new international policy framework jointly established by the Convention on Migratory Species and the Convention on International Trade in Endangered Species.</p>		
<p>2. Underpinning research</p> <p>The cheetah (<i>Acinonyx jubatus</i>) and the African wild dog (<i>Lycaon pictus</i>) are two of the world's most highly threatened species, both persisting in a small fraction of their former geographic ranges. IoZ Professor Sarah Durant directs the world's longest-running study of cheetah ecology and behaviour, in Serengeti National Park, Tanzania, while IoZ Professor Rosie Woodroffe established the first study of African wild dogs living outside protected areas, in the rangelands of northern Kenya. By tracking the fates of hundreds of individual cheetahs and wild dogs across multiple generations, these two long-term studies (cheetah: between 1974 and 2021, wild dog: between 2001 and 2021) have yielded ecological insights which have revolutionised conservation efforts for these and other large carnivore species.</p> <p>Cheetahs and wild dogs share two unusual traits: relative to other carnivores of similar size, both species live at very low population densities, and range across very large areas. An innovative behavioural study, published by Durant in 2000, highlights the mechanism underlying these traits: cheetahs risk losing their kills, and their lives, to lions and hyaenas so they move into areas where prey are less abundant and predation risks are therefore lower [R1]. The consequently low population densities and wide-ranging behaviour of these two species mean that cheetahs and wild dogs require conservation on geographic scales seldom considered in terrestrial ecosystems.</p> <p>Studies of population dynamics highlight additional challenges to conserving these two species. In 2000, Durant and her team showed that cheetahs naturally experience high cub mortality, with even small increases predicted to extirpate populations [R2]. This pattern means that removing cubs from wild populations, which occurs through the illegal pet trade,</p>		

poses a serious extinction risk for cheetahs. This high cub mortality also means that adults which are killed (e.g. by farmers) may not be replaced, likewise risking extinction [R2].

Wild dogs' sociable nature generates population dynamics that are very different from those of cheetahs, but equally problematic. In 2019, Woodroffe showed that members of larger packs survive better, and produce larger litters, but the loss of a single dominant animal can cause the whole pack to collapse [R3]. This pattern generates boom-and-bust dynamics which can trigger local extinctions with little prior warning [R3]. Woodroffe's earlier (2012) work shows that such impacts are especially likely where diseases such as rabies, caught from domestic dogs [R4], can kill whole packs and devastate wild dog populations.

Despite these threats, Woodroffe and Durant have shown that cheetahs and wild dogs can persist in some human-dominated landscapes, where lower densities of competing predators may counteract anthropogenic threats [R2]. In 2019, Woodroffe showed that wild dogs living among traditional pastoralists and on private cattle ranches survived just as well as those in protected areas [R3], while in 2017 Durant showed that 77% of remaining cheetah range falls on such non-protected lands [R5].

Durant's 2017 modelling shows how the two species' tendency to range indiscriminately across protected and unprotected lands means that human pressures on unprotected lands can potentially extirpate them both inside and outside reserves [R5]. Both authors have therefore sought sustainable ways to protect these species while also benefiting local people, for example through Woodroffe's 2007 studies on traditional husbandry to reduce predation on livestock [R6], and her 2012 prediction that domestic dog vaccination should prevent rabies in both people and wild dogs [R4].

3. References to the research

- [R1] Durant, S. M. (2000). 'Living with the enemy: avoidance of hyenas and lions by cheetahs in the Serengeti'. *Behavioral Ecology* **11**, 624-632. DOI: <https://doi.org/10.1093/beheco/11.6.624> (Citations: 258).
- [R2] Kelly, M. J. & Durant, S. M. (2000). 'Viability of the Serengeti cheetah population'. *Conservation Biology* **14**, 786-797. DOI: <http://doi.org/doi:10.1046/j.1523-1739.2000.98329.x> (Citations: 85).
- [R3] Woodroffe, R., O'Neill, H. M. K. & Rabaiotti, D. (2019). 'Within- and between-group dynamics in an obligate cooperative breeder'. *Journal of Animal Ecology* **89**, 530-540. DOI: <https://doi.org/10.1111/1365-2656.13102> (Citations: 5).
- [R4] Woodroffe, R. *et al.* (2012). 'Contact with domestic dogs increases pathogen exposure in endangered African wild dogs (*Lycaon pictus*)'. *PLoS ONE* **7**, e30099, DOI: <http://doi.org/10.1371/journal.pone.0030099>. (Citations: 97).
- [R5] Durant, S. M. *et al.* (2017). 'The global decline of cheetah *Acinonyx jubatus* and what it means for conservation'. *Proceedings of the National Academy of Sciences of the United States of America* **114**, 528-533. DOI: <http://doi.org/10.1073/pnas.1611122114>. (Citations: 106).
- [R6] Woodroffe, R., Frank, L. G., Lindsey, P. A., ole Ranah, S. M. K. & Romañach, S. S. (2007). 'Livestock husbandry as a tool for carnivore conservation in Africa's community rangelands: a case-control study'. *Biodiversity and Conservation* **16**, 1245-1260. DOI: http://doi.org/10.1007/978-1-4020-6320-6_28 (Citations: 185).

