Alison Maclean

Hair of the **dog**

With just 5000 animals left in the wild, **Clare Marsden** is collecting hair, blood and tissue samples from African wild dogs to ensure captive-breeding programmes conserve genetic diversity.

It's 5am and still dark. But on the Serengeti Plains in north-western Tanzania researchers are already setting out to monitor one of the world's most endangered canids, the African wild dog – a unique pack-dwelling species distinguished by its enormous ears and patchy coat of black, brown, blonde and white.

Researchers will spend up to 11 hours today locating and studying these elusive animals. Tracking them often requires a small plane because they roam across such a large area.

Back in Glasgow at a more respectable 9am, I'm hoping they will not only find the dogs today, but also manage to collect for me a genetic sample – blood, tissue, hair, I'm not fussy. Even poo would do. These samples are for my PhD: I am using genetics to improve our understanding of these fabulous but threatened creatures.

This start to the day is not unique to the Serengeti wild dog project in Tanzania. The scenario is repeated in many countries across sub-Saharan Africa where African wild dogs still roam, and the network of African wild-dog field-conservation projects continues to grow.

Nonetheless, protecting wild dogs is a Herculean task, and conservationists face immense challenges. Every year, more and more wildlife areas are converted to farms or put to other uses by people. Consequently, wild dogs now roam over just one twentieth, or five per cent, of their former range and less than 5000 animals remain.

African wild dog populations that were once connected are growing smaller and becoming fragmented and isolated. Small and isolated populations are more likely to suffer from genetic problems such as inbreeding and loss of genetic variation. This increases the risk that a population will die out – a risk that would be avoided if populations were larger and not isolated.

CANID: any member of the family *Canidae*, including dogs, wolves, foxes, coyotes, jackals and African wild dogs. African wild dogs are also known as African hunting dogs, painted hunting dogs and painted wolves.

Wanton killers?

For an endangered species like the African wild dog, a captive-breeding programme provides a critical element to conservation efforts. These animals raised in captivity are an insurance against extinction in the wild; a source of animals for reintroductions; and play a role in education. This final point is particularly important for African wild dogs. Until recently they were often perceived as wanton killers and dealt with as vermin.

Like their wild relatives, captive animals are at risk of inbreeding and loss of genetic variation. These are problems inherent in any captive-breeding programme. The main goal of my NERC-funded PhD project is to improve understanding of the genetic status of both wild and captive African wild dogs and to use this information to assist with conservation efforts.

Together with my PhD partner, the Royal Zoological Society of Scotland at Edinburgh Zoo, the first challenge was to coordinate sample collection across the European zoos, which represents our target captive population. This was no easy challenge: there are about 270 wild dogs scattered between nearly 40 European zoos. I had to convince each one to contribute samples. Fortunately I had a very persuasive studbook keeper on my side!

Next I needed to form collaborations. I wanted samples from across as broad a range of wild populations as possible. It is not enough to concentrate on a single country because African wild dogs do not recognise human-imposed borders; a single pack's home range can be as large as $3000km^2$ so African wild dog populations commonly span the land of more than one country.

We had to approach our research at the Africa scale. Fortunately, the African wild dog conservation community is passionate about the future of this species, and through a network of more than 70 collaborators I collated samples from more than 470 animals from 13 field projects in seven sub-Saharan African countries and a further 230 animals from more than 30 European zoos; I have certainly mastered the art of import licences!

With this first rather large hurdle – sample acquisition – mastered, it was time to move on to the genetic research. Our primary goal was to measure levels of variation in a set of immunity genes, known as the Major Histocompatibility Complex or MHC. Scientists think higher diversity of these genes is important because it enables resistance to a wider range of diseases. This is particularly important because disease outbreaks have devastated African wild dog populations in the past.

Our first question was to assess whether African wild dogs' immunity genes had as much variation as some closely related species. Perhaps not surprisingly, we found that African wild dogs had much less variation than more abundant canid species such as common jackals and grey wolves. This indicates that the population declines and fragmentation experienced by wild dogs has led to these important adaptive genes losing genetic variation. More worryingly, our data also suggest that African wild dogs have less genetic variation than other endangered canid species like the Ethiopian wolf, which currently number less than 500 in the wild. Does this mean that African wild dogs are more susceptible to disease?

Taking samples from an African wild dog.

Rosemary Groom

This is something we are unable to test, but it does highlight the importance of conserving all of the genetic variation that is left in African wild dogs.

Our data has not all been doom and gloom though. One wild population we assessed, the Serengeti population in Tanzania, disappeared in 1991, but naturally recolonised in 2003. Commonly, recolonising populations have reduced genetic diversity because they are formed by just a few colonising individuals. But when we compared the old population with the recolonised population we found more immunity gene diversity in the recolonised population. We think this is because the Serengeti was recolonised by more than just a few animals. This finding suggests that in some cases wild dogs can rebound from past population declines without incurring a significant fall in genetic diversity. There is also some evidence that these genes naturally reaccumulate new diversity, albeit very slowly.

On another positive note, testing of captive animals showed us that most of the genetic variation we detected in the wild populations was represented in the European captive population. Considering that captive-breeding programmes aim to capture the genetic diversity in the wild, this is great news. The high level of diversity appears to be the result of the founders of the captive population being caught from a number of different wild populations in several countries.

We are now working closely with the African wild dog studbook committee who manage the captive population to design a breeding programme to conserve the genetic diversity of this captive population.

For the wild populations our future work aims to use some more genetic tools to understand how individual populations are connected with each other. For example, we want to know where the recolonising Serengeti wild dogs came from. Addressing this type of question has only been made possible by the exceptionally large collaborative network of field projects that contributed samples towards our research, and represents a good example of what can be achieved when conservation groups all pull together. ❖

MORE INFORMATION

Clare Marsden is a PhD student in the Division of Ecology and Evolutionary Biology, at the University of Glasgow.
Email: c.marsden.1@research.gla.ac.uk