4. Details of the impact

The research finding that cheetahs and wild dogs require conservation across geographic scales seldom considered in terrestrial ecosystems inspired Durant and Woodroffe to address this challenge by establishing, in 2006, the Range Wide Conservation Programme for Cheetahs and African Wild Dogs (RWCP). This programme works with national governments, non-governmental organisations, and other partners to support and encourage conservation of the two species on the vast geographical scales needed, across protected and unprotected lands, within and across national borders [S1, S2]. Informed by Durant and Woodroffe's research, between 2013 and 2020 the RWCP:

- Developed national conservation action plans for cheetahs and wild dogs in partnership with seven range state governments (Algeria, Angola, Benin, Chad, Namibia, Niger, and Tanzania) and local non-governmental organisations, together covering 1.6 million km² of known cheetah range and over 500,000 km² of known wild dog range [S1], [S2], [S3], [S4]. In developing and implementing these plans, national wildlife authorities have learned to address the unique conservation challenges posed by these very wide-ranging predator species [S1], [S3], [S4].
- Reviewed and updated the International Union for Conservation of Nature/Species Survival Commission's IUCN/SSC regional strategic plan for the conservation of cheetahs and African wild dogs in southern Africa, and reviewed and updated three national conservation action plans for cheetahs and wild dogs in partnership with three range state governments (Botswana, Zimbabwe and Zambia) [S1], [S2]. This process allowed national wildlife authorities to take stock of progress to date, to incorporate new research, and to revise and update their plans in line with progress and current scientific research [S1], [S2].
- Developed national capacity for cheetah and wild dog conservation by training, mentoring and supporting National Coordinators in 14 range states, to oversee the implementation of new and existing National Action Plans [S1], [S2], [S3], [S4], [S5], [S6]. Each of these Coordinators is embedded within their national wildlife authority, and their training has included sustainable ways to protect these species while also benefiting local people, allowing cheetahs and wild dogs to survive in human-dominated landscapes [S6].
- Supported the Convention on Migratory Species (CMS) to establish a new policy initiative (the African Carnivores Initiative) in partnership with the Convention on International Trade in Endangered Species (CITES) [S1], [S7]. This joint Initiative, which started work in 2018, provides an international framework to promote cheetah and wild dog conservation on the huge geographic scales needed, including a recommendation to "*establish a national coordination structure based on the Range Wide Conservation Programme for Cheetah and Wild Dog to provide technical support, training and mentoring to coordinators and a platform for regular meetings*" [S7].
- In partnership with national governments and local experts, facilitated developing the first conservation plans for the species in two Trans-Frontier Conservation Areas (TFCAs); the Kavango-Zambezi TFCA in Botswana/Namibia/Angola/Zambia/Zimbabwe (>500,000km²), and the W-Arly-Pendjari-Oti-Mandouri TFCA in Benin/Burkina Faso/Niger/Togo (23,000km²), promoting cheetah and wild dog conservation across international borders [S2], [S4].
- Established a new conservation initiative in the W-Arly-Pendjari-Oti-Mandouri TFCA (23,000km²) to secure habitat and prey for the last cheetah population in West Africa [S2], [S4].
- Developed a carnivore management plan for the Tsavo ecosystem in Kenya/Tanzania (24,421km², in partnership with Kenya Wildlife Service, Kenyan NGO Osilalei, and local stakeholders) [S2], [S5], and a management plan for Luando National Park in Angola (8,737km², in partnership with the Angola Ministry of Environment) [S2].

- Discovered two previously unknown populations of African wild dogs covering 13,000km² in the course of surveying protected areas across Angola, a country recovering from decades of conflict [S8].
- Initiated a new on-the-ground project in Zambia, to help local communities to coexist with wild dogs, cheetahs, and other wildlife, hence securing a vital but unprotected wildlife corridor which connects wild dog and cheetah range in Kafue National Park (30,680km²), to range in the Kavango-Zambezi TFCA (558,189km²) [S1], [S2].

In addition, demographic evidence that the illegal pet trade poses a serious extinction risk for cheetahs prompted RWCP to:

- Work through CITES to raise awareness of the illegal trade in cheetahs among range states, transit, and destination countries. This resulted in a formal assessment of the impact of trade on cheetah populations (which lists RWCP as one of the organisations contributing information), and establishment of a cheetah working group within CITES, with Durant as a member [S1].
- Provide the first CITES Illegal Trade Resource Kit, to be used by customs and other enforcement officials across the world to address illegal trade in cheetahs, including identifying cheetahs and cheetah products, and ensuring that any confiscated cheetahs are managed appropriately [S1], [S2].

Moreover, Woodroffe's evidence that rabies caught from domestic dogs can kill whole packs and devastate wild dog populations prompted her Kenyan PhD student, Dedan Ngatia, to establish the Laikipia Rabies Vaccination Campaign (LRVC), which aims to protect both people and wild dogs by vaccinating domestic dogs [S10]. Although the World Health Organisation aims to eradicate human rabies by 2030, most efforts have targeted urban areas. Drawing tangible links between human and wildlife health has encouraged donors to support rural rabies control [S1], and the LRVC, which is conducted in partnership with Kenya's national and county governments, and local communities, is estimated have prevented approximately 75 human rabies deaths since its establishment in 2015 [S5]. Under the auspices of the RWCP, Woodroffe's team is now using evidence from their own research, and the experience of the LRVC, to develop disease management plans for wild dogs in Kenya, which are expected to provide a model for other wild dog conservation projects throughout Africa [S1], [S5].

In a recent independent review after 13 years of operation using the Conservation Excellence Model (CEM), the Range Wide Conservation Programme for Cheetah and African Wild Dogs was assigned a score of greater than 500. The assessors noted, that: *"For comparison, amongst programmes previously assessed against CEM, only two other programmes achieved assessment scores in excess of 500 points, both of which have been established more than 20 years"* [S2].

5. Sources to corroborate the impact

[S1] Testimonials from the Chairs of the IUCN/SSC Cat Specialist Group and the IUCN/SSC Canid Specialist Group.

[S2] Final project report for Phase 3 of the RWCP to the Howard G Buffett Foundation describing the last five years of RWCP activities and their impacts, including a summary of an independent end of project evaluation.

[S3] Testimonial from the Director of Wildlife, Ministry of Natural Resources and Tourism, Tanzania.

[S4] Testimonial from the Division des Aire Protégées, Niger.

[S5] Testimonial from Kenya Wildlife Service.

[S6] Tropical Biology Association, Effective delivery of National Action Plans
http://www.cheetahandwilddog.org/wp-content/uploads/2017/08/NCC-Course-1-Manual_2017.pdf

[S7] Convention on the Conservation of Migratory Species of Wild Animals, 1st Meeting of Range States for the Joint CMS – CITES African Carnivore Initiative (ACI1)
https://www.cms.int/sites/default/files/document/cms-cites_aci1%20_outcomes.1_communiqué_e.pdf

[S8] Overton, J.M., Castells, D.E., Elizalde, S.R.F.F., Valério, H.M., Zumbo, M.N.A., Groom, R.J. & Durant, S.M. (2020). Endangered African wild dogs (*Lycaon pictus* Temm.) in Angola: Filling a 50-year gap of knowledge with findings from two National Parks. *African Journal of Ecology* **58**: 582-587.

[S9] Convention on International Trade in Endangered Species of Wild Fauna And Flora, 65th meeting of the Standing Committee
<https://www.cites.org/sites/default/files/eng/com/sc/65/E-SC65-39.pdf>

[S10] Muloi, D. & Ngatia, D (2020) Lessons from a community-driven rabies vaccination campaign in Kenya <https://theconversation.com/lessons-from-a-community-driven-rabies-vaccination-campaign-in-kenya-142673>